BLACK & VEATCH

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Clark County Dept. of Public Works
Hiko Springs Wash Detention Basin

B&V Project 25574.400
B&V File G-6
July 25, 1996

Mr. Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate
Federal Emergency Management Agency
Washington, D.C. 20472

Subject: Case No. 96-09-357R

Dear Mr. Buckley:

This is in response to a letter dated May 16, 1996, from Mr. Michael K. Buckley, P.E., Chief, Hazard Identification Branch, Mitigation Directorate of the Federal Emergency Management Agency (FEMA) to the Honorable Yvonne Atkinson Gates, Chairperson of the Clark County Board of Commissioners regarding the FEMA response to the CLOMR submittal of January 8, 1996, for the Hiko Springs Wash Detention Basin (HSWDB).

In the May 16, 1996, response from Mr. Buckley, FEMA agreed that the discharge value downstream of the HSWDB would be reduced from 8,282 cfs to 850 cfs, conditioned on providing additional documentation for the following areas:

1. Engineering analyses that quantifies the volumes of debris flow and sediment movement associated with the base flood.
2. Maintenance and Operation Plan
3. As-built plans.
4. Flood frequency curves at the HSWDB outlet to allow a Flood Insurance Rate Map (FIRM) revision.
5. Depth and velocity for flooding downstream of the basin to allow a FIRM revision.

In response to these requests for additional documentation, the following information is provided:

"Hiko Springs Wash Detention Basin, LOMR Documentation, Volumes 1, 2, and 3"

Mr.Michael K. Buckley, P.E.

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"Hiko Springs Wash Detention Basin As-Builts Drawings"

The enclosed documents provide the following detailed information:

1. HSWDB As-Built Plans. Construction of the HSWDB was completed in April 1996. The as-built conditions of the project were recorded by the construction manager and were certified by the project engineer, Jill A. Reilly, P.E., to be constructed in accordance with the as-built plans and specifications. The as-built drawings include the following modifications to the original HSWDB design drawings: (1) the addition of soil cement to the downstream face of the embankment for erosion protection, (2) the addition of splash blocks at the top three steps of the spillway, (3) replacement of the stepped apron channel with a concrete trapezoidal channel, and (4) approximately 68,000 cy of additional excavation from the basin's impoundment area.

2. HSWDB LOMR Documentation, Volume 1. Volume 1 of this submittal contains the analyses performed during design of the HSWDB project. These analyses include the following: hydrologic, sediment transport, embankment stability, spillway design, and outlet works design. Review of these analyses will confirm the conditions presented in the CLOMR that show the HSWDB will successfully attenuate the 100-year, 6-hour storm event from 8,282 cfs to 850 cfs with sufficient capacity for sediment storage. Construction of the sediment berm and trash rack, in conjunction with the Clark County Department of Public Works' maintenance plan, will ensure efficient operation of the outlet works. A copy of the CLOMR is also included in Volume 1 for reference.

   Although the 2-, 10-, 50-, and 100-year HEC-1 models and resulting flood frequency curve were submitted to Mr. Mohr at FEMA last week, copies are also provided in the miscellaneous section of Volume 1. It is our understanding that Michael Baker Jr., Inc. has generated a model of the "new" alluvial fan created by construction of the HSWDB, and has determined that flood velocities and depths may be reduced because of the structure, which will support a FIRM revision.

   The Maintenance & Operation Plan is also included at the back of the miscellaneous section as provided by Clark County Public Works and the Clark County Regional Flood Control District.

fema2.wp5/drh/CCDPW1

Mr.Michael K. Buckley, P.E.

B&V Project 25574.400
July 25, 1996

3. HSWDB LOMR Documentation, Volume 2 and Volume 3. Volume 2 of the submittal contains the geotechnical report and soils test results. Volume 3 contains the materials test results for the roller-compacted concrete, soil cement, and concrete. These two volumes were submitted as the QA/QC report to the Nevada Division of Water Resources in compliance with the Nevada Dam Safety Permit.

Upon review of this supplemental documentation supporting the successful operation of the HSWDB for the base flood event, and acceptance of the flood frequency curve for the Hiko Springs Wash alluvial fan, it is our belief that FEMA will credit the HSWDB as a flood control structure. By doing so, the FIRM may then be revised to reflect the lower flood depths and velocities.

If you have any questions regarding this submittal, please contact Ms. Jill Reilly either by telephone at (702) 732-0448, or by facsimile at (702) 732-7578.

Very truly yours,

BLACK & VEATCH

Craig S. Swengle

Craig S. Swengle, P.E.

jar
Enclosures

cc: William C. Brandt, CCDPW
Denis Cederburg, CCDPW
Gale Frasier, CCRFCD
Kevin Eubanks, CCRFCD
Craig Swengle, B&V
Jill Reilly, B&V

fema2.wp5/drh/CCDPW1

Introduction

PERTINENT DATA

LOCATION — **SECTIONS 16 and 17**
TOWNSHIP 32 SOUTH, RANGE 66 EAST
CLARK COUNTY, NEVADA

DESIGN STORMS

INFLOW DESIGN FLOOD: 100-YR, 6-HR STORM

STORM AREA - 19.17 sq mi — PEAK INFLOW - 8,282 cfs
TOTAL RAINFALL - 4.58 in — VOLUME OF INFLOW HYDROGRAPH - 1,857 ac ft

SPILLWAY DESIGN FLOOD: PROBABLE MAXIMUM STORM

STORM AREA - 19.17 sq mi — PEAK INFLOW - 33,646 cfs
TOTAL RAINFALL - 11.84 in — VOLUME OF INFLOW HYDROGRAPH - 7,016 ac ft

DETENTION BASIN EMBANKMENT

TYPE: HOMOGENEOUS EARTHFILL
LENGTH: 2,317 ft
MAXIMUM HEIGHT ABOVE GRADE: 80 ft
TOP ELEVATION: 1086 ft
FREEBOARD:
- FOR 100-YR, 6-HR STORM - 9.88 ft
- FOR PROBABLE MAXIMUM STORM - 1.16 ft

SLOPES:
- UPSTREAM SLOPE - 3:1
- DOWNSTREAM SLOPE FROM TOP TO BOTTOM - 53 ft @ 2.5:1, 24 ft @ 5:1, AND 18 ft @ 2:1

IMPOUNDMENT AREA

FOR 100-YR, 6-HR STORM:
- POOL ELEVATION - 1076.12 ft
- SURFACE AREA - 41.4 ac
- VOLUME - 1580 ac ft
- DRAIN TIME - 47 hrs

FOR PROBABLE MAXIMUM STORM:
- POOL ELEVATION - 1084.84 ft
- SURFACE AREA - 51.0 ac
- VOLUME - 1,981 ac ft

SPILLWAY

TYPE: ROLLER-COMPACTED CONCRETE CAPPED, BROAD-CRESTED WEIR
CREST ELEVATION: 1077.5 ft
CREST LENGTH: 550 ft
CREST WIDTH: 59 ft
DISCHARGE CAPACITY @ 100-YR POOL: 0 cfs
DISCHARGE CAPACITY @ PMF POOL: 32,144 cfs

OUTLET WORKS

TYPE: 62-in DIAMETER STEEL ORIFICE PLATE WITH CAST-IN-PLACE CONCRETE BOX CULVERT
CULVERT DIMENSIONS: SINGLE BARREL, 8'-0"w X 6'-0"h
ORIFICE PLATE DISCHARGE CAPACITY @ 100-YR POOL: 850 cfs
ORIFICE PLATE DISCHARGE CAPACITY @ PMF POOL: 902 cfs

Hydrology

Hydrologic Analysis

Overview

The following discussion presents the hydrologic analysis of the Hiko Springs watershed. The purpose of this analysis was to develop the 100-year storm peak inflows in order to establish the detention basin design requirements for stage, storage, and outflow.

Previous Work

Boyle Engineering first performed a hydrologic study of the Hiko Springs watershed in May 1989, and prepared the watershed map included at the end of this section. The 1989 study was prepared prior to the guidelines established in the current Clark County Regional Flood Control District's (CCRFCD) Hydrologic Criteria and Drainage Design Manual (Manual). Boyle updated their hydrologic model in 1991, by changing the Storm Distribution Number (SDN) from 4 to 5 to correspond with the manual. Although the higher SDN would have lowered the peak inflow, Boyle continued to use the 9,500 cfs peak inflow of the original model as the 100-year design flow in their 1991 Design Memorandum. All other criteria remained the same as the 1989 model, which used the Corps of Engineers (COE) methodology for estimating lag times. Boyle used the following equations to develop the lag times:

$$Lag_{coe} = 24n(L*L_c/S^{1/2})^{0.38}$$

$$Lag_{scs} = 0.78Lag_{coe}$$

where:

n	=	Roughness coefficient for overland flow,
L	=	Length of main stream (mi),
L_c	=	Distance from the basin outlet to the centroid of the basin (mi),
S	=	Average slope of the main watercourse (ft/mi),
Lag_{coe}	=	COE lag time (hr), and
Lag_{scs}	=	Soil Conservation Service lag time (hr).

In evaluation of the 1991 Boyle models, CCRFCD recalculated the lag times in accordance with the Manual's guidelines. The manual bases lag time on the United States Bureau of Reclamation's analysis of basin characteristics for several drainage basins in the Southwest desert, Great Basin, and Colorado Plateau areas (USBR, 1989). The following equation was developed by converting the USBR's S-graph lag equation to a dimensionless unit hydrograph lag equation:

$$TLAG = 20K_n\ (L*L_c\ /S^{1/2})^{0.33}$$

where:

where:	K_n	=	Manning's roughness factor for the basin channels,
	L	=	Length of longest watercourse (mi),
	L_c	=	Distance along longest watercourse from the basin outlet to the centroid of the basin (mi), and
	S	=	Average slope of the longest watercourse (ft/mi).

The roughness coefficients ("n" or "K_n") selected by Boyle for each subbasin in the Facilities Plan were compatible with the range of values presented in the Manual, therefore, the coefficients were not modified during CCRFCD's lag time recalculations. Using the CCRFCD equation, the updated lag times were consistently higher than those previously calculated by Boyle. A spreadsheet comparing CCRFCD's and Boyle's lag time results is included at the end of this section.

The Depth-Area Reduction Factors (DARF) used in both of Boyle's HEC-1 models were obtained from NOAA publication HYDRO-40 (1984) which established factors specific to Arizona and New Mexico. Boyle calculated a DARF for each node based on the cumulated area at the node to aid in assessing different points of interest while developing the Facilities Plan.

CCRFCD used one DARF in the updated model which represents the entire watershed above node J, the location of the detention basin outlet. CCRFCD utilizes the six-hour COE depth-area reduction factors (USACE, 1988) for the Clark County area, however, according to Boyle's tabulation in the Facilities Plan, both the NOAA and USACE methods produced a DARF of .79 at node J.

By increasing the SDN from 4 to 5 and recalculating the lag times, the Boyle peak inflow figure was lowered from 9,500 cfs to 8,313 cfs in CCRFCD's updated model. The Boyle HEC-1 models used point precipitation values of 4.58 inches and 11.5 inches for the 100-year and probable maximum flood (PMF) precipitation values, respectively. These values were also used by CCRFCD.

Black & Veatch Approach

Upon receipt of the CCRFCD HEC-1 file, Black & Veatch reviewed the model parameters for consistency with the Manual and characteristic representation of the watershed subbasins. One adjustment was made in the lag time value for subbasin B3; the lag time was calculated as .88 following the manual guidelines as shown ion the spreadsheet included at the end of this section. The HEC-1 model showed a .86 lag time for subbasin B3. All other lag times and subbasin characteristics were accepted as mapped and developed by Boyle and CCRFCD. The remainder of this section will describe the 100-year and PMF storm design models used for this project.

Design Storm

For a watershed over 10 square miles, the design storm, per the Manual, is a 6-hour, 100-year storm with an SDN of 5. In accordance with the Manual, the NOAA Atlas 2 point precipitation value of 3.2 inches for the Laughlin area, is modified by an adjustment factor of 1.43 to more closely reflect the trend of observed and recorded rainfall values which have occurred since publication of the Atlas in 1973. The adjusted point precipitation for the 6-hour, 100-year storm then becomes 4.58 inches for the 19.2-square mile watershed, the same value used by Boyle. The peak inflow generated by this storm in the B&V model is 8,282 cfs.

The detention basin bottom is at elevation 1005 feet and the spillway crest is at 1077.5 feet. Storage volumes in the basin were calculated at each 5-foot change in elevation using the following conic method equation:

$$\Delta V = \{(h/3)[A_1 + A_2 + (A_1 * A_2)^{0.5}]\}$$

where:

ΔV	=	Volume between base areas 1 and 2,
A_i	=	Surface area of base i,
h	=	Vertical distance (E_2 - E_1) between bases A_1 and A_2, and
E_i	=	Elevation of base i.

The stage elevations and storage volumes for the design basin were input into HEC-1 while routing the peak inflow through a 62-inch diameter steel, square-shoulder orifice plate. The orifice plate has an invert elevation of 1005 feet. An orifice discharge coefficient of .61 was used in the HEC-1 model based on information obtained from References 3 and 4 listed at the end of this section. The diameter of the orifice plate was chosen to accommodate several design goals including the following:

- Attenuate the peak discharge flow to under 1,000 cfs.
- Provide adequate storage for the 100-year design storm and sediment accumulation.
- Limit excavation quantities.

Using the 62-inch diameter orifice, the 8,282 cfs inflow hydrograph was attenuated to a peak discharge of 850 cfs. The maximum stage elevation achieved was 1076.12 based on the following orifice equation:

$$Q = C_d A\ (2gh)^{0.5}$$

where:
- Q = Rate of flow (cfs),
- C_d = Coefficient of discharge,
- A = Area of orifice (sq ft),
- g = Acceleration of gravity (ft/s^2), and
- h = Head above orifice centerline (ft).

The following table summarizes the HEC-1 output as it relates to the 100-year design storm:

6-HOUR, 100-YEAR STORM		
Inflow	Peak flow (cfs)	8,282
	Time to peak (hrs)	4.42
Outflow	Peak flow (cfs)	850
	Time to peak (hrs)	7.83
Basin Performance	Peak stage (ft)	1076.12
	Peak storage (ac-ft)	1580

REFERENCES

1. "Facilities Plan for Hiko Springs and Unnamed Wash Laughlin - Big Bend Area, Clark County Nevada"; Boyle Engineering Corporation; May 1989.

2. "Design Memorandum for Hiko Springs Wash in Laughlin, Clark County, Nevada; Boyle Engineering Corporation; April 1991.

3. Fluid Mechanics with Engineering Applications, Eighth Edition; R.L. Daugherty, J.B. Franzini, and E.J. Finnemore; McGraw-Hill; 1985.

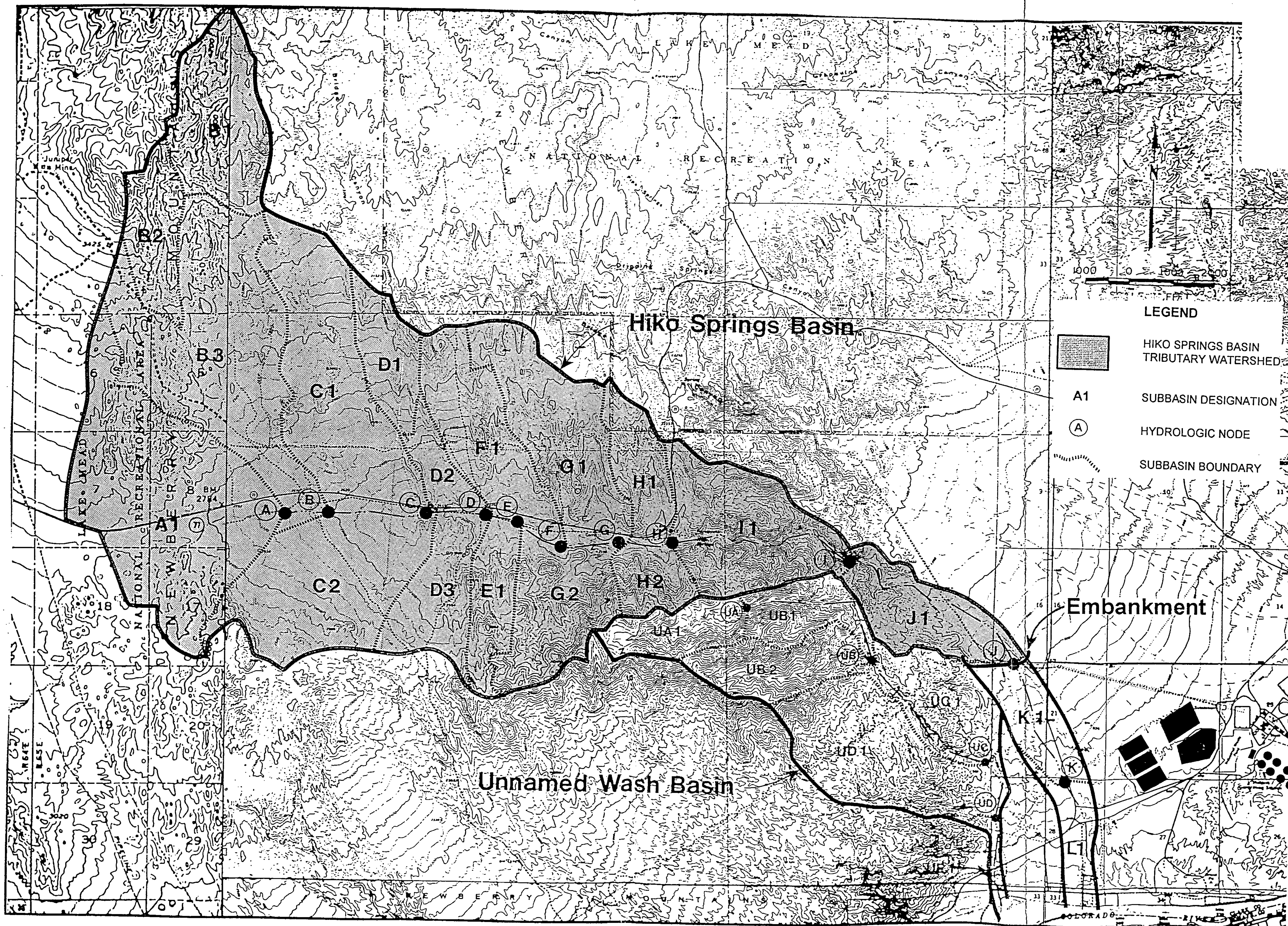
4. Water Measurement Manual, Second Edition; United States Department of the Interior, Bureau of Reclamations; 1984.

5. Engineering Hydrology Principals and Practices; Victor Miguel Ponce; Prentice Hall; 1978.

6. Hydrology and Floodplain Analysis, Second Edition; P.B. Benient and W.C. Huber; Addison-Wesley Publishing Company; 1992.

7. "Hydraulic Structures"; C.D. Smith; University of Saskatchewan.

8. "H21 Flood Hydrograph Package (HEC-1) User's Manual"; January 15, 1992.



from design rpt.

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*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                *   U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990              *                *   HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0                *                *          609 SECOND STREET           *
*                                        *                *        DAVIS, CALIFORNIA 95616       *
*  RUN DATE  05/30/1996  TIME  17:02:44  *                *           (916) 756-1104             *
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X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X         XXXXX  X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1       ID   HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
  2       ID   100 YEAR FREQUENCY  6-HOUR STORM per CCRFCD HC&DDM
  3       ID   SDN 5, DARF .79
  4       ID   Originally created by Boyle Engineering for CCRFCD
  5       ID     as Hiko Springs/Unnamed Wash Facilities Plan.
  6       ID   TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
  7       ID   Edited by Black & Veatch for design of Hiko Springs Detention Basin.
  8       IT       5       0       0     300
  9       IN       5       0       0
 10       IO       5       0       0
 11       JR    PREC     .79

 12       KK      A1
 13       KM   RUNOFF FROM SUBBASIN A1
 14       BA    2.73
 15       PB    4.58
 16       PC    .000    .020    .059    .080    .110    .144    .150    .160    .168    .171
 17       PC    .180    .182    .187    .190    .197    .202    .210    .220    .230    .241
 18       PC    .250    .259    .265    .280    .290    .300    .305    .309    .310    .317
 19       PC    .321    .327    .333    .346    .361    .381    .408    .430    .477    .514
 20       PC    .561    .630    .710    .720    .731    .752    .779    .790    .795    .804
 21       PC    .810    .820    .826    .840    .859    .889    .910    .938    .966    .970
 22       PC    .974    .979    .981    .983    .985    .989    .990    .992    .993    .996
 23       PC    .997    .999    1.00
 24       LS       0      78
 25       UD     .83

 26       KK      RA
 27       KM   ROUTE A1 RUNOFF
 28       RK    2200   .0364    .050            TRAP     200      25

 29       KK      B1
 30       KM   RUNOFF FROM SUBBASIN B1
 31       BA    1.08
 32       LS       0      83
 33       UD     .47

 34       KK     RB1
 35       KM   ROUTE B1 RUNOFF
 36       RK   15500   .0503    .050            TRAP     350      25

 37       KK      B2
 38       KM   RUNOFF FROM SUBBASIN B2
 39       BA     .61
 40       LS       0      82
 41       UD     .43

 42       KK     RB2
 43       KM   ROUTE B2 RUNOFF
 44       RK   11500   .0435    .050            TRAP     200      25
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 45           KK      B3
 46           KM   RUNOFF FROM SUBBASIN B3
 47           BA     2.5
 48           LS       0       81
 49           UD     .88

 50           KK       B
 51           KM   COMBINE RA, B1, B2, & B3
 52           HC       4

 53           KK      RB
 54           KM   ROUTE B
 55           RK    4500   .0389    .050            TRAP     300      25

 56           KK      C1
 57           KM   RUNOFF FROM SUBBASIN C1
 58           BA    1.91
 59           LS       0       80
 60           UD     .83

 61           KK      C2
 62           KM   RUNOFF FROM SUBBASIN C2
 63           BA    1.68
 64           LS       0       79
 65           UD     .94

 66           KK       C
 67           KM   COMBINE RB, C1, & C2
 68           HC       3

 69           KK      RC
 70           KM   ROUTE C
 71           RK    2900   .0414    .050            TRAP     300       5

 72           KK      D1
 73           KM   RUNOFF FROM SUBBASIN D1
 74           BA    .524
 75           LS       0       80
 76           UD     .42

 77           KK     RD1
 78           KM   ROUTE D1
 79           RK    5400    .061    .050            TRAP     100      50

 80           KK      D2
 81           KM   RUNOFF FROM SUBBASIN D2
 82           BA    .301
 83           LS       0       80
 84           UD     .34
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  85          KK      D3
  86          KM   RUNOFF FROM SUBBASIN D3
  87          BA    .753
  88          LS      0       85
  89          UD     .46

  90          KK       D
  91          KM   COMBINE RC, RD1, D2, & D3
  92          HC       4

  93          KK      RD
  94          KM   ROUTE D
  95          RK    1600   .0469    .050            TRAP     300      15

  96          KK      E1
  97          KM   RUNOFF FROM E1
  98          BA    .495
  99          LS      0       87
 100          UD     .43

 101          KK       E
 102          KM   COMBINE RD & E1
 103          HC       2

 104          KK      RE
 105          KM   ROUTE E
 106          RK    2560   .0364    .050            TRAP     300      50

 107          KK      F1
 108          KM   RUNOFF FROM SUBBASIN F1
 109          BA    1.08
 110          LS      0       82
 111          UD     .56

 112          KK       F
 113          KM   COMBINE RE & F1
 114          HC       2

 115          KK      RF
 116          KM   ROUTE F
 117          RK    3000   .0467    .050            TRAP     300      50

 118          KK      G1
 119          KM   RUNOFF FROM SUBBASIN G1
 120          BA    1.36
 121          LS      0       83
 122          UD     .62

 123          KK      G2
 124          KM   RUNOFF FROM SUBBASIN G2
 125          BA    1.02
 126          LS      0       88
 127          UD     .47
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 128        KK      6
 129        KM   COMBINE RF, G1, & G2
 130        HC      3

 131        KK     R6
 132        KM   ROUTE 6
 133        RK   2600   .0346    .050             TRAP     300       5

 134        KK     H1
 135        KM   RUNOFF FROM SUBBASIN H1
 136        BA   .560
 137        LS      0       83
 138        UD    .42

 139        KK     H2
 140        KM   RUNOFF FROM SUBBASIN H2
 141        BA   .373
 142        LS      0       90
 143        UD    .24

 144        KK      H
 145        KM   COMBINE R6, H1 & H2
 146        HC      3

 147        KK     RH
 148        KM   ROUTE H
 149        RK   9400   .0585    .070             TRAP      75       5

 150        KK     I1
 151        KM   RUNOFF FROM SUBBASIN I1
 152        BA   1.35
 153        LS      0       89
 154        UD    .55

 155        KK      I
 156        KM   COMBINE RH & I1
 157        HC      2

 158        KK     RI
 159        KM   ROUTE I
 160        RK  10000   .0410    .050             TRAP     400      50

 161        KK     J1
 162        KM   RUNOFF FROM SUBBASIN J1
 163        BA   .847
 164        LS      0       75
 165        UD    .41

 166        KK      J
 167        KM   COMBINE RI & J1
 168        HC      2
 169        KO      1
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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          KK   DET B
          KM   DETENTION BASIN SITE
          KM     Spillway elevation of 1077.5 ft.: 62" dia. low-level outlet pipe:
          KM     storage capacity of 1636 ac ft.
          KO       1
          RS       1    STOR      -1
          SV       0    2.68   27.13   75.75  141.59  216.52  299.74  393.04  497.42  612.84
          SV  738.58  873.92 1018.86 1174.58 1343.32 1531.69 1746.05 1988.34
          SE    1002    1005    1010    1015    1020    1025    1030    1035    1040    1045
          SE    1050    1055    1060    1065    1070    1075    1080    1085
          SL  1007.5   20.97     .61      .5
          SS  1077.5     550   2.939     1.5
          ZZ
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*                                      *                              *                                     *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                              *  U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990            *                              *  HYDROLOGIC ENGINEERING CENTER      *
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*                                      *                              *     DAVIS, CALIFORNIA 95616         *
* RUN DATE  05/30/1996  TIME  17:02:44 *                              *         (916) 756-1104              *
*                                      *                              *                                     *
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                    HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
                    100 YEAR FREQUENCY  6-HOUR STORM per CCRFCD HC&DDM
                    SDN 5, DARF .79
                    Originally created by Boyle Engineering for CCRFCD
                      as Hiko Springs/Unnamed Wash Facilities Plan.
                    TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
                    Edited by Black & Veatch for design of Hiko Springs Detention Basin.

 10 IO         OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2    0  ENDING DATE
                    NDTIME       0055  ENDING TIME
                     ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT

   JP           MULTI-PLAN OPTION
                      NPLAN          1  NUMBER OF PLANS

   JR           MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                      .79


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169 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           1  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

168 HC          HYDROGRAPH COMBINATION
                     ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE
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HYDROGRAPH AT STATION J
SUM OF 2 HYDROGRAPHS
PLAN 1, RATIO = .79

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	4262.	1		1230	151	29.	1		1845	226	4.
1		0005	2	0.	1		0620	77	3998.	1		1235	152	28.	1		1850	227	4.
1		0010	3	0.	1		0625	78	3731.	1		1240	153	27.	1		1855	228	4.
1		0015	4	0.	1		0630	79	3461.	1		1245	154	26.	1		1900	229	4.
1		0020	5	0.	1		0635	80	3194.	1		1250	155	25.	1		1905	230	4.
1		0025	6	0.	1		0640	81	2935.	1		1255	156	24.	1		1910	231	3.
1		0030	7	0.	1		0645	82	2686.	1		1300	157	23.	1		1915	232	3.
1		0035	8	0.	1		0650	83	2454.	1		1305	158	22.	1		1920	233	3.
1		0040	9	0.	1		0655	84	2239.	1		1310	159	21.	1		1925	234	3.
1		0045	10	0.	1		0700	85	2040.	1		1315	160	21.	1		1930	235	3.
1		0050	11	0.	1		0705	86	1858.	1		1320	161	20.	1		1935	236	3.
1		0055	12	0.	1		0710	87	1699.	1		1325	162	19.	1		1940	237	3.
1		0100	13	0.	1		0715	88	1551.	1		1330	163	19.	1		1945	238	3.
1		0105	14	1.	1		0720	89	1417.	1		1335	164	18.	1		1950	239	3.
1		0110	15	1.	1		0725	90	1299.	1		1340	165	17.	1		1955	240	3.
1		0115	16	2.	1		0730	91	1188.	1		1345	166	17.	1		2000	241	3.
1		0120	17	8.	1		0735	92	1091.	1		1350	167	16.	1		2005	242	3.
1		0125	18	16.	1		0740	93	1000.	1		1355	168	16.	1		2010	243	3.
1		0130	19	25.	1		0745	94	919.	1		1400	169	15.	1		2015	244	3.
1		0135	20	40.	1		0750	95	844.	1		1405	170	15.	1		2020	245	3.
1		0140	21	61.	1		0755	96	777.	1		1410	171	14.	1		2025	246	3.
1		0145	22	83.	1		0800	97	715.	1		1415	172	14.	1		2030	247	3.
1		0150	23	112.	1		0805	98	659.	1		1420	173	13.	1		2035	248	3.
1		0155	24	144.	1		0810	99	608.	1		1425	174	13.	1		2040	249	3.
1		0200	25	179.	1		0815	100	562.	1		1430	175	13.	1		2045	250	3.
1		0205	26	222.	1		0820	101	518.	1		1435	176	12.	1		2050	251	2.
1		0210	27	264.	1		0825	102	480.	1		1440	177	12.	1		2055	252	2.
1		0215	28	319.	1		0830	103	442.	1		1445	178	12.	1		2100	253	2.
1		0220	29	378.	1		0835	104	411.	1		1450	179	11.	1		2105	254	2.
1		0225	30	435.	1		0840	105	380.	1		1455	180	11.	1		2110	255	2.
1		0230	31	485.	1		0845	106	354.	1		1500	181	11.	1		2115	256	2.
1		0235	32	534.	1		0850	107	330.	1		1505	182	10.	1		2120	257	2.
1		0240	33	605.	1		0855	108	306.	1		1510	183	10.	1		2125	258	2.
1		0245	34	683.	1		0900	109	286.	1		1515	184	10.	1		2130	259	2.
1		0250	35	750.	1		0905	110	266.	1		1520	185	10.	1		2135	260	2.
1		0255	36	818.	1		0910	111	247.	1		1525	186	9.	1		2140	261	2.
1		0300	37	877.	1		0915	112	231.	1		1530	187	9.	1		2145	262	2.
1		0305	38	939.	1		0920	113	215.	1		1535	188	9.	1		2150	263	2.
1		0310	39	1008.	1		0925	114	200.	1		1540	189	9.	1		2155	264	2.
1		0315	40	1097.	1		0930	115	188.	1		1545	190	8.	1		2200	265	2.
1		0320	41	1211.	1		0935	116	176.	1		1550	191	8.	1		2205	266	2.
1		0325	42	1398.	1		0940	117	165.	1		1555	192	8.	1		2210	267	2.
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

1	0345	46	3177.	*	1	1000	121	129.	*	1	1615	196	7.	*	1	2230	271	2.
1	0350	47	4047.	*	1	1005	122	122.	*	1	1620	197	7.	*	1	2235	272	2.
1	0355	48	5075.	*	1	1010	123	115.	*	1	1625	198	7.	*	1	2240	273	2.
1	0400	49	6088.	*	1	1015	124	109.	*	1	1630	199	7.	*	1	2245	274	2.
1	0405	50	6968.	*	1	1020	125	102.	*	1	1635	200	7.	*	1	2250	275	2.
1	0410	51	7644.	*	1	1025	126	97.	*	1	1640	201	6.	*	1	2255	276	2.
1	0415	52	8034.	*	1	1030	127	93.	*	1	1645	202	6.	*	1	2300	277	2.
1	0420	53	8229.	*	1	1035	128	88.	*	1	1650	203	6.	*	1	2305	278	2.
1	0425	54	8282.	*	1	1040	129	84.	*	1	1655	204	6.	*	1	2310	279	2.
1	0430	55	8255.	*	1	1045	130	80.	*	1	1700	205	6.	*	1	2315	280	2.
1	0435	56	8212.	*	1	1050	131	75.	*	1	1705	206	6.	*	1	2320	281	2.
1	0440	57	8176.	*	1	1055	132	71.	*	1	1710	207	6.	*	1	2325	282	2.
1	0445	58	8148.	*	1	1100	133	67.	*	1	1715	208	6.	*	1	2330	283	2.
1	0450	59	8115.	*	1	1105	134	63.	*	1	1720	209	5.	*	1	2335	284	2.
1	0455	60	8063.	*	1	1110	135	60.	*	1	1725	210	5.	*	1	2340	285	1.
1	0500	61	7998.	*	1	1115	136	57.	*	1	1730	211	5.	*	1	2345	286	1.
1	0505	62	7925.	*	1	1120	137	54.	*	1	1735	212	5.	*	1	2350	287	1.
1	0510	63	7840.	*	1	1125	138	52.	*	1	1740	213	5.	*	1	2355	288	1.
1	0515	64	7725.	*	1	1130	139	49.	*	1	1745	214	5.	*	2	0000	289	1.
1	0520	65	7563.	*	1	1135	140	47.	*	1	1750	215	5.	*	2	0005	290	1.
1	0525	66	7345.	*	1	1140	141	45.	*	1	1755	216	5.	*	2	0010	291	1.
1	0530	67	7076.	*	1	1145	142	43.	*	1	1800	217	5.	*	2	0015	292	1.
1	0535	68	6768.	*	1	1150	143	41.	*	1	1805	218	4.	*	2	0020	293	1.
1	0540	69	6433.	*	1	1155	144	39.	*	1	1810	219	4.	*	2	0025	294	1.
1	0545	70	6084.	*	1	1200	145	38.	*	1	1815	220	4.	*	2	0030	295	1.
1	0550	71	5737.	*	1	1205	146	36.	*	1	1820	221	4.	*	2	0035	296	1.
1	0555	72	5406.	*	1	1210	147	34.	*	1	1825	222	4.	*	2	0040	297	1.
1	0600	73	5095.	*	1	1215	148	33.	*	1	1830	223	4.	*	2	0045	298	1.
1	0605	74	4804.	*	1	1220	149	31.	*	1	1835	224	4.	*	2	0050	299	1.
1	0610	75	4529.	*	1	1225	150	30.	*	1	1840	225	4.	*	2	0055	300	1.
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PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW		
(CFS)	(HR)		6-HR	24-HR	72-HR	24.92-HR
8282.	4.42	(CFS)	3744.	971.	935.	935.
		(INCHES)	1.816	1.883	1.883	1.883
		(AC-FT)	1857.	1925.	1925.	1925.

CUMULATIVE AREA = 19.17 SQ MI

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        *            *
170 KK  *    DET B   *
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174 KO      OUTPUT CONTROL VARIABLES
                IPRNT          1  PRINT CONTROL
                IPLOT          0  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE

            HYDROGRAPH ROUTING DATA

175 RS      STORAGE ROUTING
                NSTPS          1  NUMBER OF SUBREACHES
                 ITYP       STOR  TYPE OF INITIAL CONDITION
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176 SV	STORAGE	.0	2.7	27.1	75.8	141.6	216.5	299.7	393.0	497.4	612.8
		738.6	873.9	1018.9	1174.6	1343.3	1531.7	1746.1	1988.3		
178 SE	ELEVATION	1002.00	1005.00	1010.00	1015.00	1020.00	1025.00	1030.00	1035.00	1040.00	1045.00
		1050.00	1055.00	1060.00	1065.00	1070.00	1075.00	1080.00	1085.00		

180 SL LOW-LEVEL OUTLET

ELEVL	1007.50	ELEVATION AT CENTER OF OUTLET
CAREA	20.97	CROSS-SECTIONAL AREA
COQL	.61	COEFFICIENT
EXPL	.50	EXPONENT OF HEAD

181 SS SPILLWAY

CREL	1077.50	SPILLWAY CREST ELEVATION
SPWID	550.00	SPILLWAY WIDTH
COQW	2.94	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

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COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	169.02	190.92	219.35	257.72	312.36	396.41	542.34	858.32
ELEVATION	1002.00	1007.50	1010.21	1010.96	1012.07	1013.81	1016.77	1022.43	1035.45	1077.50
OUTFLOW	892.86	1128.77	1764.60	2999.50	5031.27	8059.63	12281.89	17898.24	25106.23	34104.37
ELEVATION	1077.58	1077.80	1078.18	1078.70	1079.38	1080.20	1081.18	1082.30	1083.58	1085.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	2.68	14.90	27.13	29.21	36.50	47.27	64.19	75.75	99.07
OUTFLOW	.00	.00	.00	162.21	169.02	190.92	219.35	257.72	280.95	312.36
ELEVATION	1002.00	1005.00	1007.50	1010.00	1010.21	1010.96	1012.07	1013.81	1015.00	1016.77
STORAGE	141.59	178.02	216.52	299.74	393.04	402.38	497.42	612.84	738.58	873.92
OUTFLOW	362.71	396.41	429.16	486.62	537.98	542.34	584.85	628.23	668.80	707.05
ELEVATION	1020.00	1022.43	1025.00	1030.00	1035.00	1035.45	1040.00	1045.00	1050.00	1055.00
STORAGE	1018.86	1174.58	1343.32	1531.69	1638.87	1642.14	1651.83	1667.93	1690.46	1719.40
OUTFLOW	743.33	777.92	811.04	842.86	858.32	892.86	1128.77	1764.60	2999.50	5031.27
ELEVATION	1060.00	1065.00	1070.00	1075.00	1077.50	1077.58	1077.80	1078.18	1078.70	1079.38
STORAGE	1746.05	1755.90	1803.13	1857.61	1919.35	1988.34				
OUTFLOW	7263.10	8059.63	12281.89	17898.24	25106.23	34104.37				
ELEVATION	1080.00	1080.20	1081.18	1082.30	1083.58	1085.00				

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HYDROGRAPH AT STATION DET B
PLAN 1. RATIO = .79

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	14.9	1007.5	*	1		0820	101	849.	1572.0	1075.9	*	1		1640	201	755.	1071.7	1061.7
1		0005	2	0.	14.9	1007.5	*	1		0825	102	848.	1569.6	1075.9	*	1		1645	202	754.	1066.6	1061.5
1		0010	3	0.	14.9	1007.5	*	1		0830	103	848.	1566.9	1075.8	*	1		1650	203	753.	1061.4	1061.4
1		0015	4	0.	14.9	1007.5	*	1		0835	104	848.	1564.0	1075.8	*	1		1655	204	752.	1056.3	1061.2
1		0020	5	0.	14.9	1007.5	*	1		0840	105	847.	1560.9	1075.7	*	1		1700	205	751.	1051.2	1061.0
1		0025	6	0.	14.9	1007.5	*	1		0845	106	847.	1557.6	1075.6	*	1		1705	206	749.	1046.0	1060.9
1		0030	7	0.	14.9	1007.5	*	1		0850	107	846.	1554.2	1075.5	*	1		1710	207	748.	1040.9	1060.7

1	0050	11	0.	14.9	1007.5	*	1	0910	111	844.	1538.8	1075.2	*	1	1730	211	744.	1020.5	1060.1
1	0055	12	0.	14.9	1007.5	*	1	0915	112	843.	1534.6	1075.1	*	1	1735	212	742.	1015.4	1059.9
1	0100	13	0.	14.9	1007.5	*	1	0920	113	843.	1530.3	1075.0	*	1	1740	213	741.	1010.4	1059.7
1	0105	14	0.	14.9	1007.5	*	1	0925	114	842.	1526.0	1074.8	*	1	1745	214	740.	1005.3	1059.5
1	0110	15	0.	14.9	1007.5	*	1	0930	115	841.	1521.5	1074.7	*	1	1750	215	739.	1000.2	1059.4
1	0115	16	0.	14.9	1007.5	*	1	0935	116	840.	1517.0	1074.6	*	1	1755	216	737.	995.2	1059.2
1	0120	17	1.	15.0	1007.5	*	1	0940	117	840.	1512.4	1074.5	*	1	1800	217	736.	990.1	1059.0
1	0125	18	2.	15.0	1007.5	*	1	0945	118	839.	1507.7	1074.4	*	1	1805	218	735.	985.1	1058.8
1	0130	19	3.	15.2	1007.6	*	1	0950	119	838.	1503.0	1074.2	*	1	1810	219	734.	980.1	1058.7
1	0135	20	6.	15.3	1007.6	*	1	0955	120	837.	1498.2	1074.1	*	1	1815	220	732.	975.1	1058.5
1	0140	21	10.	15.6	1007.7	*	1	1000	121	836.	1493.3	1074.0	*	1	1820	221	731.	970.0	1058.3
1	0145	22	15.	16.1	1007.7	*	1	1005	122	836.	1488.4	1073.9	*	1	1825	222	730.	965.0	1058.1
1	0150	23	22.	16.6	1007.8	*	1	1010	123	835.	1483.5	1073.7	*	1	1830	223	729.	960.0	1058.0
1	0155	24	32.	17.3	1008.0	*	1	1015	124	834.	1478.5	1073.6	*	1	1835	224	727.	955.1	1057.8
1	0200	25	43.	18.2	1008.2	*	1	1020	125	833.	1473.5	1073.5	*	1	1840	225	726.	950.1	1057.6
1	0205	26	57.	19.2	1008.4	*	1	1025	126	832.	1468.4	1073.3	*	1	1845	226	725.	945.1	1057.5
1	0210	27	73.	20.4	1008.6	*	1	1030	127	831.	1463.4	1073.2	*	1	1850	227	724.	940.2	1057.3
1	0215	28	92.	21.9	1008.9	*	1	1035	128	830.	1458.3	1073.1	*	1	1855	228	722.	935.2	1057.1
1	0220	29	115.	23.5	1009.3	*	1	1040	129	830.	1453.1	1072.9	*	1	1900	229	721.	930.3	1056.9
1	0225	30	140.	25.5	1009.7	*	1	1045	130	829.	1448.0	1072.8	*	1	1905	230	720.	925.3	1056.8
1	0230	31	164.	27.6	1010.0	*	1	1050	131	828.	1442.8	1072.6	*	1	1910	231	719.	920.4	1056.6
1	0235	32	171.	29.9	1010.3	*	1	1055	132	827.	1437.6	1072.5	*	1	1915	232	717.	915.5	1056.4
1	0240	33	179.	32.7	1010.6	*	1	1100	133	826.	1432.4	1072.4	*	1	1920	233	716.	910.6	1056.3
1	0245	34	189.	35.8	1010.9	*	1	1105	134	825.	1427.2	1072.2	*	1	1925	234	715.	905.6	1056.1
1	0250	35	199.	39.4	1011.3	*	1	1110	135	824.	1421.9	1072.1	*	1	1930	235	714.	900.7	1055.9
1	0255	36	209.	43.4	1011.7	*	1	1115	136	823.	1416.7	1071.9	*	1	1935	236	713.	895.9	1055.8
1	0300	37	220.	47.8	1012.1	*	1	1120	137	823.	1411.4	1071.8	*	1	1940	237	711.	891.0	1055.6
1	0305	38	231.	52.5	1012.6	*	1	1125	138	822.	1406.1	1071.7	*	1	1945	238	710.	886.1	1055.4
1	0310	39	243.	57.6	1013.1	*	1	1130	139	821.	1400.8	1071.5	*	1	1950	239	709.	881.2	1055.3
1	0315	40	255.	63.1	1013.7	*	1	1135	140	820.	1395.5	1071.4	*	1	1955	240	708.	876.4	1055.1
1	0320	41	268.	69.2	1014.3	*	1	1140	141	819.	1390.1	1071.2	*	1	2000	241	706.	871.5	1054.9
1	0325	42	282.	76.3	1015.0	*	1	1145	142	818.	1384.8	1071.1	*	1	2005	242	705.	866.7	1054.7
1	0330	43	293.	84.9	1015.7	*	1	1150	143	817.	1379.4	1071.0	*	1	2010	243	704.	961.9	1054.6
1	0335	44	307.	95.4	1016.5	*	1	1155	144	816.	1374.1	1070.8	*	1	2015	244	702.	857.0	1054.4
1	0340	45	324.	108.7	1017.5	*	1	1200	145	815.	1368.7	1070.7	*	1	2020	245	701.	852.2	1054.2
1	0345	46	344.	126.0	1018.8	*	1	1205	146	814.	1363.4	1070.5	*	1	2025	246	700.	847.4	1054.0
1	0350	47	369.	148.4	1020.5	*	1	1210	147	814.	1358.0	1070.4	*	1	2030	247	698.	842.6	1053.8
1	0355	48	396.	177.2	1022.4	*	1	1215	148	813.	1352.7	1070.2	*	1	2035	248	697.	837.8	1053.7
1	0400	49	426.	212.8	1024.8	*	1	1220	149	812.	1347.3	1070.1	*	1	2040	249	696.	833.1	1053.5
1	0405	50	456.	254.7	1027.3	*	1	1225	150	811.	1341.9	1070.0	*	1	2045	250	694.	828.3	1053.3
1	0410	51	488.	301.8	1030.1	*	1	1230	151	810.	1336.5	1069.8	*	1	2050	251	693.	823.5	1053.1
1	0415	52	516.	352.3	1032.8	*	1	1235	152	809.	1331.2	1069.6	*	1	2055	252	691.	818.8	1053.0
1	0420	53	543.	404.7	1035.6	*	1	1240	153	808.	1325.8	1069.5	*	1	2100	253	690.	814.0	1052.8
1	0425	54	567.	457.7	1038.1	*	1	1245	154	807.	1320.4	1069.3	*	1	2105	254	689.	809.3	1052.6
1	0430	55	590.	510.7	1040.6	*	1	1250	155	805.	1315.0	1069.2	*	1	2110	255	687.	804.6	1052.4
1	0435	56	610.	563.2	1042.9	*	1	1255	156	804.	1309.6	1069.0	*	1	2115	256	686.	799.9	1052.3
1	0440	57	629.	615.4	1045.1	*	1	1300	157	803.	1304.3	1068.8	*	1	2120	257	685.	795.2	1052.1
1	0445	58	646.	667.2	1047.2	*	1	1305	158	802.	1298.9	1068.7	*	1	2125	258	683.	790.5	1051.9
1	0450	59	662.	718.7	1049.2	*	1	1310	159	801.	1293.5	1068.5	*	1	2130	259	682.	785.8	1051.7
1	0455	60	678.	769.8	1051.2	*	1	1315	160	800.	1288.2	1068.4	*	1	2135	260	681.	781.1	1051.6
1	0500	61	692.	820.4	1053.0	*	1	1320	161	799.	1282.8	1068.2	*	1	2140	261	680.	776.4	1051.4
1	0505	62	706.	870.4	1054.9	*	1	1325	162	798.	1277.4	1068.0	*	1	2145	262	678.	771.9	1051.2
1	0510	63	719.	919.8	1056.6	*	1	1330	163	797.	1272.1	1067.9	*	1	2150	263	677.	767.1	1051.1
1	0515	64	731.	968.4	1058.3	*	1	1335	164	796.	1266.7	1067.7	*	1	2155	264	676.	762.5	1050.9
1	0520	65	743.	1016.0	1059.9	*	1	1340	165	795.	1261.3	1067.6	*	1	2200	265	674.	757.8	1050.7
1	0525	66	753.	1062.2	1061.4	*	1	1345	166	794.	1256.0	1067.4	*	1	2205	266	673.	753.2	1050.5
1	0530	67	763.	1106.6	1062.8	*	1	1350	167	793.	1250.6	1067.3	*	1	2210	267	672.	748.6	1050.4
1	0535	68	772.	1149.0	1064.2	*	1	1355	168	792.	1245.3	1067.1	*	1	2215	268	670.	744.0	1050.2
1	0540	69	781.	1189.1	1065.4	*	1	1400	169	791.	1239.9	1066.9	*	1	2220	269	669.	739.4	1050.0
1	0545	70	788.	1226.8	1066.5	*	1	1405	170	790.	1234.6	1066.8	*	1	2225	270	668.	734.8	1049.9
1	0550	71	795.	1262.1	1067.6	*	1	1410	171	789.	1229.3	1066.6	*	1	2230	271	666.	730.2	1049.7
1	0555	72	802.	1294.9	1068.6	*	1	1415	172	788.	1223.9	1066.5	*	1	2235	272	665.	725.7	1049.5
1	0600	73	808.	1325.5	1069.5	*	1	1420	173	787.	1218.6	1066.3	*	1	2240	273	663.	721.1	1049.3

1	0620	77	825.	1428.0	1072.2	*	1	1440	177	782.	1197.4	1065.7	*	1	2300	277	657.	703.0	1048.6
1	0625	78	829.	1448.9	1072.8	*	1	1445	178	781.	1192.0	1065.5	*	1	2305	278	656.	698.4	1048.4
1	0630	79	832.	1468.0	1073.3	*	1	1450	179	780.	1186.7	1065.4	*	1	2310	279	654.	693.9	1048.2
1	0635	80	835.	1485.1	1073.8	*	1	1455	180	779.	1181.5	1065.2	*	1	2315	280	653.	689.5	1048.0
1	0640	81	838.	1500.5	1074.2	*	1	1500	181	778.	1176.2	1065.0	*	1	2320	281	652.	685.0	1047.9
1	0645	82	840.	1514.1	1074.5	*	1	1505	182	777.	1170.9	1064.9	*	1	2325	282	650.	680.5	1047.7
1	0650	83	842.	1526.0	1074.8	*	1	1510	183	776.	1165.6	1064.7	*	1	2330	283	649.	676.0	1047.5
1	0655	84	844.	1536.3	1075.1	*	1	1515	184	775.	1160.3	1064.5	*	1	2335	284	647.	671.6	1047.3
1	0700	85	845.	1545.2	1075.3	*	1	1520	185	774.	1155.1	1064.4	*	1	2340	285	646.	667.1	1047.2
1	0705	86	846.	1552.8	1075.5	*	1	1525	186	772.	1149.8	1064.2	*	1	2345	286	644.	662.7	1047.0
1	0710	87	847.	1559.3	1075.6	*	1	1530	187	771.	1144.6	1064.0	*	1	2350	287	643.	658.3	1046.8
1	0715	88	848.	1564.6	1075.8	*	1	1535	188	770.	1139.3	1063.9	*	1	2355	288	641.	653.9	1046.6
1	0720	89	848.	1569.0	1075.9	*	1	1540	189	769.	1134.1	1063.7	*	2	0000	289	640.	649.5	1046.5
1	0725	90	849.	1572.5	1076.0	*	1	1545	190	768.	1128.8	1063.5	*	2	0005	290	639.	645.1	1046.3
1	0730	91	849.	1575.2	1076.0	*	1	1550	191	767.	1123.6	1063.4	*	2	0010	291	637.	640.7	1046.1
1	0735	92	849.	1577.2	1076.1	*	1	1555	192	765.	1118.4	1063.2	*	2	0015	292	636.	636.3	1045.9
1	0740	93	850.	1578.6	1076.1	*	1	1600	193	764.	1113.2	1063.0	*	2	0020	293	634.	632.0	1045.8
1	0745	94	850.	1579.3	1076.1	*	1	1605	194	763.	1108.0	1062.9	*	2	0025	294	633.	627.6	1045.6
1	0750	95	850.	1579.6	1076.1	*	1	1610	195	762.	1102.8	1062.7	*	2	0030	295	632.	623.3	1045.4
1	0755	96	850.	1579.3	1076.1	*	1	1615	196	761.	1097.6	1062.5	*	2	0035	296	630.	618.9	1045.2
1	0800	97	850.	1578.6	1076.1	*	1	1620	197	760.	1092.4	1062.4	*	2	0040	297	629.	614.6	1045.1
1	0805	98	849.	1577.5	1076.1	*	1	1625	198	759.	1087.7	1062.2	*	2	0045	298	627.	610.3	1044.9
1	0810	99	849.	1576.0	1076.0	*	1	1630	199	757.	1082.0	1062.0	*	2	0050	299	626.	606.0	1044.7
1	0815	100	849.	1574.2	1076.0	*	1	1635	200	756.	1076.9	1061.9	*	2	0055	300	624.	601.7	1044.5
						*							*						

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PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW		
(CFS)	(HR)		6-HR	24-HR	72-HR	24.92-HR
850.	7.83	(CFS)	837.	675.	650.	650.
		(INCHES)	.406	1.309	1.309	1.309
		(AC-FT)	415.	1338.	1338.	1338.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
(AC-FT)	(HR)	6-HR	24-HR	72-HR	24.92-HR
1580.	7.83	1497.	969.	934.	934.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE		
(FEET)	(HR)	6-HR	24-HR	72-HR	24.92-HR
1076.12	7.83	1074.03	1055.39	1053.62	1053.62

CUMULATIVE AREA = 19.17 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .79
HYDROGRAPH AT	A1	2.73	1	FLOW	1202.
				TIME	4.25
ROUTED TO	RA	2.73	1	FLOW	1200.
				TIME	4.33
HYDROGRAPH AT	B1	1.08	1	FLOW	780.
				TIME	3.83
ROUTED TO	RB1	1.08	1	FLOW	773.
				TIME	4.42
HYDROGRAPH AT	B2	.61	1	FLOW	442.
				TIME	3.83
ROUTED TO	RB2	.61	1	FLOW	435.
				TIME	4.25
HYDROGRAPH AT	B3	2.50	1	FLOW	1202.
				TIME	4.33
4 COMBINED AT	B	6.92	1	FLOW	3556.
				TIME	4.42
ROUTED TO	RB	6.92	1	FLOW	3541.
				TIME	4.50
HYDROGRAPH AT	C1	1.91	1	FLOW	914.
				TIME	4.25
HYDROGRAPH AT	C2	1.68	1	FLOW	717.
				TIME	4.42
3 COMBINED AT	C	10.51	1	FLOW	5124.
				TIME	4.42
ROUTED TO	RC	10.51	1	FLOW	5107.
				TIME	4.50
HYDROGRAPH AT	D1	.52	1	FLOW	355.
				TIME	3.83
ROUTED TO	RD1	.52	1	FLOW	351.
				TIME	4.00
HYDROGRAPH AT	D2	.30	1	FLOW	225.
				TIME	3.75
HYDROGRAPH AT	D3	.75	1	FLOW	589.
				TIME	3.83

ROUTED TO	RD	12.09	1	FLOW	5632.
				TIME	4.50
HYDROGRAPH AT	E1	.50	1	FLOW	424.
				TIME	3.83
2 COMBINED AT	E	12.58	1	FLOW	5801.
				TIME	4.50
ROUTED TO	RE	12.58	1	FLOW	5780.
				TIME	4.50
HYDROGRAPH AT	F1	1.08	1	FLOW	687.
				TIME	3.92
2 COMBINED AT	F	13.66	1	FLOW	6189.
				TIME	4.50
ROUTED TO	RF	13.66	1	FLOW	6162.
				TIME	4.58
HYDROGRAPH AT	G1	1.36	1	FLOW	855.
				TIME	4.00
HYDROGRAPH AT	G2	1.02	1	FLOW	869.
				TIME	3.83
3 COMBINED AT	G	16.04	1	FLOW	7117.
				TIME	4.50
ROUTED TO	RG	16.04	1	FLOW	7115.
				TIME	4.50
HYDROGRAPH AT	H1	.56	1	FLOW	424.
				TIME	3.83
HYDROGRAPH AT	H2	.37	1	FLOW	441.
				TIME	3.58
3 COMBINED AT	H	16.98	1	FLOW	7381.
				TIME	4.50
ROUTED TO	RH	16.98	1	FLOW	7377.
				TIME	4.58
HYDROGRAPH AT	I1	1.35	1	FLOW	1096.
				TIME	3.92
2 COMBINED AT	I	18.33	1	FLOW	8067.
				TIME	4.33
ROUTED TO	RI	18.33	1	FLOW	8063.
				TIME	4.42
HYDROGRAPH AT	J1	.85	1	FLOW	469.
				TIME	3.83
2 COMBINED AT	J	19.17	1	FLOW	8282.
				TIME	4.42
ROUTED TO	DET B	19.17	1	FLOW	850.
				TIME	7.83

** PEAK STAGES IN FEET **

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                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                INTERPOLATED TO
                                                              COMPUTATION INTERVAL
       ISTAQ    ELEMENT     DT       PEAK    TIME TO    VOLUME      DT      PEAK    TIME TO     VOLUME
                                               PEAK                                    PEAK

                           (MIN)     (CFS)     (MIN)     (IN)      (MIN)    (CFS)     (MIN)       (IN)

       FOR PLAN = 1  RATIO=  .79
            RA  MANE        1.72   1201.89    258.42     1.59      5.00   1199.66   260.00       1.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2312E+03 EXCESS= .0000E+00 OUTFLOW= .2313E+03 BASIN STORAGE= .1725E-03 PERCENT ERROR=     .0

       FOR PLAN = 1  RATIO=  .79
           RB1  MANE        5.00    777.54    265.86     1.97      5.00    773.15   265.00       1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1128E+03 EXCESS= .0000E+00 OUTFLOW= .1134E+03 BASIN STORAGE= .7786E-01 PERCENT ERROR=    -.6

       FOR PLAN = 1  RATIO=  .79
           RB2  MANE        4.79    438.38    255.85     1.89      5.00    434.65   255.00       1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6118E+02 EXCESS= .0000E+00 OUTFLOW= .6143E+02 BASIN STORAGE= .1471E-01 PERCENT ERROR=    -.4

       FOR PLAN = 1  RATIO=  .79
            RB  MANE        2.53   3551.09    268.09     1.75      5.00   3541.34   270.00       1.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6468E+03 EXCESS= .0000E+00 OUTFLOW= .6471E+03 BASIN STORAGE= .4882E-01 PERCENT ERROR=    -.1

       FOR PLAN = 1  RATIO=  .79
            RC  MANE        1.19   5119.21    267.98     1.73      5.00   5106.85   270.00       1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9720E+03 EXCESS= .0000E+00 OUTFLOW= .9722E+03 BASIN STORAGE= .5358E-01 PERCENT ERROR=     .0

       FOR PLAN = 1  RATIO=  .79
           RD1  MANE        4.85    354.45    238.65     1.74      5.00    351.24   240.00       1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4837E+02 EXCESS= .0000E+00 OUTFLOW= .4850E+02 BASIN STORAGE= .1061E-03 PERCENT ERROR=    -.3

       FOR PLAN = 1  RATIO=  .79
            RD  MANE         .69   5634.16    270.83     1.76      5.00   5631.69   270.00       1.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1134E+04 EXCESS= .0000E+00 OUTFLOW= .1134E+04 BASIN STORAGE= .2596E-01 PERCENT ERROR=     .0

       FOR PLAN = 1  RATIO=  .79
            RE  MANE        1.37   5797.70    272.39     1.78      5.00   5779.84   270.00       1.78
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          FOR PLAN = 1  RATIO=  .79
               RF  MANE        1.56   6183.96    272.92      1.79      5.00   6162.28    275.00       1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1303E+04 EXCESS= .0000E+00 OUTFLOW= .1303E+04 BASIN STORAGE= .4480E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .79
               RG  MANE        1.10   7115.40    270.53      1.84      5.00   7115.05    270.00       1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1574E+04 EXCESS= .0000E+00 OUTFLOW= .1574E+04 BASIN STORAGE= .7316E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .79
               RH  MANE        2.62   7379.38    274.30      1.86      5.00   7376.80    275.00       1.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1684E+04 EXCESS= .0000E+00 OUTFLOW= .1684E+04 BASIN STORAGE= .1679E+00 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .79
               RI  MANE        4.82   8064.60    269.29      1.91      5.00   8063.42    265.00       1.91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1862E+04 EXCESS= .0000E+00 OUTFLOW= .1862E+04 BASIN STORAGE= .3505E+00 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
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Sediment Analysis

Sediment Transport Analysis

Overview

The following discussion covers the analysis of sediment transport to the detention basin. The purpose of this analysis is to establish the design requirements for sediment storage and control structures, and to discuss maintenance requirements.

Previous Work

Boyle Engineering completed a sediment analysis for the Facilities Plan based on the Universal Soil Loss Equation (USLE). As one would expect, their analysis indicates that the upland watershed is highly erodible due to the steep gradient of the terrain and the lack of ground cover. Based on the analysis, Boyle estimated a total annual watershed sediment production of 111,200 tons per year. Using a sediment delivery ratio (SDR) of 15 percent, Boyle estimated an average annual sediment delivery to the detention basin of 9.6 acre-ft. In the Design Memorandum, Boyle established a target value for sediment storage of 96 acre-ft to allow for 10 years of sediment storage, indicating that small refinements will be made during the final design.

The USLE has been widely beneficial in the prediction of soil loss from agricultural lands and strip mining operations based on average annual rainfall, vegetative cover, and other factors. However, it is an empirical method, at best a rough approximation for determining the gross erosion for drainage areas normally less than 4 square miles in size (Ref 9). In addition, selection of an appropriate SDR is probably the most uncertain aspect of sedimentation engineering. Several methodologies for estimating SDRs for use with the USLE have been developed, most of which are probably only applicable to riverain environments. Like the USLE, methodologies for estimating SDRs are highly empirical and do not take into account the physical hydraulic parameters of the transport mechanism.

In reviewing the work by Boyle, it appears that an SDR value of 15 percent was determined on the basis of an area-delivery relationship. The use of this method is likely more applicable to more highly channelized watersheds.

Black & Veatch Approach

In general, steep desert watersheds in Southern Nevada contain large quantities of sediment. Based on site observation and map study, we have reason to believe that the Hiko Springs watershed contains an abundant supply of sediment. Thus, for our analysis, we will assume that the amount of sediment delivered to the detention basin is controlled by the transport capacity of the channel (wash) for a given discharge, rather than the availability of sediment in the upstream watershed.

For the purposes of detention basin design, we will estimate sediment delivery for various storm events rather than for annual rainfall accumulation. Annual predictions of sediment seem inappropriate for detention basin design when it is probable that negligible sediment transport will occur during most rainfall events. However, events of hydrologic significance will surely deposit significant amounts of sediment in the detention basin.

Numerous sediment transport relationships have been developed based on theoretical relationships, laboratory experiments, and field measurements. However, most of the relationships developed are very limited in terms of practical application. Furthermore, much of the information available was developed on the basis of flowing rivers or alluvial streams, and does not relate to the occurrence of flash floods in dry desert washes.

Because the Hiko Springs Wash is very broad, the utilization of sediment transport equations is complicated by the fact that the bed width is a function of discharge. For the purpose of this analysis, the width of flow for a given discharge was determined based on the FEMA methodology outlined in Reference 10. Since flow in the wash is broad and shallow, it is assumed that the top width of the flow path is equal to the channel bed width.

FEMA: *Top Width,* $T = 9.5 \times Q^{0.4}$

Flow Depth, $y = 0.07 \times Q^{0.4}$

Determination of Sediment Delivery

To determine the sediment delivery to the detention basin, sediment transport analysis was completed using the Meyer-Peter (MP) and the Meyer-Peter & Muller (MPM) relations for various frequency flood events. The MP and MPM relations were developed in the 1930's and 40's. The relations are said to be physically well founded, theoretically correct, and among the most widely used. Storm hydrographs generated using HEC-1 were coupled with the sediment discharge equations to develop sediment graphs. The volume of sediment delivered to the detention basin was then computed from the sediment graphs. Results from the analyses are shown in the following table. A discussion of the methodology follows and calculations and reference information are provided at the end of this section.

Sediment Delivery to Detention Basin		
Flood Event	**Meyer-Peter (acre-ft)**	**Meyer-Peter & Muller (acre-ft)**
100-yr	39.2	40.0
50-yr	28.7	29.6
25-yr	19.7	20.7
10-yr	10.7	11.4
5-yr	6.4	7.0
2-yr	2.1	2.3

Meyer-Peter. The sediment discharge equation for this relation can be readily combined with a flood hydrograph because the MP equation has only 3 variables: slope, discharge, and median particle diameter of the bed material. However, as is the case with most sediment discharge equations, it does have limitations. Reference 3 states that the MP relationship was developed from experiments with well sorted river sediments ranging in median size from 3.1 to 28.6 mm. The Meyer-Peter relation is of the form:

$$g_s^{2/3} = 39.25 \times q^{2/3} \times S - 9.95 \times D_{50}$$

where: g_s = Sediment transport rate (lbs/ft/sec),
q = Unit discharge of channel (cfs),
S = Channel slope (ft/ft), and
D_{50} = Median particle diameter (ft).

In review of the geotechnical data for this project, we see that the median particle size of the bed material contained in the wash is approximately 2 mm. Thus, in using the MP equation, we are slightly outside the range of laboratory data. The implication is that fine-grained sediments tend to produce bedforms such as ripples or dunes, which, in turn, increases roughness of the channel bed. Conversely, coarser sediments do not produce rugged bed forms, thus bed roughness is a function only of sediment grain roughness. Understanding this, we conclude that use of the MP relationship for this analysis is, at best, a rough approximation because the potential increase in flow resistance attributed to bedforms will not be accounted for.

The MP relationship, as discussed in References 3, 4, and 7, was directly implemented to compute sediment delivery rates. Bed width was adjusted for discharge as previously discussed. Spreadsheet calculations are attached.

Meyer-Peter & Muller. This method is more complicated for this analysis. Reference 3 indicates that the relation was developed from flume data with sediments of "effective size" ranging from 0.4 to 30 mm, where the effective bed grain size is determined as the geometric mean. The MPM relation is applicable for graded sediments subjected to flow conditions that give rise to bedforms (Ref. 3).

In utilizing the MPM relationship for this analysis, variation of the bed width created additional computation problems. After reviewing the results from the MP method, we know that most of the sediment transport occurs near the peak stages of a flood event. Thus, to simplify the MPM analysis, bed width was adjusted for each frequency event, but not for each hydrograph ordinate. Results using the MPM relation were slightly higher than those obtained from the MP relation. The MPM relationship is discussed in References 3 and 4. Reference 6 and the accompanying computer abstract were used in the analysis. Spreadsheet calculations are attached.

Detention Basin Design

In considering current downstream planning efforts and the advancement of stormwater quality regulations, it sensible that sediment transported to the detention basin from the upstream watershed should, to the greatest reasonable extent, be trapped in the detention basin. Maintenance costs associated with the removal of sediment from the detention basin will be significantly lower than the cost associated with removal of sediment and debris from future downstream conveyance systems. In addition, allowing sediment to discharge from the detention basin may have adverse impacts on the Colorado River, particularly when considering current riverfront planning concepts.

Thus, for detention basin design, we assume that no sediment will be discharged from the detention basin. Common sense would indicate that the available sediment storage volume provided in the detention basin should exceed that required for the 100-year flood event. From the sediment transport analysis, we know that sediment storage in excess of 40 acre-ft should be provided. However, it is impractical to design a maintenance-free detention basin in terms of sediment accumulation. Sediment will have to be periodically removed from the detention basin. In optimizing detention basin performance, we seek to maximize peak flow reduction, balance earthwork, and provide a practical volume of sediment storage. To achieve these requirements it is practical to store 50 to 60 acre-ft of sediment in the detention basin.

For the purpose of estimating sediment accumulation in the detention basin over time, an estimate was prepared using the results from the Meyer-Peter & Muller sediment transport analysis. The estimate is based on the following assumptions:

1. Storm events occur at their recurrence interval. A 1-yr storm occurs every one year, a 2-yr event occurs every two years, and so on. In considering statistical probabilities, this is an unlikely scenario. However, it is also unlikely that a 2-yr event and a 5-yr event will occur during the same year. The probability of a 2-year event and a 5-yr event occurring during the same year is less likely that the probability of one event occurring. Hence, this assumption reflects conservatism.

2. Assume no discharge of sediment from the detention basin over time.

3. The sediment delivery for a 1-yr storm event was taken to be one half the value for a 2-yr event.

Referring to the attached spreadsheet titled "Sediment Accumulation Over Time", we see that a sediment storage volume of 50 to 60 acre-ft will be reached in 10 to 14 years.

Further, we see that the sediment storage volume required for the 100-year event may be in jeopardy after approximately five years of sediment accumulation. It is understood that this estimate is conservative, however, for planning purposes, annual inspection with sediment removal scheduled every five years reflects a solid pragmatic approach until field data on actual basin performance becomes available.

Sediment Berm

As previously mentioned, it is desirable to prevent sediment discharge form the detention basin. We recommend that a sediment berm (see attached sketches) be constructed near the outletworks. The sediment berm will prevent sediment discharge and reduce dead storage by protecting the outletworks and forcing sediment out towards the perimeter of the basin. The crest of the sediment berm should be set to the top of the sediment storage volume. The berm will also serve as a permanent visual indicator of sediment accumulation.

References

1. "Facilities Plan for Hiko Springs and Unnamed Wash Laughlin - Big Bend Area, Clark County Nevada"; Boyle Engineering Corporation; May 1989.

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5. "Computing Degradation and Local Scour", USDI Bureau of Reclamation; January 1984.

6. "Width of Straight Alluvial Channel"; Michael A. Stevens; ASCE Journal of Hydraulic Engineering; March 1987.

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12. Open-Channel Hydraulics; Richard H. French; McGraw-Hill; 1985.

13. "Guides for Erosion and Sediment Control in Nevada"; USDA Soil Conservation Service; August 1976.

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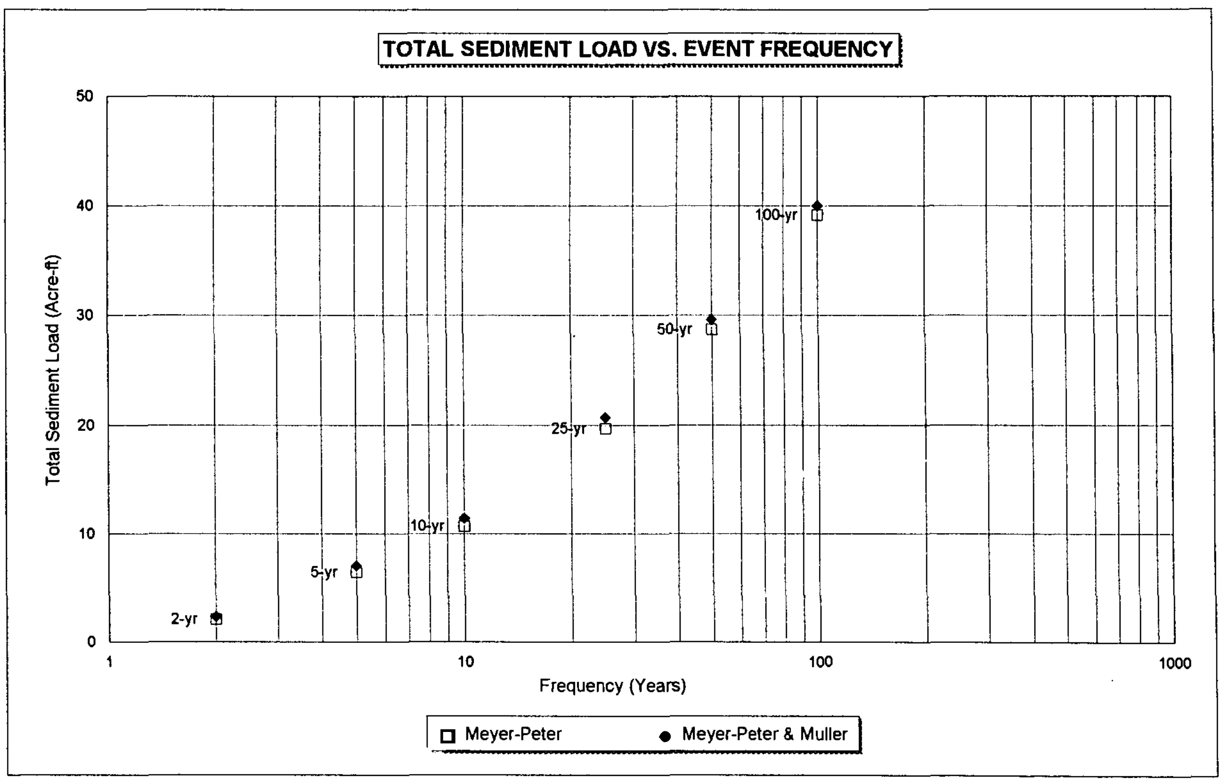
CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Summary Meyer-Peter Method and Meyer-Peter & Muller Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

The following is a summary of the sediment delivery to the detention basin for various frequency events. Spreadsheet calculations used to develop sediment graphs for each event are contained on the following pages.

Event Frequency (Yrs)	Total Sediment Load	
	Meyer-Peter (acre-ft)	Meyer-Peter & Muller (acre-ft)
2	2.1	2.3
5	6.4	7.0
10	10.7	11.4
25	19.7	20.7
50	28.7	29.6
100	39.2	40.0



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CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

This spreadsheet generates sedimnet graphs in one hour computation intervals based on the hourly ordinates from the 6-hour storm hydrographs developed with HEC-1. The computation of sediment discharge rates is based on the Meyer - Peter Formula as discussed in reference 3 as follows:

gs = 39.25 x q^(2/3) x S - 9.95 x d50

where gs = sediment transport rate in lbs/ft/sec; q = unit discharge of channel; S = slope of channel; d50 = median particle size diameter

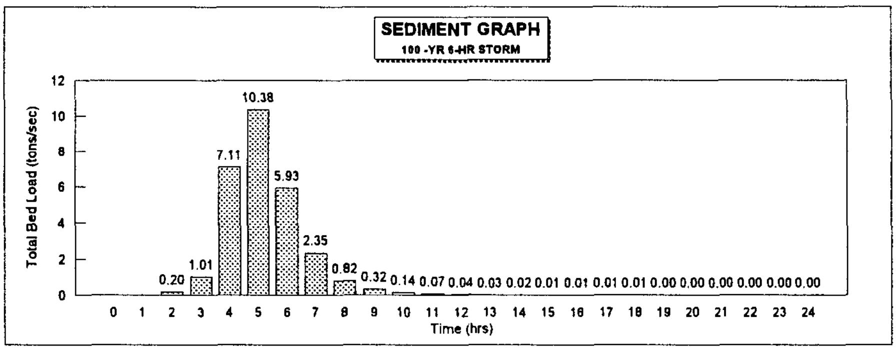
The bed width for sediment transport is based on the FEMA methodology for determining the width of flow for washes on alluvial fans, except that since the flow is shallow it is asssumed that the top width of the flow path is equal to the channel bed for sediment transport. The relationships for discharge, bed width and flow depth are as follows:

Bedwidth = 9.5 x Q^0.4 and Flow depth = 0.07 x Q ^0.4

The volume of sediment delivered to the detention basin is based on a natural deposition density of 120 lbs pcf.

Channel Slope S= 0.045 ft/ft
Median Particle Size D50 = 2 mm 0.007 ft

Event: **100 -YR 6-HR STORM**



Time	Total Discharge Q	Flow Depth d	Bed Width B	Unit Discharge q	Velocity V	Unit Bed Laod gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	ft	(ft)	cfs/ft	(fps)	lbs/ft/sec	tons/sec	tons
0	0	0.0	0	ERR	ERR	ERR	ERR	0
1	0	0.0	0	ERR	ERR	ERR	ERR	0
2	179	0.6	76	2.37	4.24	5.38	0.20	733
3	879	1.1	143	6.15	5.83	14.19	1.01	3653
4	6102	2.3	310	19.66	8.60	45.80	7.11	25586
5	8900	2.7	361	24.66	9.27	57.50	10.38	37359
6	5093	2.1	289	17.64	8.29	41.07	5.93	21343
7	2030	1.5	200	10.16	6.90	23.56	2.35	8476
8	710	1.0	131	5.41	5.59	12.47	0.82	2946
9	284	0.7	91	3.12	4.65	7.14	0.32	1169
10	128	0.5	66	1.93	3.97	4.38	0.14	522
11	66	0.4	51	1.30	3.48	2.91	0.07	266
12	37	0.3	40	0.92	3.10	2.03	0.04	147
13	23	0.2	33	0.69	2.82	1.51	0.03	90
14	15	0.2	28	0.53	2.58	1.15	0.02	58
15	11	0.2	25	0.44	2.43	0.94	0.01	42
16	8	0.2	22	0.37	2.28	0.77	0.01	30
17	6	0.1	19	0.31	2.15	0.64	0.01	22
18	5	0.1	18	0.28	2.07	0.57	0.01	18
19	4	0.1	17	0.24	1.98	0.49	0.00	15
20	3	0.1	15	0.20	1.87	0.40	0.00	11
21	2	0.1	13	0.16	1.73	0.31	0.00	7
22	2	0.1	13	0.16	1.73	0.31	0.00	7
23	2	0.1	13	0.16	1.73	0.31	0.00	7
24	1	0.1	10	0.11	1.50	0.19	0.00	3
TOTAL SEDIMENT LOAD TO BASIN (tons)								***102,511***
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)								***39.2***

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CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

50 -YR 6-HR STORM

Time	Total Discharge Q	Flow Depth d	Bed Width B	Unit Discharge q	Velocity V	Unit Bed Laod gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	ft	(ft)	cfs/ft	(fps)	lbs/ft/sec	tons/sec	tons
0	0	0.0	0	ERR	ERR	ERR	ERR	0
1	0	0.0	0	ERR	ERR	ERR	ERR	0
2	56	0.4	48	1.18	3.36	2.63	0.06	225
3	505	0.8	115	4.41	5.22	10.13	0.58	2090
4	4098	2.0	265	15.48	7.94	36.02	4.77	17161
5	6220	2.3	313	19.89	8.63	46.33	7.25	26083
6	4136	2.0	266	15.57	7.95	36.22	4.81	17320
7	1740	1.4	188	9.26	6.69	21.46	2.02	7260
8	628	0.9	125	5.02	5.45	11.57	0.72	2603
9	255	0.6	87	2.93	4.55	6.68	0.29	1048
10	120	0.5	64	1.86	3.92	4.21	0.14	489
11	62	0.4	50	1.25	3.43	2.80	0.07	250
12	36	0.3	40	0.90	3.08	2.00	0.04	143
13	22	0.2	33	0.67	2.79	1.47	0.02	86
14	15	0.2	28	0.53	2.58	1.15	0.02	58
15	10	0.2	24	0.42	2.38	0.89	0.01	38
16	8	0.2	22	0.37	2.28	0.77	0.01	30
17	6	0.1	19	0.31	2.15	0.64	0.01	22
18	5	0.1	18	0.28	2.07	0.57	0.01	18
19	4	0.1	17	0.24	1.98	0.49	0.00	15
20	3	0.1	15	0.20	1.87	0.40	0.00	11
21	2	0.1	13	0.16	1.73	0.31	0.00	7
22	2	0.1	13	0.16	1.73	0.31	0.00	7
23	2	0.1	13	0.16	1.73	0.31	0.00	7
24	1	0.1	10	0.11	1.50	0.19	0.00	3
TOTAL SEDIMENT LOAD TO BASIN (tons)								*74,974*
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)								***28.7***

25 -YR 6-HR STORM

Time	Total Discharge Q	Flow Depth d	Bed Width B	Unit Discharge q	Velocity V	Unit Bed Laod gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	ft	(ft)	cfs/ft	(fps)	lbs/ft/sec	tons/sec	tons
0	0	0.0	0	ERR	ERR	ERR	ERR	0
1	0	0.0	0	ERR	ERR	ERR	ERR	0
2	9	0.2	23	0.39	2.33	0.83	0.01	34
3	217	0.6	82	2.66	4.41	6.05	0.25	890
4	2273	1.5	209	10.87	7.06	25.23	2.64	9496
5	4227	2.0	268	15.77	7.99	36.70	4.92	17703
6	3175	1.8	239	13.28	7.54	30.87	3.69	13283
7	1429	1.3	174	8.23	6.43	19.05	1.65	5956
8	538	0.9	117	4.58	5.29	10.53	0.62	2228
9	224	0.6	83	2.71	4.44	6.17	0.26	920
10	108	0.5	62	1.75	3.84	3.95	0.12	439
11	58	0.4	48	1.20	3.39	2.69	0.06	233
12	34	0.3	39	0.87	3.04	1.93	0.04	135
13	21	0.2	32	0.65	2.76	1.42	0.02	82
14	14	0.2	27	0.51	2.55	1.10	0.02	54
15	10	0.2	24	0.42	2.38	0.89	0.01	38
16	8	0.2	22	0.37	2.28	0.77	0.01	30
17	6	0.1	19	0.31	2.15	0.64	0.01	22
18	4	0.1	17	0.24	1.98	0.49	0.00	15
19	3	0.1	15	0.20	1.87	0.40	0.00	11
20	3	0.1	15	0.20	1.87	0.40	0.00	11
21	2	0.1	13	0.16	1.73	0.31	0.00	7
22	2	0.1	13	0.16	1.73	0.31	0.00	7
23	2	0.1	13	0.16	1.73	0.31	0.00	7
24	1	0.1	10	0.11	1.50	0.19	0.00	3
TOTAL SEDIMENT LOAD TO BASIN (tons)								*51,603*
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)								***19.7***

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CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

10 -YR 6-HR STORM

Time	Total Discharge Q	Flow Depth d	Bed Width B	Unit Discharge q	Velocity V	Unit Bed Laod gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	ft	(ft)	cfs/ft	(fps)	lbs/ft/sec	tons/sec	tons
0	0	0.0	0	ERR	ERR	ERR	ERR	0
1	0	0.0	0	ERR	ERR	ERR	ERR	0
2	0	0.0	0	ERR	ERR	ERR	ERR	0
3	13	0.2	27	0.49	2.51	1.05	0.01	50
4	528	0.9	117	4.53	5.27	10.41	0.61	2186
5	2204	1.5	207	10.67	7.01	24.76	2.56	9206
6	2093	1.5	202	10.35	6.94	24.00	2.43	8740
7	1023	1.1	152	6.73	6.01	15.56	1.18	4255
8	431	0.8	108	4.01	5.06	9.20	0.49	1781
9	192	0.6	78	2.47	4.30	5.62	0.22	787
10	96	0.4	59	1.63	3.75	3.67	0.11	389
11	55	0.3	47	1.17	3.35	2.60	0.06	221
12	32	0.3	38	0.84	3.01	1.86	0.04	127
13	21	0.2	32	0.65	2.76	1.42	0.02	82
14	14	0.2	27	0.51	2.55	1.10	0.02	54
15	10	0.2	24	0.42	2.38	0.89	0.01	38
16	8	0.2	22	0.37	2.28	0.77	0.01	30
17	6	0.1	19	0.31	2.15	0.64	0.01	22
18	4	0.1	17	0.24	1.98	0.49	0.00	15
19	4	0.1	17	0.24	1.98	0.49	0.00	15
20	3	0.1	15	0.20	1.87	0.40	0.00	11
21	2	0.1	13	0.16	1.73	0.31	0.00	7
22	2	0.1	13	0.16	1.73	0.31	0.00	7
23	2	0.1	13	0.16	1.73	0.31	0.00	7
24	1	0.1	10	0.11	1.50	0.19	0.00	3
TOTAL SEDIMENT LOAD TO BASIN (tons)								*28,034*
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)								*10.7*

5 -YR 6-HR STORM

Time	Total Discharge Q	Flow Depth d	Bed Width B	Unit Discharge q	Velocity V	Unit Bed Laod gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	ft	(ft)	cfs/ft	(fps)	lbs/ft/sec	tons/sec	tons
0	0	0.0	0	ERR	ERR	ERR	ERR	0
1	0	0.0	0	ERR	ERR	ERR	ERR	0
2	0	0.0	0	ERR	ERR	ERR	ERR	0
3	0	0.0	0	ERR	ERR	ERR	ERR	0
4	85	0.4	56	1.51	3.66	3.40	0.10	344
5	1116	1.2	157	7.09	6.12	16.40	1.29	4645
6	1378	1.3	171	8.05	6.38	18.64	1.60	5742
7	731	1.0	133	5.50	5.62	12.69	0.84	3034
8	351	0.7	99	3.54	4.86	8.12	0.40	1448
9	165	0.5	73	2.25	4.18	5.12	0.19	675
10	86	0.4	56	1.52	3.67	3.43	0.10	348
11	49	0.3	45	1.09	3.28	2.42	0.05	196
12	31	0.3	38	0.83	2.99	1.82	0.03	123
13	20	0.2	31	0.64	2.74	1.38	0.02	78
14	14	0.2	27	0.51	2.55	1.10	0.02	54
15	10	0.2	24	0.42	2.38	0.89	0.01	38
16	7	0.2	21	0.34	2.22	0.71	0.01	26
17	6	0.1	19	0.31	2.15	0.64	0.01	22
18	4	0.1	17	0.24	1.98	0.49	0.00	15
19	4	0.1	17	0.24	1.98	0.49	0.00	15
20	3	0.1	15	0.20	1.87	0.40	0.00	11
21	2	0.1	13	0.16	1.73	0.31	0.00	7
22	2	0.1	13	0.16	1.73	0.31	0.00	7
23	2	0.1	13	0.16	1.73	0.31	0.00	7
24	1	0.1	10	0.11	1.50	0.19	0.00	3
TOTAL SEDIMENT LOAD TO BASIN (tons)								*16,838*
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)								*6.4*

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CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

2 -YR 6-HR STORM

Time	Total Discharge Q	Flow Depth d	Bed Width B	Unit Discharge q	Velocity V	Unit Bed Laod gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	ft	(ft)	cfs/ft	(fps)	lbs/ft/sec	tons/sec	tons
0	0	0.0	0	ERR	ERR	ERR	ERR	0
1	0	0.0	0	ERR	ERR	ERR	ERR	0
2	0	0.0	0	ERR	ERR	ERR	ERR	0
3	0	0.0	0	ERR	ERR	ERR	ERR	0
4	1	0.1	10	0.11	1.50	0.19	0.00	3
5	226	0.6	83	2.72	4.45	6.21	0.26	928
6	349	0.7	99	3.53	4.85	8.09	0.40	1439
7	278	0.7	90	3.08	4.63	7.04	0.32	1144
8	164	0.5	73	2.24	4.17	5.10	0.19	671
9	108	0.5	62	1.75	3.84	3.95	0.12	439
10	69	0.4	52	1.34	3.51	2.99	0.08	278
11	42	0.3	42	0.99	3.18	2.20	0.05	168
12	27	0.3	36	0.76	2.91	1.67	0.03	107
13	19	0.2	31	0.62	2.71	1.34	0.02	74
14	13	0.2	27	0.49	2.51	1.05	0.01	50
15	10	0.2	24	0.42	2.38	0.89	0.01	38
16	8	0.2	22	0.37	2.28	0.77	0.01	30
17	6	0.1	19	0.31	2.15	0.64	0.01	22
18	5	0.1	18	0.28	2.07	0.57	0.01	18
19	4	0.1	17	0.24	1.98	0.49	0.00	15
20	3	0.1	15	0.20	1.87	0.40	0.00	11
21	2	0.1	13	0.16	1.73	0.31	0.00	7
22	2	0.1	13	0.16	1.73	0.31	0.00	7
23	2	0.1	13	0.16	1.73	0.31	0.00	7
24	1	0.1	10	0.11	1.50	0.19	0.00	3
TOTAL SEDIMENT LOAD TO BASIN (tons)								*5,459*
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)								***2.1***

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter & Muller Method
Determination of Median Particle Size

Project: 25574.300
Date: 18-Jun-94
By: S. Canney

Dm = $\sum$ pi x di

where pi is the fraction by weight of the total sample having the mean size di.

Seive Size	Particle Size (mm)	Percent Finer	di	pi	pidi
1.5	38.10	100.0			
1	25.40	98.0	31.75	2.00%	0.64
0.75	19.05	94.8	22.23	3.20%	0.71
0.5	12.70	90.0	15.88	4.80%	0.76
0.375	9.53	85.0	11.11	5.00%	0.56
#4	4.75	75.6	7.14	9.40%	0.67
#8	2.36	56.5	3.56	19.10%	0.68
#16	1.18	35.0	1.77	21.50%	0.38
#30	0.60	25.0	0.89	10.00%	0.09
#50	0.30	15.0	0.45	10.00%	0.05
#100	0.13	9.5	0.22	5.50%	0.01
#200	0.08	6.2	0.11	3.30%	0.00
	0.00	0.0	0.04	6.20%	0.00
				100.00%	4.55

Median Particle Size Dm = 4.55 mm

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CLARK COUNTY DEPARTMENT OF PUBLIC WORKS		Project:	25574.300
HIKO SPRINGS WASH DETENTION BASIN		Date:	11-Aug-94
SEDIMENT TRANSPORT ANALYSIS		By:	S. Canney
Meyer - Peter & Muller Method			

This spreadsheet generates sedimnet graphs in one hour computation intervals based on the hourly ordinates from the 6-hour storm hydrographs developed with HEC-1. The computation of sediment discharge rates is based on the Meyer - Peter Formula as discussed in the computer abstract presented by M.A. Stevens whereby a substitution of the Darcy-Weisbach friction factor simplifies the equation as follows:

gs = A x (T-Tc)^1.5

where gs = sediment transport rate in lbs/ft/sec A = (8 x g/62.2)^0.5 x (Sg/(Sg-1)
Tc = 0.47 x (Sg-1) x 62.4 x Dm T = 62.4 x y x S
F = 0.116 x (D90)^(1/3) y = ((0.116 x (D90)^(1/2)/(8 x g x S))^(0.3) x q^(0.6)

The bed width for sediment transport is based on the FEMA methodology for determining the width of flow for washes on alluvial fans, except that since the flow is shallow it is asssumed that the top width of the flow path is equal to the channel bed for sediment transport. The relationships for discharge, bed width and flow depth are as follows:

Bedwidth = 9.5 x Q^0.4 and Flow depth = 0.07 x Q ^0.4

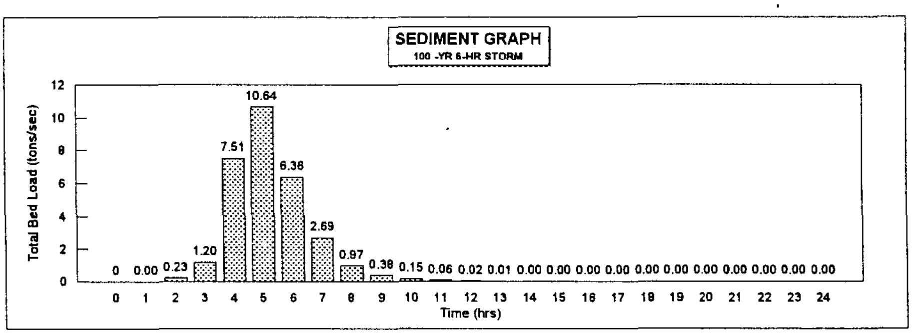
Except that the bedwidth for sediment transport is assumed to be constant for the flood event due to computational difficulties associated with recalculating bed width for each hydrograph ordinate.

Event: 100 -YR 6-HR STORM

Channel Width	b=	361 ft		
Channel Slope	S=	0.045 ft/ft		
Specific Gravity	Sg=	2.65		
90 Percentile Particle Size	D90=	12.75 mm	0.042 ft	
Effective Diameter of Bed Sediment	Dm=	4.55 mm	0.015 ft	

Critical Bed Shear Tc = 0.047 x (Sg-1) x 62.4 x Dm ——► Tc = 0.072 psf

Particle Density Coefficient A = 8 x (g/62.4)^0.5 x (Sg/(Sg-1)) ——► A = 9.230



Time	Total Discharge Q	Unit Discharge q	Flow Depth Y	Friction Factor f	Velocity v	Bed Shear t	Unit Bed Load gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	cfs/ft	ft		fps	psf	lbs/ft/sec	tons/sec	acre-ft
0	0	0	0	0	0	0	0	0	0
1	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
2	179	0.50	0.12	0.082	4.13	0.34	1.26	0.23	0.30
3	879	2.43	0.31	0.059	7.80	0.88	6.65	1.20	1.59
4	6102	16.90	1.00	0.040	16.94	2.80	41.62	7.51	9.93
5	8900	24.65	1.25	0.037	19.70	3.51	58.93	10.64	14.06
6	5093	14.11	0.90	0.042	15.76	2.51	35.21	6.36	8.40
7	2030	5.62	0.52	0.050	10.91	1.45	14.89	2.69	3.55
8	710	1.97	0.27	0.062	7.17	0.77	5.39	0.97	1.29
9	284	0.79	0.16	0.074	4.97	0.44	2.10	0.38	0.50
10	128	0.35	0.10	0.087	3.61	0.28	0.85	0.15	0.20
11	66	0.18	0.07	0.100	2.77	0.19	0.35	0.06	0.08
12	37	0.10	0.05	0.112	2.20	0.13	0.13	0.02	0.03
13	23	0.06	0.04	0.123	1.82	0.10	0.04	0.01	0.01
14	15	0.04	0.03	0.134	1.53	0.08	0.00	0.00	0.00
15	11	0.03	0.02	0.143	1.35	0.06	0.00	0.00	0.00
16	8	0.02	0.02	0.152	1.19	0.05	0.00	0.00	0.00
17	6	0.02	0.02	0.161	1.06	0.04	0.00	0.00	0.00
18	5	0.01	0.01	0.167	0.99	0.04	0.00	0.00	0.00
19	4	0.01	0.01	0.175	0.90	0.03	0.00	0.00	0.00
20	3	0.01	0.01	0.185	0.80	0.03	0.00	0.00	0.00
21	2	0.01	0.01	0.201	0.68	0.02	0.00	0.00	0.00
22	2	0.01	0.01	0.201	0.68	0.02	0.00	0.00	0.00
23	2	0.01	0.01	0.201	0.68	0.02	0.00	0.00	0.00
24	1	0.00	0.01	0.230	0.52	0.02	0.00	0.00	0.00
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)									**40.0**

BLACK & VEATCH

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter & Muller Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

Event: 50 -YR 6-HR STORM

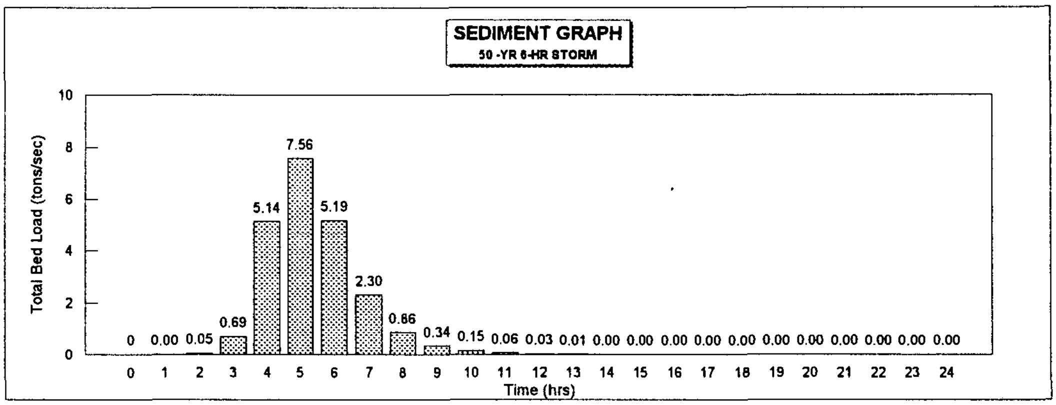
Channel Width	b=	313 ft		
Channel Slope	S=	0.045 ft/ft		
Specific Gravity	Sg=	2.65		
90 Percentile Particle Size	D90=	12.75 mm	0.042	ft
Effective Diameter of Bed Sediment	Dm=	4.55 mm	0.015	ft

Critical Bed Shear

Tc = 0.047 x (Sg-1) x 62.4 x Dm ——————► Tc = 0.072 psf

Particle Density Coefficient

A = 8 x (g/62.4)^0.5 x {Sg/(Sg-1)} ——————► A = 9.230



Time	Total Discharge Q	Unit Discharge q	Flow Depth Y	Friction Factor f	Velocity V	Bed Shear t	Unit Bed Load gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	cfs/ft	ft		fps	psf	lbs/ft/sec	tons/sec	acre-ft
0	0	0.00	0	0	0	0	0	0	0
1	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
2	56	0.18	0.07	0.100	2.75	0.18	0.34	0.05	0.07
3	505	1.61	0.24	0.064	6.62	0.68	4.42	0.69	0.91
4	4098	13.09	0.86	0.042	15.30	2.40	32.86	5.14	6.80
5	6220	19.87	1.10	0.039	18.07	3.09	48.32	7.56	10.00
6	4136	13.21	0.86	0.042	15.35	2.42	33.14	5.19	6.86
7	1740	5.56	0.51	0.050	10.86	1.44	14.73	2.30	3.05
8	628	2.01	0.28	0.062	7.22	0.78	5.50	0.86	1.14
9	255	0.81	0.16	0.074	5.04	0.45	2.18	0.34	0.45
10	120	0.38	0.10	0.086	3.73	0.29	0.93	0.15	0.19
11	62	0.20	0.07	0.098	2.86	0.19	0.39	0.06	0.08
12	36	0.12	0.05	0.109	2.30	0.14	0.16	0.03	0.03
13	22	0.07	0.04	0.121	1.89	0.10	0.05	0.01	0.01
14	15	0.05	0.03	0.130	1.62	0.08	0.01	0.00	0.00
15	10	0.03	0.02	0.141	1.38	0.07	0.00	0.00	0.00
16	8	0.03	0.02	0.148	1.26	0.06	0.00	0.00	0.00
17	6	0.02	0.02	0.156	1.12	0.05	0.00	0.00	0.00
18	5	0.02	0.02	0.162	1.05	0.04	0.00	0.00	0.00
19	4	0.01	0.01	0.170	0.96	0.04	0.00	0.00	0.00
20	3	0.01	0.01	0.180	0.85	0.03	0.00	0.00	0.00
21	2	0.01	0.01	0.195	0.72	0.02	0.00	0.00	0.00
22	2	0.01	0.01	0.195	0.72	0.02	0.00	0.00	0.00
23	2	0.01	0.01	0.195	0.72	0.02	0.00	0.00	0.00
24	1	0.00	0.01	0.224	0.55	0.02	0.00	0.00	0.00
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)									***29.6***

BLACK & VEATCH

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter & Muller Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

Event: **25 -YR 6-HR STORM**

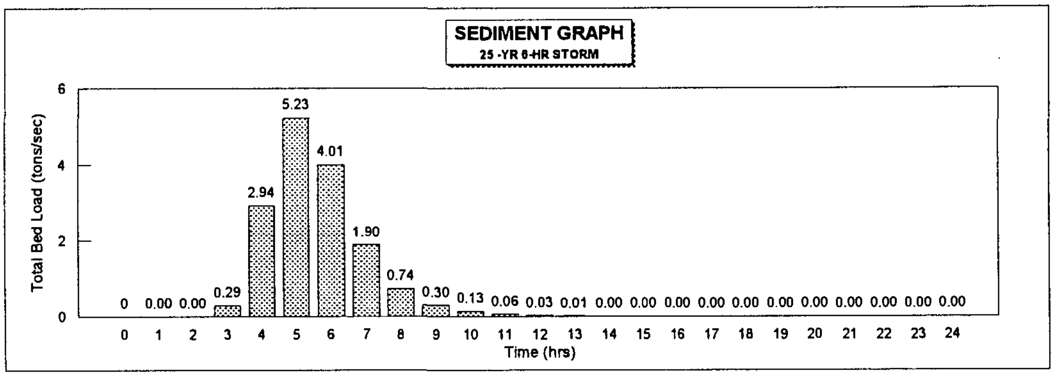
Channel Width	b=	268 ft		
Channel Slope	S=	0.045 ft/ft		
Specific Gravity	Sg=	2.65		
90 Percentile Particle Size	D90=	12.75 mm	0.042 ft	
Effective Diameter of Bed Sediment	Dm=	4.55 mm	0.015 ft	

Critical Bed Shear

Tc = 0.047 x (Sg-1) x 62.4 x Dm ——→ Tc = 0.072 psf

Particle Density Coefficient

A = 8 x (g/62.4)^0.5 x {Sg/(Sg-1)} ——→ A = 9.230



Time	Total Discharge Q	Unit Discharge q	Flow Depth Y	Friction Factor f	Velocity V	Bed Shear t	Unit Bed Load gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	cfs/ft	ft		fps	psf	lbs/ft/sec	tons/sec	acre-ft
0	0	0	0	0	0	0	0	0	0
1	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
2	9	0.03	0.02	0.140	1.41	0.07	0.00	0.00	0.00
3	217	0.81	0.16	0.074	5.02	0.45	2.16	0.29	0.38
4	2273	8.48	0.66	0.046	12.86	1.85	21.92	2.94	3.88
5	4227	15.77	0.96	0.041	16.48	2.69	39.04	5.23	6.92
6	3175	11.85	0.81	0.043	14.70	2.26	29.94	4.01	5.31
7	1429	5.33	0.50	0.051	10.68	1.40	14.16	1.90	2.51
8	538	2.01	0.28	0.062	7.22	0.78	5.50	0.74	0.97
9	224	0.84	0.16	0.074	5.09	0.46	2.24	0.30	0.40
10	108	0.40	0.11	0.085	3.80	0.30	0.99	0.13	0.18
11	58	0.22	0.07	0.096	2.96	0.21	0.45	0.06	0.08
12	34	0.13	0.05	0.107	2.39	0.15	0.20	0.03	0.03
13	21	0.08	0.04	0.118	1.97	0.11	0.07	0.01	0.01
14	14	0.05	0.03	0.128	1.68	0.09	0.02	0.00	0.00
15	10	0.04	0.03	0.137	1.47	0.07	0.00	0.00	0.00
16	8	0.03	0.02	0.143	1.34	0.06	0.00	0.00	0.00
17	6	0.02	0.02	0.152	1.20	0.05	0.00	0.00	0.00
18	4	0.01	0.01	0.164	1.02	0.04	0.00	0.00	0.00
19	3	0.01	0.01	0.174	0.91	0.03	0.00	0.00	0.00
20	3	0.01	0.01	0.174	0.91	0.03	0.00	0.00	0.00
21	2	0.01	0.01	0.189	0.77	0.03	0.00	0.00	0.00
22	2	0.01	0.01	0.189	0.77	0.03	0.00	0.00	0.00
23	2	0.01	0.01	0.189	0.77	0.03	0.00	0.00	0.00
24	1	0.00	0.01	0.217	0.58	0.02	0.00	0.00	0.00
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)									***20.7***

BLACK & VEATCH

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter & Muller Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

Event: 10 -YR 6-HR STORM

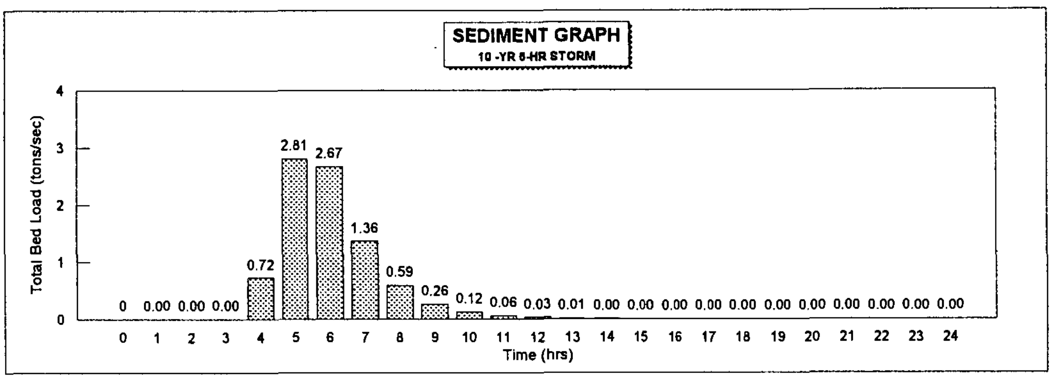
Channel Width	b=	207 ft		
Channel Slope	S=	0.045 ft/ft		
Specific Gravity	Sg=	2.65		
90 Percentile Particle Size	D90=	12.75 mm	0.042 ft	
Effective Diameter of Bed Sediment	Dm=	4.55 mm	0.015 ft	

Critical Bed Shear

Tc = 0.047 x (Sg-1) x 62.4 x Dm ⟶ Tc = 0.072 psf

Particle Density Coefficient

A = 8 x (g/62.4)^0.5 x {Sg/(Sg-1)} ⟶ A = 9.230



Time	Total Discharge Q	Unit Discharge q	Flow Depth Y	Friction Factor f	Velocity v	Bed Shear t	Unit Bed Load gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	cfs/ft	ft		fps	psf	lbs/ft/sec	tons/sec	acre-ft
0	0	0	0	0	0	0	0	0	0
1	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
2	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
3	13	0.06	0.03	0.123	1.81	0.10	0.04	0.00	0.01
4	528	2.55	0.32	0.059	7.95	0.90	6.96	0.72	0.95
5	2204	10.65	0.76	0.044	14.08	2.12	27.11	2.81	3.71
6	2093	10.11	0.73	0.045	13.79	2.06	25.84	2.67	3.54
7	1023	4.94	0.48	0.052	10.36	1.34	13.17	1.36	1.80
8	431	2.08	0.28	0.061	7.33	0.80	5.70	0.59	0.78
9	192	0.93	0.17	0.072	5.31	0.49	2.50	0.26	0.34
10	96	0.46	0.12	0.083	4.02	0.32	1.17	0.12	0.16
11	55	0.27	0.08	0.092	3.22	0.23	0.59	0.06	0.08
12	32	0.15	0.06	0.103	2.59	0.17	0.27	0.03	0.04
13	21	0.10	0.05	0.112	2.19	0.13	0.13	0.01	0.02
14	14	0.07	0.04	0.122	1.86	0.10	0.05	0.00	0.01
15	10	0.05	0.03	0.130	1.63	0.08	0.01	0.00	0.00
16	8	0.04	0.03	0.136	1.49	0.07	0.00	0.00	0.00
17	6	0.03	0.02	0.144	1.33	0.06	0.00	0.00	0.00
18	4	0.02	0.02	0.156	1.13	0.05	0.00	0.00	0.00
19	4	0.02	0.02	0.156	1.13	0.05	0.00	0.00	0.00
20	3	0.01	0.01	0.165	1.01	0.04	0.00	0.00	0.00
21	2	0.01	0.01	0.179	0.85	0.03	0.00	0.00	0.00
22	2	0.01	0.01	0.179	0.85	0.03	0.00	0.00	0.00
23	2	0.01	0.01	0.179	0.85	0.03	0.00	0.00	0.00
24	1	0.00	0.01	0.206	0.65	0.02	0.00	0.00	0.00
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)									***11.4***

BLACK & VEATCH

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter & Muller Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

Event: 5 -YR 6-HR STORM

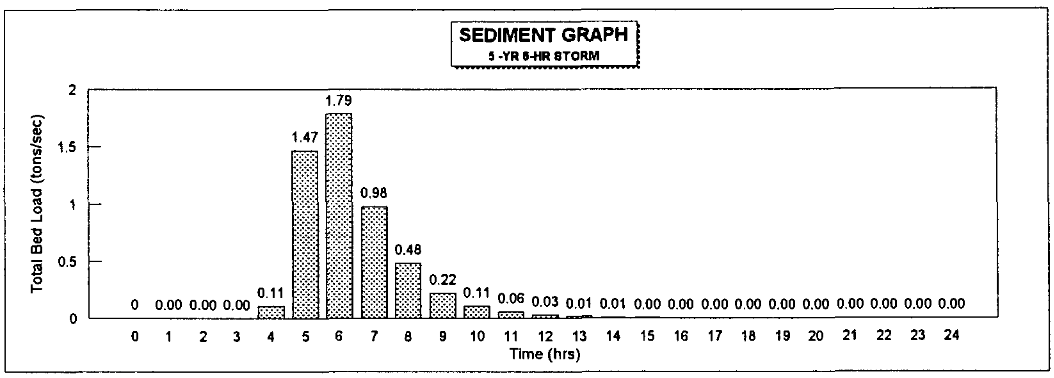
Channel Width	b=	171	ft		
Channel Slope	S=	0.045	ft/ft		
Specific Gravity	Sg=	2.65			
90 Percentile Particle Size	D90=	12.75	mm	0.042	ft
Effective Diameter of Bed Sediment	Dm=	4.55	mm	0.015	ft

Critical Bed Shear

Tc = 0.047 x (Sg-1) x 62.4 x Dm ⟶ Tc = 0.072 psf

Particle Density Coefficient

A = 8 x (g/62.4)^0.5 x {Sg/(Sg-1)} ⟶ A = 9.230



Time	Total Discharge Q	Unit Discharge q	Flow Depth Y	Friction Factor f	Velocity v	Bed Shear t	Unit Bed Load gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	cfs/ft	ft		fps	psf	lbs/ft/sec	tons/sec	acre-ft
0	0	0	0	0	0	0	0	0	0
1	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
2	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
3	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
4	85	0.50	0.12	0.082	4.13	0.34	1.26	0.11	0.14
5	1116	6.53	0.56	0.049	11.58	1.58	17.14	1.47	1.94
6	1378	8.06	0.64	0.047	12.60	1.80	20.90	1.79	2.36
7	731	4.27	0.44	0.053	9.78	1.23	11.47	0.98	1.30
8	351	2.05	0.28	0.061	7.29	0.79	5.62	0.48	0.64
9	165	0.96	0.18	0.071	5.39	0.50	2.61	0.22	0.29
10	86	0.50	0.12	0.081	4.15	0.34	1.28	0.11	0.14
11	49	0.29	0.09	0.091	3.32	0.24	0.65	0.06	0.07
12	31	0.18	0.07	0.100	2.76	0.18	0.35	0.03	0.04
13	20	0.12	0.05	0.109	2.32	0.14	0.17	0.01	0.02
14	14	0.08	0.04	0.117	2.01	0.11	0.08	0.01	0.01
15	10	0.06	0.03	0.125	1.76	0.09	0.03	0.00	0.00
16	7	0.04	0.03	0.134	1.52	0.08	0.00	0.00	0.00
17	6	0.04	0.02	0.139	1.43	0.07	0.00	0.00	0.00
18	4	0.02	0.02	0.150	1.22	0.05	0.00	0.00	0.00
19	4	0.02	0.02	0.150	1.22	0.05	0.00	0.00	0.00
20	3	0.02	0.02	0.159	1.08	0.05	0.00	0.00	0.00
21	2	0.01	0.01	0.173	0.92	0.04	0.00	0.00	0.00
22	2	0.01	0.01	0.173	0.92	0.04	0.00	0.00	0.00
23	2	0.01	0.01	0.173	0.92	0.04	0.00	0.00	0.00
24	1	0.01	0.01	0.198	0.70	0.02	0.00	0.00	0.00
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)									***7.0***

BLACK & VEATCH

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS WASH DETENTION BASIN
SEDIMENT TRANSPORT ANALYSIS
Meyer - Peter & Muller Method

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

Event: **2 -YR 6-HR STORM**

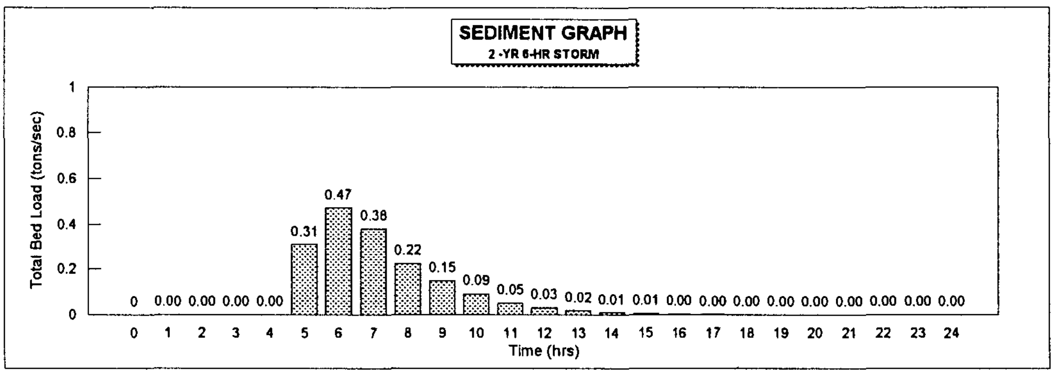
Channel Width	b=	99	ft		
Channel Slope	S=	0.045	ft/ft		
Specific Gravity	Sg=	2.65			
90 Percentile Particle Size	D90=	12.75	mm	0.042	ft
Effective Diameter of Bed Sediment	Dm=	4.55	mm	0.015	ft

Critical Bed Shear

Tc = 0.047 x (Sg-1) x 62.4 x Dm ⟶ Tc = 0.072 psf

Particle Density Coefficient

A = 8 x (g/62.4)^0.5 x {Sg/(Sg-1)} ⟶ A = 9.230



Time	Total Discharge Q	Unit Discharge q	Flow Depth Y	Friction Factor f	Velocity V	Bed Shear t	Unit Bed Load gs	Total Bed Load Gs	Total Bed Load
hrs	cfs	cfs/ft	ft		fps	psf	lbs/ft/sec	tons/sec	acre-ft
0	0	0	0	0	0	0	0	0	0
1	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
2	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
3	0	0.00	0.00	ERR	ERR	0.00	0.00	0.00	0.00
4	1	0.01	0.01	0.178	0.87	0.03	0.00	0.00	0.00
5	226	2.28	0.30	0.060	7.61	0.64	6.24	0.31	0.41
6	349	3.53	0.39	0.055	9.05	1.09	9.53	0.47	0.62
7	278	2.81	0.34	0.058	8.26	0.95	7.65	0.38	0.50
8	164	1.66	0.25	0.064	6.69	0.70	4.54	0.22	0.30
9	108	1.09	0.19	0.070	5.66	0.54	2.96	0.15	0.19
10	69	0.70	0.15	0.076	4.73	0.41	1.84	0.09	0.12
11	42	0.42	0.11	0.084	3.88	0.31	1.05	0.05	0.07
12	27	0.27	0.08	0.092	3.25	0.24	0.61	0.03	0.04
13	19	0.19	0.07	0.099	2.82	0.19	0.38	0.02	0.02
14	13	0.13	0.05	0.106	2.43	0.15	0.21	0.01	0.01
15	10	0.10	0.05	0.112	2.19	0.13	0.13	0.01	0.01
16	8	0.08	0.04	0.117	2.00	0.11	0.08	0.00	0.01
17	6	0.06	0.03	0.124	1.78	0.10	0.03	0.00	0.00
18	5	0.05	0.03	0.129	1.66	0.09	0.01	0.00	0.00
19	4	0.04	0.03	0.135	1.51	0.07	0.00	0.00	0.00
20	3	0.03	0.02	0.143	1.35	0.06	0.00	0.00	0.00
21	2	0.02	0.02	0.155	1.15	0.05	0.00	0.00	0.00
22	2	0.02	0.02	0.155	1.15	0.05	0.00	0.00	0.00
23	2	0.02	0.02	0.155	1.15	0.05	0.00	0.00	0.00
24	1	0.01	0.01	0.178	0.87	0.03	0.00	0.00	0.00
TOTAL SEDIMENT LOAD TO BASIN (acre-ft)									**2.3**

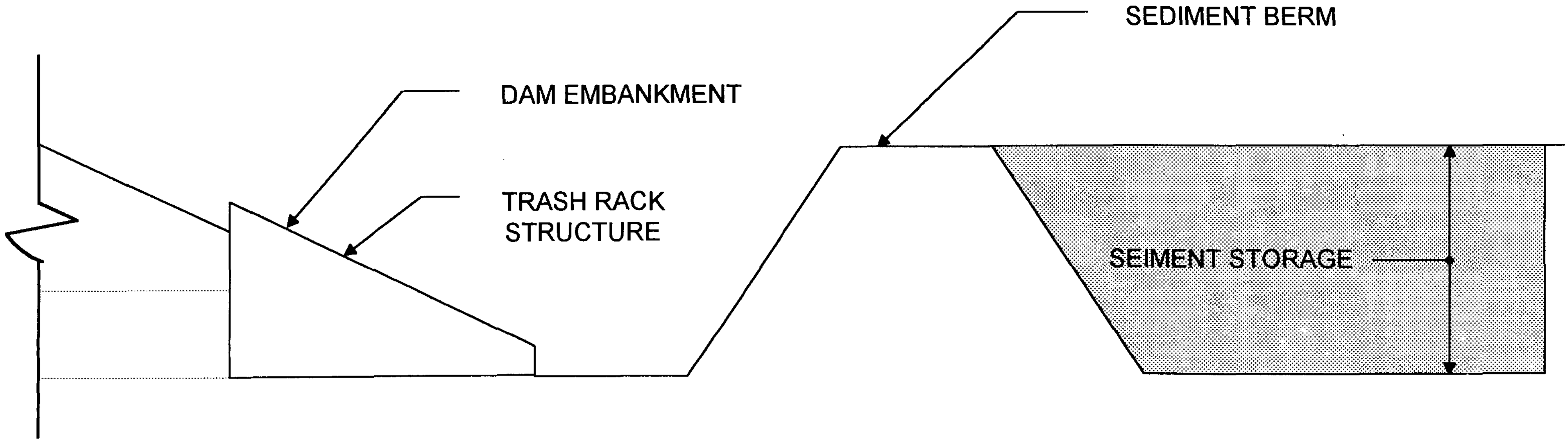
BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Detention Basin
Sediment Accumulation Over Time

Project: 25574.300
Date: 11-Aug-94
By: S. Canney

Objective: Estimate the accumulation of sediment in the detention basin over time. Use sediment transport rate from Meyer-Peter & Muller analysis for various storm events. Assume that stom events occur regularily at their recurrance intervals, depositing sediment into the detention basin. No sediemnt discharge from the detention basin.

YEAR	1yr Events (acre-ft)	2-yr Events (acre-ft)	5-yr Events (acre-ft)	10-yr Events (acre-ft)	25-yr Events (acre-ft)	Yearly Total (acre-ft)	Cumulative Total (acre-ft)
1	1.2						
2	1.2	2.3				3.5	3.5
3	1.2					1.2	4.7
4	1.2	2.3				3.5	8.2
5	1.2		7.0			8.2	16.4
6	1.2	2.3				3.5	19.9
7	1.2					1.2	21.1
8	1.2	2.3				3.5	24.6
9	1.2					1.2	25.8
10	1.2	2.3	7.0	11.4		21.9	47.7
11	1.2					1.2	48.9
12	1.2	2.3				3.5	52.4
13	1.2					1.2	53.6
14	1.2	2.3				3.5	57.1
15	1.2		7.0			8.2	65.3



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SEDIMENT BERM

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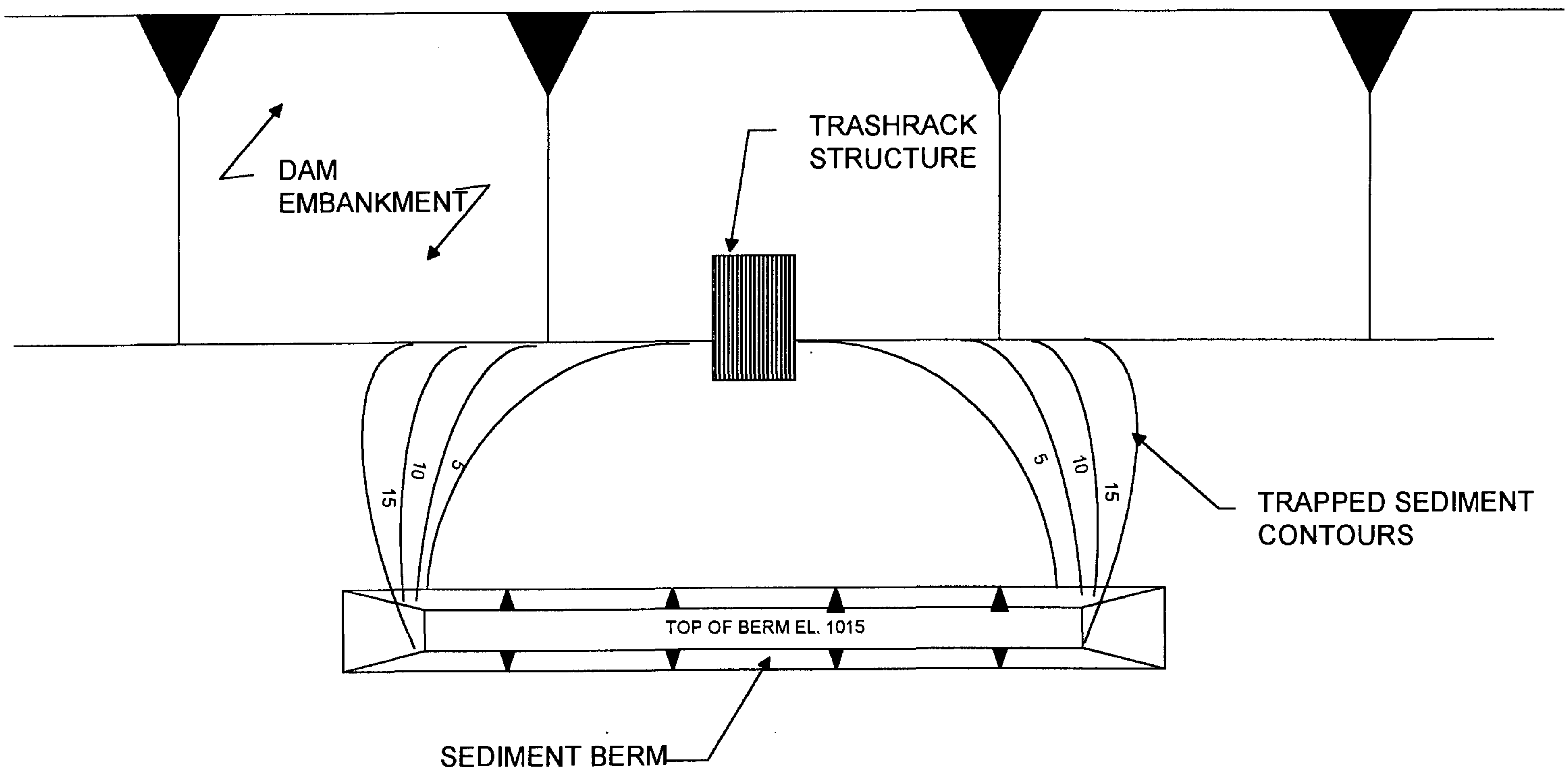

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H. Sediment Discharge Formulas

56. General.—Engineers engaged in river regulation and design and operation of canal systems have great need for methods of computing sediment discharge. In fact, obtaining such methods is probably the most important practical objective of research in sedimentation. Unfortunately, available methods or relations for computing sediment discharge are far from completely satisfactory with the result that plans for works involving sediment movement by water cannot be based strongly on such relations. At best these relations serve as guides to planning and usually the engineer is forced to rely strongly on experience and judgment in such work. The guiding provided turns out to be important especially when the conditions in the problem area differ from those in the experience of the planning engineers. For this reason it seems pertinent to present some of the available relations in this section.

Relations for calculating sediment discharge will be referred to as formulas even though parts or all of some relations are presented in graphical form and, strictly speaking, are not formulas. The objective of presenting them is to make them conveniently available to those who may need to employ them and to give some information that may help in evaluating them.

Many formulas have appeared in the literature since DuBoys (1879) presented his tractive force relation. The problem of the engineer is to select one or more of these for use in solving his particular problem. This selection is not straightforward since the results of different formulas often differ drastically and it is not possible to determine positively which one gives the most realistic result. To help engineers select formulas, a brief outline of the data on which each formula is based will be given and an attempt will be made to evaluate the formulas by comparing observed sediment discharges in rivers with values calculated by the formulas. Only a few of the many formulas available will be presented and discussed. These were selected because they are used by many engineers or because it may appear that they show promise of being adopted in the future. Some formulas considered important by many experts in sedimentation have probably been omitted because of this subjective method of selection. No derivations will be attempted in this section because the fundamental ideas upon which the derivations are based are discussed in Chapter II, Section G.

In addition to the formulas, procedures will be presented for estimating the discharge of bed sediment from suspended load samples and normal stream flow measurements. This approach to obtaining sediment discharge is one of the most important developments in river sedimentation in recent years. By making use of observed quantities it gives results that are very much more reliable than those given by the formulas. A compilation of sediment discharge formulas by Shulits and Hill (1968) gives computer programs for a number of the formulas listed herein.

57. Formulas.—All of the formulas presented in this section are for discharge of bed sediment under conditions of uniform steady flow and do not include the wash load. The formulas are as follows:

DuBoys (Brown, 1950), 1879	Eq. 2.224
Meyer-Peter (Meyer-Peter and Muller, 1948)	Eq. 2.225
Schoklitsch (Shulits, 1935)	Eq. 2.226
Shields (1936)	Eq. 2.227
Meyer-Peter and Muller (1948)	Eq. 2.228
Einstein-Brown (Brown, 1950)	Eq. 2.229
Einstein Bed Load Function (Einstein, 1950)	Eq. 2.230
Laursen (1958)	Eq. 2.231
Blench Regime Formula (Blench, 1966a)	Eq. 2.232
Colby (1964a-b)	Eq. 2.233
Engelund-Hansen (Engelund, 1966; Engelund and Hansen, 1967)	Eq. 2.234
Inglis-Lacey (Inglis, 1968)	Eq. 2.235
Toffaleti (1969)	Eq. 2.236

To apply these formulas the flow depth, d, and slope, S, or mean velocity, depth, and slope must be given.

DuBoys Formula (Brown, 1950)

$$g_s = \Psi_D \tau_o (\tau_o - \tau_c) \quad \text{(2.224)}$$

in which g_s = sediment discharge, in pounds per second per foot of width; Ψ_D = coefficient with dimensions of cubic feet per pound per second; $\tau_o = \gamma\, r_b S$ bed shear stress, in pounds per square foot; γ = specific weight of water, in pounds per cubic foot; τ_c = critical bed shear stress at which sediment movement begins; r_b = bed hydraulic radius, in feet (determined by the Side-wall Correction method outlined in Chapter II, Section F); and S = slope of stream, in feet per foot. Values of Ψ_D and τ_c obtained by Straub and reported in Brown, 1950 are given as functions of median size of the bed sediment, d_{50}, in Fig. 2.95. These quantities were based mainly on data from experiments by Gilbert (1914; Johnson, 1943) in small flumes. Eq. 2.224 as presented herein is valid only for the foot-pound-second system of units.

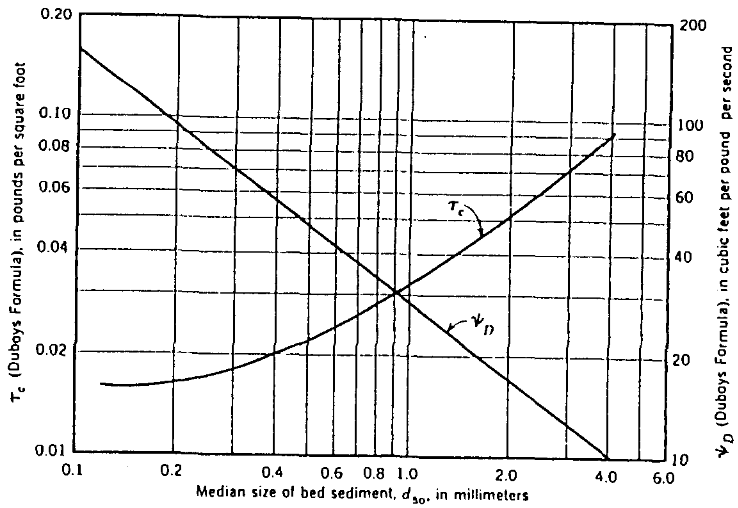

FIG. 2.95.—Coefficient Ψ_D and Critical Shear Stress τ_c for DuBoys Eq. 2.227 as Functions of Median Size of Bed Sediment

Meyer-Peter Formula (Meyer-Peter and Muller, 1948)

$$g_s^{2/3} = 39.25\, q^{2/3} S - 9.95\, d_{50} \quad (2.225)$$

in which q = water discharge, in cubic feet per second per foot of width; d_{50} = median size of bed sediment, in feet; and g_s and S are as defined previously. Eq. 2.225 is valid only for the foot-pound-second system of units. For the meter-kilogram-second units the numbers 39.25 and 9.95 in Eq. 2.225 are replaced by 250 and 42.5., respectively.

The constants in Eq. 2.225 were determined by fitting the equation to data obtained in experiments with five well-sorted river sediments ranging in median size from 3.1 mm–28.6 mm. The experiments with three of these sediments were made by Gilbert (1914) in flumes 8 in., 12 in., and 16 in. wide with flow depths ranging from 1 in.–6 in. The experiments with the 28.6-mm sediment and one other were made in a flume 2 m wide. These coarse sediments do not produce rugged bed forms so that in these experiments the flow resistance was due mainly to grain roughness. Therefore Eq. 2.225 is valid only for beds of relatively coarse sediments for which the flow resistance due to bed forms is a small part of the total resistance.

Schoklitsch Formula (Shulits, 1935)

$$g_s = \sum_i p_i \frac{25.3}{\sqrt{d_{si}}} S^{3/2} (q - q_{ci}) \quad (2.226a)$$

$$q_{ci} = 0.638 \frac{d_{si}}{S^{4/3}} \quad (2.226b)$$

in which q_{ci} = critical value of q for initiating motion of sediment of mean size, d_{si} as given by Eq. 2.226b; p_i = fraction by weight of that fraction of the bed sediment with mean size, d_{si}; the symbol, Σ_i, denotes summation for all sets of values of p_i, d_{si}, and q_{ci}; and other symbols are as defined previously. All quantities in Eq. 2.226b are expressed in the foot-pound-second system of units.

To determine sets of values of p_i and d_{si} a mechanical analysis of a representative sample of the bed sediment is made and a size distribution curve prepared. A set of size grades is then selected and the corresponding p_i values can be determined from the size distribution curve. The size grades frequently used are those shown in Table 2.1. The mean size, d_{si}, of a fraction is often taken as the geometric mean of the extreme sizes in the fraction.

The Schoklitsch formula was based mainly on data from experiments by Gilbert (1914) in small flumes with well-sorted and also graded sediments with median sizes ranging from 0.3 mm–5 mm. Sediment discharges calculated with the formula also agreed well (Shulits, 1935) with bed load discharges measured with samplers in two European rivers that have gravel beds. This suggests that it is a bed load formula that should not be applied to sand bed streams that carry considerable bed sediment in suspension.

Shields Formula (Shields, 1936)

$$g_s = 10 q S \frac{(\tau_o - \tau_c)}{\left(\frac{\gamma_s}{\gamma} - 1\right)^2 d_{50}} \quad (2.227)$$

in which γ_s = specific weight of the sediment grains; τ_c = critical bed shear stress for sediment of size d_{50} given by Shields graph, Chapter II, Section E, Fig. 2.43; γ_s = the specific weight of the sediment; and all other quantities in Eq. 2.227 are already defined except that since the equation is dimensionally homogeneous, the quantities can be expressed in any consistent set of units.

(In the formulas presented in this section, sediment discharge and concentration are usually given in weight units even though they should be given in mass units. In the traditional systems of units, i.e., foot-pound-second and meters-kilogram-second this confusion gives no difficulty since pounds and kilograms of mass are numerically equal to those of weight. However, in the SI system of units the formulas as presented will give sediment discharge and concentration in terms of Newtons that numerically are 9.8 times as large as the same quantities expressed in kilograms of mass.)

The Shields formula is based mainly on data from two flumes with widths of 40 cm and 80 cm, respectively, with five sediments of specific gravities ranging from 1.06–4.2. The lightest sediment was made of amber particles with a median size of 1.56 mm. The other sediments were well sorted with median sizes ranging from 1.7 mm–2.5 mm. Ripples were produced on the bed but none of them was very high or steep. Because the sediments in the experiments were coarse and the shear stresses low, essentially all of the sediment moved was bed load.

Meyer-Peter and Muller Formula (1948)

$$\left(\frac{k_r}{k_r'}\right)^{3/2} \gamma r_b S = 0.047 (\gamma_s - \gamma) d_m + 0.25 \left(\frac{\gamma}{g}\right)^{1/3} \left(\frac{\gamma_s - \gamma}{\gamma_s}\right)^{2/3} g_s^{2/3} \quad (2.228a)$$

$$\frac{k_r}{k_r'} = \sqrt{\frac{f_b'}{8}} \frac{V}{\sqrt{g r_b S}} \quad (2.228b)$$

in which g = acceleration of gravity; f_b' = Darcy-Weisbach bed friction factor for the sand grain roughness defined in Chapter II, Section F; and V = mean flow velocity of the stream. The quantities, k_r and k'_r, are defined by

$$V = k_r r_b^{2/3} S^{1/2} \quad (2.228c)$$

and $$V = k_r' r_b^{2/3} S'^{1/2} \quad (2.228d)$$

in which S' is that part of the total slope, S, required to overcome the grain resistance and is defined in terms of f_b' as

$$V = \sqrt{\frac{8}{f_b'}} \sqrt{g r_b S'} \quad (2.228e)$$

The friction factor, f_b', is obtained from the well-known pipe friction graph of the Nikuradse pipe friction data in which the friction factor, f, is expressed as a function of Reynolds number VD/ν and relative roughness D/k_s in which D = pipe diameter; ν = kinematic viscosity of the water; and k_s = the grain size of the sand forming the roughness at the pipe wall. To obtain f_b' from the pipe friction graph, the diameter, D, is replaced by $4r_b$ and k_s is replaced by d_{90}, the grain size of the bed sediment for which 90% is finer. When the boundary

Reynolds number, $\sqrt{(f_b'/8)}\,V(d_{90}/\nu)$, equals or exceeds a value of approx 100, the boundary will be hydrodynamically rough and k_r' is given by

$$k_r' = \frac{26}{d_{90}^{1/6}} \qquad (2.228f)$$

in which d_{90} is in meters and k_r' is in meters to the one-third power per second. The quantity, d_m, is the effective diameter of the sediment given by

$$d_m = \sum_i p_i d_{si} \qquad (2.228g)$$

in which p_i, d_{si}, and the summation sign are as in the Schoklitsch formula.

Eqs. 2.228a, 2.228b, and 2.228e are dimensionally homogeneous so that any consistent set of units may be used with them. On the other hand, Eq. 2.228f is valid only when d_{90} is expressed in meters and time is in seconds. When k_r' is obtained from Eq. 2.228f the quantity, k_r, is to be calculated from Eq. 2.228c in which V and r_b are expressed, respectively, in meters per second and meters. Once k_r and k_r' are obtained in meter-second units any other consistent set of units may be used for all other quantities in Eqs. 2.228a, 2.228b, and 2.228e.

The Meyer-Peter and Muller formula is based on data from experiments in flumes ranging in width from 15 cm–2 m with slopes varying from 0.0004–0.02 and water depths ranging from 1 cm–120 cm. The sediments used in the experiments ranged from coal with a small specific gravity, $\gamma_s/\gamma = 1.25$, to river sediment to barite with a specific gravity in excess of four. Some of the sediments were graded and others were sorted. The mean sizes and effective diameters, d_m, of the sediments ranged from 0.4 mm–30 mm. The advantage of this formula over the older Meyer-Peter formula, Eq. 2.225, is that it can be used for graded sediments under flow conditions that give rise to dunes and other bed forms. Most of the data upon which the formula is based were obtained in flows with little or no suspended load that suggests that the formula is not valid for flows with appreciable suspended loads.

Einstein-Brown Formula (Brown, 1950)

This formula was presented in Chapter XII of Rouse, 1950. It is a modification developed by Hunter Rouse, M. C. Boyer, and E. M. Laursen of a formula by Einstein (1942). Its name derives from the name of the original author and the author of the chapter where the formula first appeared. The formula is

$$\Phi = f\left(\frac{1}{\Psi}\right) \qquad (2.229a)$$

in which the function, $f(1/\Psi)$, as given in Rouse (1950) is shown in Fig. 2.96

$$\text{and } \Phi = \frac{g_s}{\gamma_s F_1 \sqrt{g\left(\frac{\gamma_s}{\gamma} - 1\right) d_s^3}} \qquad (2.229b)$$

$$\frac{1}{\Psi} = \frac{\tau_o}{(\gamma_s - \gamma) d_s} = \tau_* \qquad (2.229c)$$

$$F_1 = \sqrt{\frac{2}{3} + \frac{36\nu^2}{g d_s^3\left(\frac{\gamma_s}{\gamma} - 1\right)}} - \sqrt{\frac{36\nu^2}{g d_s^3\left(\frac{\gamma_s}{\gamma} - 1\right)}} \qquad (2.229d)$$

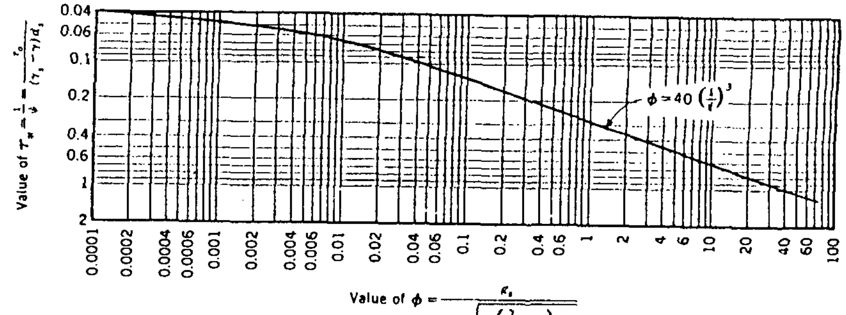

FIG. 2.96.—Function $\phi = f(1/\Psi)$ for Einstein Brown Eq. 2.229

As shown by Fig. 2.96, Eq. 2.229a becomes $\Phi = 40(1/\Psi)^3$ for $1/\Psi$ in excess of 0.09.

The quantity, d_s, is the representative size of bed sediment and is usually taken as the median size, d_{50}, or geometric mean size, d_g. The bed shear stress, τ_o, is usually taken as $\gamma r_b S$. The quantity, F_1, appears in the Rubey (1933) formula for fall velocity w of sediment of size d_s:

$$w = F_1 \sqrt{\left(\frac{\gamma_s}{\gamma} - 1\right) g d_s} \qquad (2.229e)$$

Note that $1/\Psi$ is the same as the dimensionless shear stress, τ_*, introduced by Shields (1936). Since all of Eqs. 2.231 are dimensionally homogeneous any consistent set of units may be used in them.

The Einstein-Brown formula was based on flume data by Gilbert (1914) and Meyer-Peter and Muller with well-sorted sediments. The Gilbert data were obtained in small flumes with river sediment with median sizes from 0.3 mm–7 mm. The other data used were obtained with a flume 2 m wide with 28.6-mm gravel and with a smaller flume with 5.21-mm gravel, barite, and coal. The specific gravities of the barite and coal were 4.2 and 1.25, respectively.

Einstein Bed Load Function (Einstein, 1950)

In this method the sediment discharge is computed for individual size fractions of the bed material. This means that one also obtains the size distribution of the sediment load. The equations and relations used in the calculations follow:

$$g_s = \sum_i g_{si} \qquad (2.230a)$$

$$G_s = b g_s \qquad (2.230b)$$

$$g_{si} = g_{sbi}[P_r I_1(\eta_{oi}, z_i) + I_2(\eta_{oi}, z_i) + 1] \qquad (2.230c)$$

In these equations g_s = discharge of bed sediment in weight per unit width and time as defined previously; G_s = the total bed sediment discharge of the stream, in weight per unit time; b = the bed width of the stream; g_{si} = discharge of bed sediment of mean size d_{si}, i.e., the ith size fraction, per unit width; the summation sign, $\sum_i$, indicates the sum of g_{si} for all size fractions; and g_{sbi} = discharge of bed load of mean size d_{si}, in weight per unit width. The product of g_{sbi} and the first two

ρ = fluid density;
τ_o = local wall-shear stress;
$\bar{\tau}_o$ = average wall-shear stress;
$\bar{\tau}_{op}$ = average wall-shear stress over portion of perimeter; and
ψ_s = secondary flow streamfunction.

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Pulsing Flow in Steep Alluvial Streams

By Michael G. Foley[1] and Vito A. Vanoni,[2] F. ASCE

Introduction

During simulated floods in sand-bed, rigid-wall, and alluvial-bank channels in an open-circuit flume, pulsing flow caused by quasiperiodic bores up to 1 cm in height developed in flows approx 2 cm deep during the waning flood. These bores (Fig. 1) resembled roll waves in morphology, regularity of spacing, and the impression that larger waves overtake smaller ones. However, the Froude number of the flows never exceeded 1.1 while bores were observed. Brock's (1) analysis indicates that roll waves should not form at Froude numbers less than two, and Koloseus and Davidian (6, Fig. 4) indicate they should not form at Froude numbers less than about 1.8 for the width-depth ratio and friction factor of these flows.

Observed development of bores in an alluvial-bank channel (Fig. 1) indicated that they were not artifacts of rigid flume walls. However, no quantitative measurements were made in the alluvial-bank channel because the banks were eroding too rapidly to establish steady-state flow conditions that would permit such measurements. Instead, bore development was studied in a rigid-wall channel with a sand bed under conditions of steady flow.

Apparatus

Experiments were conducted in the 18-m flume of the W. M. Keck Laboratory of Hydraulics and Water Resources of the California Institute of Technology, Pasadena, Calif. Rigid flume walls were 26.7 cm apart, and painted with an epoxy enamel which gave them a hydrodynamically smooth surface. Sediment input was by an automated wet sand feeder (4) in the flume inlet. Water surface elevation was measured by recording pressure transducers at 2-m intervals along the flume.

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PROCEDURE

Five steady-state experiments were performed with a movable bed and sand fed at the inlet. These experiments were conducted over a range of discharges that bracketed the range producing bores in earlier simulated floods. Sediment input rate had the same relation to discharge as that used in the simulated floods. The sand bed was leveled before each run, and, except for run 5, runs

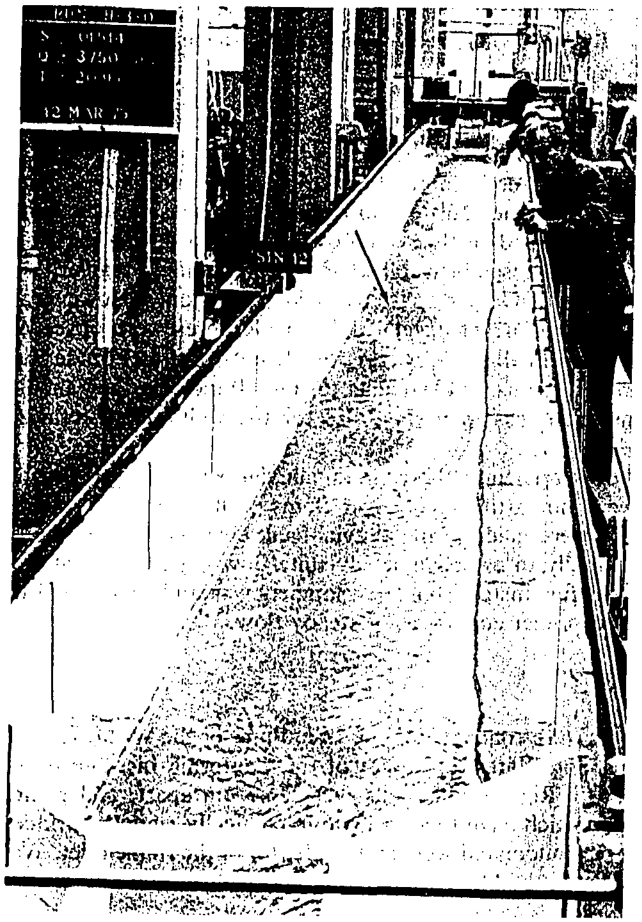

FIG. 1.—Typical Bore (Arrow) in Alluvial-Bank Experiment

were limited to about 6-min duration to prevent significant changes of mean bed elevation. Pressure transducer recorders were adjusted to maximum sensitivity possible for the water depth and bore heights of the runs, and calibrations were checked prior to each run. Flume slope was 0.00853, bed material was naturally-worn quartz sand with a geometric mean diameter of 0.28 mm and geometric standard deviation of 1.42, and water temperature was 23° C.

Two simulated floods were run over a nonerodible bed using the hydrograph that produced bores in the movable-bed experiments, but with no sediment input. In the first simulated flood, the sand bed was covered with a 1-cm thick plywood false bottom. This bottom was mounted with its top surface flush with the inlet and outlet sills so channel geometry was the same as that used in the simulated flood experiments, except with a fixed bed. It was painted with the epoxy resin used on the flume walls, and edges and joints were sealed with vinyl tape. No channel bores developed in the course of the simulated flood run through this channel.

For the second simulated flood in the fixed bed channel, the false bottom was painted and dry bed sand was sprinkled on the wet paint. After the paint dried, excess sand was washed off, and a simulated flood run over the roughened fixed bed. This bed had the same bed sand-grain roughness as that used in simulated floods, but again no bores developed during the simulated flood. The water surface was disturbed in both experiments with a fixed bed, but no waves developed except stationary ones caused by fixed irregularities in the flume walls.

EXPERIMENTAL RESULTS

Fig. 2 shows a typical bore developed in the steady flow experiments with the sand bed. The bore can be seen entering the field of view from the right. Bore height is about 0.8 cm and water ahead of the bore is about 1.8 cm deep. Small downstream-migrating antidunes can be seen on the bed and the surface waves that move in phase with the antidunes are also visible. These surface waves are referred to herein as antidune waves. Fig. 2 shows that antidune waves in the shallow water ahead of the bore are breaking, and that the surface of the bore has superimposed antidune waves, giving it a lumpy appearance in this photograph. As the bores travel downstream, antidune waves in front of them break. In some cases the flow ahead of the bores apparently becomes slow and shallow enough so that the antidune waves break and disappear, and the bore advances over a relatively smooth water surface. In these instances, the breaking of the antidune waves and sudden shallowing of the flow immediately downstream of the bore gives the illusion that the flow surges *upstream*. Sand transport virtually stops in these instances, but no verified upstream movement of sand or water has been observed. In other instances, the bore overrides the antidune waves while they are breaking (Fig. 2) and leaves them behind apparently in about the same position as before the bore passed.

Mean Flow and Bore Parameters.—Fig. 3 is a section of the pressure transducer record for Run 2. For every bore that developed during the 6-min runs, minimum water depth in front of the bore, d_t, and bore height, h, was determined at each of the six pressure transducer stations along the flume.

Fig. 4 shows mean bore height at each transducer for Runs 1-5. This figure also shows that bores in Runs 1-5 were generated upstream of flume station 3.25 m, and observations indicated that they were first visible downstream of station 1.5 m. Bores were observed coming out of the inlet during Run 5. The sand feeder was shut off after 390 sec, and Run 5 was separated into Run 5a (feeder on) and Run 5b (feeder off). Fig. 4 shows that bores in Run 5b form farther downstream than those in Run 5a, but achieve the same height by station 13.25 m. Thus, although the feeder input disturbances had some effect on initial bore generation, final bore size was not affected.

Fig. 4 shows that mean bore height varies but little downstream of station 7.25 m. Table 1 gives a summary of mean flow parameters and mean bore parameters from 7.25 m-13.25 m. Table 1 indicates that in Runs 4 and 5 the Froude number, F, is less than 0.84, the minimum value for flows in which antidunes form (9). The Froude number, $\mathbf{F} = \bar{V}/\sqrt{g\bar{d}}$, is based on mean values of velocity, $\bar{V}$ and depth $\bar{d}$; however, depth and velocity are not uniform in

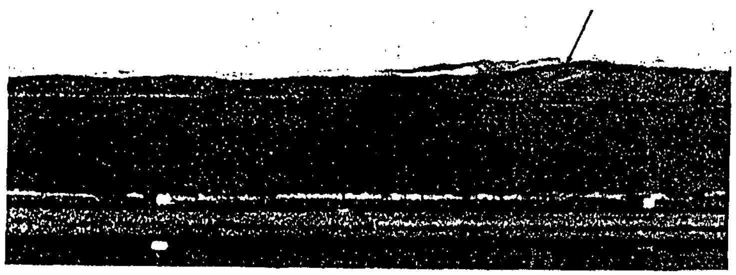

FIG. 2.—Typical Bore (Arrow) in Rigid-Wall Channel, Flow from Right to Left

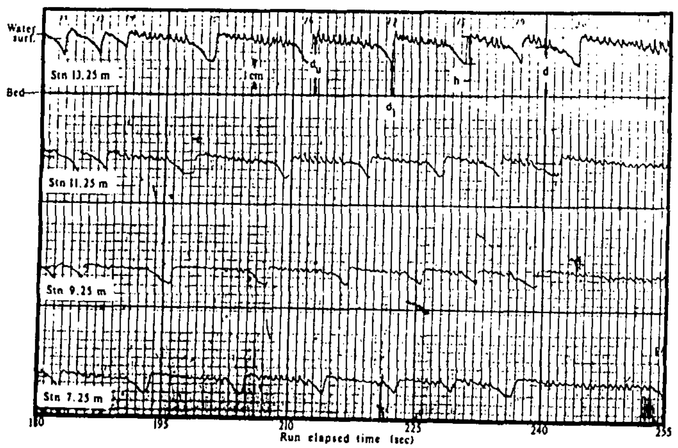

FIG. 3.—Pressure Transducer Record for Run 2

a cross section and antidunes do not extend across the entire flume. It is believed that the Froude number of the flow where antidunes occurred was higher than the average as found by Colby (2) in Pigeon Roost Creek.

Analysis.—Visually the channel bores resemble roll waves in terms of morphology, regularity of spacing, and the impression that larger waves overtake smaller ones. However, quantitative data from Runs 1-5 show that the bores do not behave like roll waves. Although the average bores increase slightly in amplitude after initiation (Fig. 4), many individual bores decayed after reaching peak height. Also, in the rare instances where one bore overtook another, the overtaking

bore was of smaller height. This behavior is typical of surges (5, pp. 77 and 300). Henderson indicates that celerity, c, of surges of finite amplitude should be within the limits, $\sqrt{gd_l} < c < \sqrt{gd_u}$, in which d_l and d_u are water depths downstream and upstream of the bore, respectively (Fig. 3), and g = acceleration of gravity. Table 2 shows that observed experimental bore celerities behave this way except for Run 5, where bore celerities are greater than $\sqrt{gd_u}$. The greater celerities calculated from transducer data than predicted from hydraulic

TABLE 1.—Mean Flow and Bore Parameters for Runs 1–5

Run (1)	Q (2)	$\bar{d}$ (3)	$\bar{r}$ (4)	$\bar{V}$ (5)	Number of bores (6)	$\bar{h}$ (7)	$\bar{V}_w$ (8)	c (9)	F (10)	f (11)
1	2,550	2.03	1.76	47.1	9	0.79	86.5	39.4	1.06	0.053
2	2,070	1.93	1.69	40.2	26	0.76	79.7	39.5	0.92	0.070
3	1,649	1.73	1.53	35.7	36	0.58	74.9	39.2	0.87	0.080
4	1,380	1.66	1.48	31.2	41	0.56	73.7	42.5	0.77	0.102
5a	1,130	1.54	1.38	27.5	50	0.50	72.2	44.7	0.71	0.122
5b	1,130	1.50	1.35	28.3	18	0.42	69.8	41.5	0.74	0.113

Note: Values in Col. 2 are given in cubic centimeters per second; values in Cols. 3, 4, and 7 are given in centimeters; values in Cols. 5, 8, and 9 are given in centimeters per second.

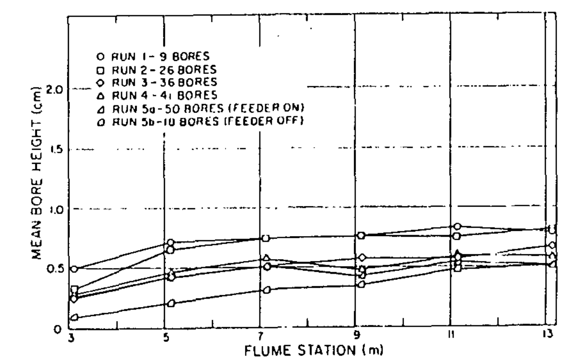

FIG. 4.—Mean Bore Height along Flume for Runs 1–5

theory for Run 5 may be due to properties of the pressure measuring system. Brock (1) used an alternate method for determining roll wave crest height because pressure transducer response time was slower than wave-front rise time. Transducer response in these experiments is even slower than in Brock's, because water pressure increase must be transmitted through 6 cm of sand before reaching the piezometric taps. Apparent dips in bore height at station 9.25 m for Runs 4 and 5 (Fig. 4) are probably caused by slower response time for that transducer relative to the others, giving a smaller apparent d_h. All of the transducers should systematically low readings for d_h, which can account for the failure in Run 5 for $\sqrt{g\bar{d}_u}$ to be greater than c. This transducer response problem also means that all values of $\bar{h}$ and $\bar{d}_h$ are systematically low; thus, no quantitative use of wave-height data in Table 1 should be made beyond that in Table 2.

Henderson (5) and Lighthill and Whitham (7) indicate that bores in Runs 1-5 should decay in height once initiated. This decay is observed in some bores, but on the average the experimental bores do not decay within the length of the channel (Fig. 4).

It was mentioned earlier that in Run 5, bores were observed coming out

TABLE 2.—Computed and Actual Bore Celerities

Run (1)	$\bar{d}_l$ (2)	$\bar{d}_u$ (3)	$\sqrt{g\bar{d}_l}$ (4)	c (5)	$\sqrt{g\bar{d}_u}$ (6)
1	1.42	2.21	37.3	39.4	46.6
2	1.37	2.13	36.7	39.5	45.7
3	1.33	1.91	36.1	39.2	43.3
4	1.32	1.88	36.0	42.5	42.9
5a	1.21	1.71	34.5	44.7	41.0
5b	1.19	1.61	34.2	41.5	39.7

Note: Values in Cols. 2 and 3 are given in centimeters; values in Cols. 4, 5, and 6 are given in centimeters per second.

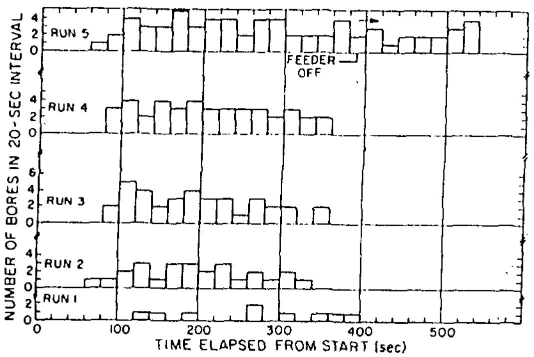

FIG. 5.—Bore Frequency at Station 13.25 m for Runs 1–5

of the inlet, suggesting that blobs of sand falling from the feeder initiated the bores. However, Fig. 4 shows that bores form with the feeder off, and Fig. 5 shows that the frequency of bores does not change appreciably when the feeder is shut off. Data in Fig. 5 are the number of bores passing station 13.25 m during successive 20-sec intervals. In all cases there is a slight peak in bore frequency in the middle of the run, but no significant difference in frequency in the 100 sec before and the 100 sec after feeder shutoff in Run 5; thus, the feeder apparently does not cause the bores.

The bore development can be explained by the formation and breaking of

trains of antidune waves. Bores were observed in simulated floods only during flow over antidunes (3) which in the present experiments always migrated downstream. As previously mentioned, the same simulated flood over a rigid bed produced no bores. Observations suggest they are caused by the release of water "stored" by trains of the low amplitude antidune waves. If the waves begin breaking at the downstream end of a train, each breaking wave appears to release a small amount of water. This produces a small wave propagating downstream and also causes the next wave upstream to break. As a result the train of antidune waves "unravels" upstream, producing a series of small waves traveling downstream. However, if the wave at the upstream end of a train breaks first, the disturbance causes the next wave downstream to break, and so on. The small downstream-traveling wave released by the first stationary wave joins those released by the second and subsequent breaking waves downstream, finally resulting in a bore.

All of the bores observed in the present studies were formed in flows with antidunes that moved downstream. However, there is reason to believe that such bores also can occur in flows with the common antidunes that migrate upstream. Simons, et al. (8) observed that in a flume flow 0.43 ft deep over 0.45-mm sand, considerable water was stored in the flume when trains of antidune waves broke. These authors indicated that the surging of the flow following this storage could explain surges observed in some natural streams. The storage of water in antidune flows and its subsequent release will certainly cause surges. However, the extent and importance of this phenomenon is probably limited since it has received little attention in the engineering literature.

Field Occurrence

Field occurrences of such bores which have come to the attention of the writers were reported by John S. Shelton (personal communication), who observed them on a flow on the floor of the San Gabriel Reservoir, California, and by Neil D. Skilton (personal communication), who observed them in a barranca on the flank of Volcán de Fuego, Guatemala. In neither case were bed sediment size, water depth, or bedform accurately measured. However, in both cases, sediment size and water depth were estimated to be within the range necessary to produce downstream-migrating antidunes, i.e., the depths were less than about 11 cm, the depth range within which antidunes have been observed (3, Fig. 7-5) to migrate downstream.

Conclusions

The channel bores observed in simulated flood experiments in rigid-wall and alluvial-bank channels are apparently related to the existence and quasiperiodic breaking of trains of waves associated with downstream-migrating antidunes. Release of water stored by breaking stationary waves apparently both initiates and nurtures the bores, which otherwise would decay even if independently initiated. Similar bores have been observed in the field under flow conditions similar to those in the laboratory, suggesting that bores are a bona fide natural phenomenon.

Observation of deeper flume flows (8) shows that upon breaking, trains of antidune waves of the kind that migrate upstream, cause water to be stored. This suggests that the release of this stored water will produce a surge and further suggests that surging due to antidune activity can occur in natural streams.

Acknowledgments

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Appendix I.—References

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Appendix II.—Notation

The following symbols are used in this paper:

$c = \bar{V}_w - \bar{V}$ = bore celerity

$\bar{d}$ = mean undisturbed water depth for run;

$\bar{d}_l$ = mean low water depth in front of bores;

$\bar{d}_u$ = mean high water depth behind bores;

$F = \bar{V}/(g\bar{d})^{1/2}$ = Froude number;

$f = (8g\bar{r}S)/\bar{V}^2$ = Darcy-Weisbach friction factor;

g = acceleration of gravity;

$\bar{h}$ = mean bore height;

Q = water discharge;

$\bar{r} = W\bar{d}/(W + 2\bar{d})$ = hydraulic radius;

$S = 0.00853$ = flume slope;

$\bar{V} = Q/W\bar{d}$ = mean flow velocity;

$\bar{V}_w$ = mean bore velocity relative to flume; and

W = flume width = 26.67 cm.

JOURNAL OF THE HYDRAULICS DIVISION

Mathematical Modeling of Scour and Deposition

By William A. Thomas,[1] and Alan L. Prasuhn,[2] Members ASCE

Introduction

Since natural rivers are usually confined by a boundary that can be entrained and transported by the flowing water, an extra degree-of-freedom is introduced into the physical process governing the hydraulics of flow. It is common practice to substitute engineering judgment for an analytical treatment of this problem when knowledge of only the water surface profile is required. However, many engineering studies require knowledge about the rate and extent of change of boundary geometry, and an analytical treatment of this problem requires detailed information about the hydraulics of flow and the interaction between the water-sediment mixture and sediment material forming the stream's boundary.

It is sometimes possible to separate sedimentation studies from those involving the hydraulics of flow. For example, deposition in deep reservoirs can be studied from the standpoint of a reduction in reservoir storage capacity because there is little reentrainment of material once it has deposited. On the other hand, sedimentation studies in shallow reservoirs, downstream from dams or in natural rivers, require treatment of the entire movable boundary problem because both scour and deposition are involved. It is for this more general type of problem that this simulation model is designed.

Design of Computer Program

In concept, digital modeling utilizes the digital computer to simulate, with respect to time, the behavior of a physical system or process by applying the necessary theory to describe the physical process in terms of dependent and independent variables and by specifying the necessary functional relationships to describe the physical system. The utility of this generalized computer program

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$\tilde{n}$ = cross-stream coordinate;
r = k/ϵ;
r_* = $2 + 2.5 \ln(\tilde{h}/k_*)$;
s = dimensionless downstream coordinate = $\tilde{s}/b$;
$\tilde{s}$ = downstream coordinate;
U = cross-sectionally averaged downstream velocity;
u = dimensionless downstream velocity;
$\tilde{u}$ = downstream velocity;
$\bar{u}$ = vertically averaged downstream velocity;
u_1 = perturbation of u;
$\tilde{u}_b$ = downstream velocity at bed;
$\tilde{u}_*$ = shear velocity;
v = $\hat{v}/\epsilon$;
$\tilde{v}$ = transverse velocity;
$\bar{v}$ = vertically averaged transverse velocity;
$\hat{v}$ = dimensionless vertically averaged transverse velocity;
v_1 = perturbation of v;
$\tilde{x}, \tilde{y}, \tilde{z}$ = Cartesian coordinates, $\tilde{z}$ being directed upward from bed;
α = coefficient = 0.077;
γ = b/H_*;
ϵ = $(b/H_*)C_f$;
ζ = $\tilde{z}/\tilde{h}$;
η = dimensionless bed elevation;
$\tilde{\eta}$ = bed elevation;
η_1 = perturbation of η;
θ = angle between centerline down-channel direction and $\tilde{x}$-axis;
θ_o = angle amplitude of channel centerline;
$\tilde{\lambda}$ = meander wavelength, measured along river channel;
ν = dimensionless secondary flow velocity = $\tilde{\nu}/U$;
$\tilde{\nu}$ = secondary flow velocity;
ν_1 = perturbation of ν;
ν_t = eddy viscosity;
ξ = dimensionless water-surface elevation;
$\tilde{\xi}$ = water-surface elevation;
ξ_1 = perturbation of ζ;
ρ = density of water;
σ = dimensionless centerline curvature;
σ_{SL}, σ_{WL} = phase lags of secondary flow and water surface, respectively;
$\tilde{\tau}_s, \tilde{\tau}_n$ = bed shear stress in down-channel and transverse directions, respectively;
ϕ = ks;
χ = $r_*\alpha$;
χ_1 = $\chi + 1/3$;
χ_{20} = coefficient in Eq. 33b;
χ_2, χ_3 = coefficients in Eq. 45;
χ_w = coefficient defined by Eq. 51; and
ψ_o = $b/\tilde{r}_m$.

Width of Straight Alluvial Channels

By Michael A. Stevens[1]

Abstract: The minimum width of an essentially straight stable alluvial channel transporting water with or without a bed material or wash load is related to the tractive strength and the sliding strength of the bank soils, either alluvial or residual. In addition, the variation of the bed level at the banks due to bed forms, alternate bars, and other three-dimensional flow effects is an important factor. The variation is defined by the ratio of the maximum depth along the bank to the average depth over the bed. The maximum width is not so well defined but depends on the depositional characteristics of the suspended sediment and the development of meandering tendencies in wider channels. Use of bank soil properties to determine stable channel widths indicates that more than one width and slope are possible to carry a given water discharge with or without bed-material load. For design, the minimum allowable width is usually the best choice.

Introduction

A channel carrying water and an accompanying sediment load in a cross section with banks of alluvial or otherwise erodible material can adjust its width depending on the amount of water, the amount and type of sediment supplied, and the strength of the bank soil. Historically, there have been three approaches to determining the stable (noneroding and nondepositing) width of such a channel. The earliest was the Lindley (1919) regime width, followed in the next 40 years by numerous other width predictors of the same ilk. In 1955, Lane presented the tractive force theory developed by many people at the U.S. Bureau of Reclamation. More recently, concepts of minimum stream power (Chang 1980) and maximum sediment transporting capacity (White et al. 1982) have been put forth as suitable width indicators. Superficially, the three methods have very little in common.

From a theoretical point of view, it is the interplay of the properties of the fluid and the soil at the banks that determine the minimum and maximum stable widths of erodible channels which are essentially straight. The stable channel width must be such that the water and sediment (if any) supplied to the channel are transported without any significant net erosion or deposition on the bed and banks. Intuitively, one knows that channels with strong materials for banks can be narrow and if the bank materials are weak, the channel must be wider.

Herein, the properties of the bank material that determine the minimum stable widths are labelled the "tractive strength" and the "sliding strength." Essentially, the theory employed is an extension of Lane's (1955) work and is valid for both alluvial and rigid boundary channels. The method of using the tractive and shearing strength criteria for determining the minimum width of essentially straight alluvial channels is illustrated with an example of the sizing of a sandbed canal.

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$\tilde{n}$ r r_* s $\bar{s}$ U u $\bar{u}$ $\bar{u}$ u_1 $\bar{u}_b$ $\bar{u}_*$ v $\bar{v}$ v v v $\bar{x}, \bar{y}$, σ

Regime

Lindley (1919) related the bed width b of regime canals in the plain the Indus River to the so-called critical velocity of the flow V_0, the veloc necessary to prevent aggradation of the canal bed. Regime canals are stab channels flowing in deposits of sediment carried by the flow. It was Lindl who conceived the idea that the dimensions (width, depth, and gradient) a channel to carry a supply of water loaded with a given silt-charge, we all fixed by nature. For the Lower Chenab, the relation was simply

$$b = 4.4V_0^{2.82} \quad (1$$

The units were ft and ft/sec, respectively. Traditionally, English units ar used in regime theory, except for sediment size which is in millimeters.

Lacey (1930), employing Kennedy's (1894) and Lindley's (1919) data derived the empirical equations

$$V = 1.17(fR)^{0.5} \quad (2$$

$$Af^2 = 3.8V^5 \quad (3)$$

which when combined with the definitions $Q = VA$ and $R = A/P$ result in the ". . . somewhat remarkable . . ." (Lacey's words) formula

$$P = 2.67Q^{0.5} \quad (4)$$

Here, V = average velocity in the canal; f = Lacey's silt factor; R = hydraulic radius; A = cross-sectional area of flow; P = wetted perimeter; and Q = discharge. The units are English. The formula states that for a given discharge the wetted perimeter of a stable channel is constant and independent of the type of sediment transported!

Lacey made no distinction for type of bank material although it had been recognized by Lindley (1919) that the ". . . quantity and nature of . . . berm silt . . ." was an important factor in determining regime dimensions.

The fundamental premise behind Lacey's width expression (Eq. 4) is that the canal banks are formed from silt and clay carried by the canal or from the pristine soils of the Punjab and Sind Provinces of Pakistan.

Blench (1957) was more specific than Lacey, stating explicitly that canals be designed for weak or strong banks. Blench used his own silt factor F_s which related bank material properties, the velocity and the width in the form

$$b = \frac{V^3}{F_s} \quad (5)$$

His guidelines for selecting F_s are: friable material, 0.1 sq ft/sec^3; silty clay loam, 0.2 sq ft/sec^3; and tough clay, 0.3 sq ft/sec^3.

Simons and Albertson's (1963) study of American canals supports Blench's view that canal width is related to the soil properties of the banks. Their results were in the form

$$P = k_s Q^{0.512} \quad (6)$$

in which k_s (in English units) is 3.3 for canals with sand banks and bed; 2.8 for sand bed and cohesive banks; 2.1 for cohesive bed and banks; and 1.7 for coarse noncohesive material.

Leopold and Maddock (1953) extended the regime concept of alluvial

ıannels to American rivers. They reported that, for midwestern and ephem- ·al streams in the United States, the width is proportional to the square root f the bankfull discharge, as it increases in the downstream direction within river basin. Different basins have different widths. For example, at a flow f 1,000 cu ft/sec, their rivers varied in width from 80 to 300 ft. Presum- ıbly, the variation is due to bank material.

Schumm (1960, 1961a, 1961b) developed a more complex function re- ating width and discharge for rivers. His principal parameters are the dis- charge and the percent of wetted perimeter which is fine material. Williams and Wolman (1984) were not able to distinguish stable and unstable river banks using Schumm's method, noting that ". . . difficulty appears to be that weighting of the particle size of the sediments by the channel width significantly distorts a controlling relationship between actual differences in bed and bank sediments." Such has been the writer's experience also.

Tractive Force

Tractive force theory for stability of banks of non-cohesive material (sand and gravel) was developed within the U.S. Bureau of Reclamation and reported by Lane (1952, 1955). The theory relates the shearing force of the fluid on the banks to the geometry of the cross section and the weight of the individual particles. Lane did not include any sloughing or sliding analyses in his stability criteria because these ". . . have been to a large extent developed." The Bureau's work forms an important segment of this general stability theory.

Henderson (1963) employed Lane's tractive force theory to relate fluid shear stress on noncohesive bank and bed particles to the discharge and width and hence to Lacey's Eq. 4, modifying it to include the particle size on the left-hand side but only to the minus 3/20 power.

Extremal Methods

In contrast to regime concepts which relate canal width to discharge and sediment in the banks, recently different concepts have been put forth. The hypothesis of Chang (1980) is that the necessary and sufficient condition for regime is that the stream power, γQS, be a minimum subject to constraints. Here γ = unit weight of fluid, and S = slope of the channel bed. Given a water and sediment inflow, the canal establishes its width, depth and slope such that the stream power or slope is a minimum. His method underpredicts appreciably the width of Punjab and Sind canals wider than 150 ft (46 m) but fits smaller canal data much better.

White et al. (1982) argue that the width, depth, and slope are established so that the sediment transporting capacity is maximized. They could ". . . find no physical justification to support . . ." this hypothesis but report that it ". . . leads to acceptable predictions over a large range of flow conditions." As they show, their hypothesis is equivalent to the minimum stream power concept (Chang 1980). For many field channels (their figure 4), their method underpredicts the width of large canals (widths greater than 330 ft or 100 m) by significant amounts on the average. Agreement is much better for small canals with widths of 10 to 30 ft (3 to 10 m).

One-Dimensional Channel

Consider a straight prismatic canal of trapezoidal shape (Fig. 1) with side slopes z horizontal to 1 vertical (zH to $1V$) flowing at its design discharge.

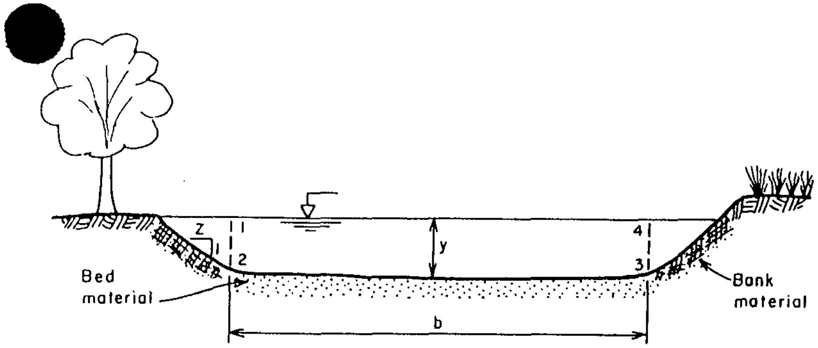

FIG. 1. Cross Section of Straight Alluvial Channel

The bed is defined as that portion of the perimeter which is covered with bed material. When the canal banks are formed by sediment carried by the canal, the bank material is finer grading from finest at the top to coarsest at the bottom. If there is no clear demarcation between bed and bank materials at the toe of the banks, the bed width b is defined by the points where bed forms no longer exist on the perimeter.

The one-dimensional channel is characterized by the large central portion over which the flow exchanges suspended sediment with sediment on the boundary. For example, in sandbed channels, sand in suspension becomes deposited on the bed and sand on the bed is resuspended. On the banks, there is no such exchange of sand. Then as far as transport of bed material is concerned, the flow "sees" only the bed and not the banks.

Although Lacey (1930) considered regime canals to be elliptical in cross-sectional shape, Lindley (1930), Belasis (1930), Kennedy (1894), Inglis (1930), and Blench (1957) confirmed that the regime section has a horizontal bed and steep side slopes. The trapezoidal section is an appropriate representation.

As the fluid moves over the boundary of the channel, it exerts a force on the boundary called the tractive force by Lane (1952). When the flow is uniform, steady and essentially one-dimensional, the tractive force on the bank varies with width-to-depth ratio b/y and with position down the bank. The distributions of this shear for trapezoidal sections have been measured by Ghosh and Roy (1970). For $b/y > 4$, the maximum tractive stress on the bank is

$$\tau_m = 0.75\gamma y S \quad (7)$$

On the bed, the maximum time-averaged shear stress can be taken as $\gamma y S$. Eq. 7 is that developed by Lane (1955) and confirmed in an approximate manner in the experiments of Ippen and Drinkler (1962) and Replogle and Chow (1966).

For $b/d > 4$, the central portion with corners marked 1-2-3-4 in Fig. 1 has an almost uniform bed shear stress. The shear stresses on the vertical segments 1-2 and 3-4 are small. If it is assumed that the bed shear stress is uniform and equal to $\gamma y S$, there is no shear stress on the sides 1-2 and 3-4, and the depth of flow is uniform with a value y, then at every vertical over the bed, the depth-averaged velocity is a constant U. This is the one-

dimensional approximation, the foundation of this analysis. The [illegible]r discharge over the bed is byU. The velocity for flow over the bed of width b is

$$U = \left(\frac{8}{f} g y S\right)^{0.5} \quad (8)$$

in which f = d'Arcy-Weisbach friction factor and g = acceleration due to gravity.

For the triangular-shaped area at each bank, the area is small and the velocity is less than over the bed. For simplicity assume that the friction factor for the sides (banks) is the same as that for the bed. Then, the flow along the sides is

$$Q_b = A\left(\frac{8}{f} g R S\right)^{0.5} \quad (9)$$

in which $A = zy^2$ and $R = zy/2(z^2 + 1)^{0.5}$. The total flow is

$$Q = \left[\left(\frac{z^3}{2(z^2 + 1)^{0.5}}\right)^{0.5} \frac{y}{b} + 1\right] byU \quad (10)$$

The first term in the brackets accounts for the flow along the banks. It is the ratio of the side flow to that over the bed and is but a small fraction.

Stable Width Criteria

In order for the banks to be stable, two criteria must be met. First, the shear stress on the banks must be such that the suspended sediment is not deposited on the banks and no particles are eroded from the banks. Some deposition and erosion might occur, but it should remain on the average insignificant. Second, the banks must remain free from sliding failures or other types of geotechnical failures under adverse conditions in the soil. Herein, the first is labeled the "tractive strength" criterion and is directly related to the tractive force; the second is the "sliding strength" criterion and is only indirectly related to the tractive force.

Tractive Strength

Fine particles of suspended sediment, clays, are carried in greater concentrations than larger particles at and near the the surface of the flow. Clay particles have electrical charges, on their edges as well as on the flat sides of their lamella, where there are some unshared electrons from oxygen molecules in the silicon-oxygen layering common in most clays. The attraction or repulsion forces between charged particles of clay can be much greater than the gravity force acting to settle all particles. The gravity force is proportional to the submerged weight of the particle. As illustrated by Lane (1955), the allowable shear stress for clays is unrelated to the particle size.

In wide prismatic channels, the shear stress on the banks at the surface is low, especially for sloping banks (Ghosh and Roy 1970). Clay particles moving near the bank can become deposited even on a vertical face if the shear stress at the surface is very small.

The number of clay particles being deposited when the shear stress is low should be in proportion to the concentration, but as the bank builds into the flow, the slope steepens and the shear stress increases. Thus, the criterion for mathematical (and physical) stability is present. As the phenomenon of bank deposition develops, its rate of development decreases.

The same is true for erosion. When particles are plucked from the top of the bank by the shear stress of the flowing water, the slope decreases, which in turn decreases the shear stress.

Whereas the local bank slope at or near the surface can be steep and stable because of the magnitude of the shear stress and the nature of the clay sediment, down lower on the banks particles are larger, shear stresses higher, and gravity forces dominate over electrochemical forces. When erosion occurs in the lower zone, bank steepening followed by sliding failures can occur. The normal bank profile for alluvial canals carrying cohesive sediment in suspension is steep at the top and flatter at the bottom.

In mathematical terms, erosion is prevented if, at every location on the bank, the fluid shear stress $\epsilon\gamma yS$ is less than C_t, the tractive strength which the soil possesses to resist dislodging of particles. That is,

$$C_t \geq \epsilon\gamma yS \qquad (11)$$

everywhere on the bank. Here ϵ is a number depending on b/y and z, the position up and down the bank and variations in shear due to three-dimensional motion of the water. For wide channels ($b/y > 4$) with prismatic banks, the time-averaged maximum value $\epsilon = 0.75$ is obtained near 2/3 depth.

For noncohesive soils, C_t is directly related to easily measured properties of the individual particles. By neglecting lift forces on the particles on the bank (Graf 1984), Lane's (1955) value for tractive strength for sand and gravel is

$$C_t = k_c(S_s - 1)\gamma D_{50} \cos\theta\left(1 - \frac{\tan^2\theta}{\tan^2\phi}\right)^{0.5} \qquad (12)$$

in which k_c = critical value of the Shield's number; S_s = specific gravity of the solid particles; θ = side slope angle measured from the horizontal; D_{50} = median sieve size (by weight) of the particles on the side slope; and ϕ = angle of repose for the particles. When the flow at the banks is hydraulically rough, $k_c = 0.047$ (Gessler 1971) but for small particles and high viscosity k_c can be as low as 0.030. For gravel beds, Lane (1955) used instead D_{75} and $k_c = 0.075$.

Eq. 12 illustrates that it is not feasible to design large canals with sand banks. D_{50} is small and $\tan\theta/\tan\phi$ must be less than unity so channels with noncohesive sand banks must be extremely shallow with very flat side slopes.

Tractive strength of cohesive soil is not so easily related to other soil properties. The electrochemical forces which dominate in cohesive soil are only partially understood (Partheniades 1962, 1971) and vary for the most part with changing moisture content and with dissolved solids in the water.

The tractive strength of cohesive soil can be inferred from field studies such as those conducted by Flaxman (1963). Some of the guidelines for tractive strength of cohesive soil are given by Chow (1959). Other experimental data are summarized by the Task Committee on Erosion of Cohesive Materials (1968) and Graf (1984). In general, tractive strengths for clay are in the range from 0.01 to 0.5 lb/sq ft (0.5 to 25 Pa).

Sliding Strength

The sliding strength criterion for a stable alluvial canal is that the bank height and bank slope be such that there are no simple slip circle or other type of geotechnical failures. For banks composed of homogeneous cohesive soil, the slip-circle stability analysis is straight forward and is presented here. For nonhomogeneous banks composed of cohesive soils with properties which prevent piping and liquefaction, the analyses is similar, but more complex. Bank cantilevers and other types of erosion mechanisms for alluvial banks such as wave action and flow slides are described in comprehensive papers by Thorne (1982) and Christian (1985).

A canal bank composed of homogeneous cohesive soil and shaped to a side slope described by the angle θ fails by slipping when the vertical height is H_c. The pertinent properties of the soil are its cohesion C, its internal friction angle ϕ, and its in-place unit weight at the time of failure, γ_s. The dimensionless parameters for defining failure are $H_c\gamma_s/C$, ϕ, and θ (e.g., Chen and Giger 1971).

The gravity force, represented by the in-place unit weight, acting on all the particles of soil and water in the mass above the slip surface causes the failure. The failure is resisted by shear stresses, represented by cohesion, developed along the slip surface. Roots can add significant strength to soils (Gray and Leiser 1982).

The slope stability analysis for wet and dry soil indicates the following:

1. Alluvium with higher cohesion or undrained shear strength can form higher banks.
2. Lighter alluvium can form higher banks.
3. Alluvium with no cohesion can stand to any height provided the bank slope is less than the internal friction angle.
4. The critical bank height is not very sensitive to internal friction angle when the banks are vertical or nearly so.
5. Vertical banks cave at smaller heights than sloping banks.

Commonly, slip-circle failures occur when canals are dewatered or on the recession of floods in rivers. Technically, this is the rapid drawdown case, a situation in which the water does not drain from the soil as quickly as the level falls in the channel. For this condition, one can replace the cohesion C with the saturated undrained shear strength C_u of the soil and assume $\phi = 0$. The bank height at failure is

$$H_c = \frac{5C_u}{\gamma_s} \qquad (13)$$

in which γ_s = saturated unit weight of the soil. The value 5 is that for slope angles of approximately 70°, the assumption being that not many slopes become absolutely vertical throughout their entire height. For vertical slopes the value is 3.8 (Chen and Giger 1971).

The U.S. Bureau of Reclamation (Hilf 1974) has indexed the saturated undrained strengths of soils for the unified soil classification system (U.S. Army Corps of Engineers 1953). Average values of C_u range from a high of 650 lb/sq ft (31 kPa) for inorganic silts (MH classification) to a low of 200 lb/sq ft (9.6 kPa) for clayey gravels and gravel-sand-clay mixtures (GC classification).

The bank height h for canals can be written

$$h = ky + f_b \quad (14)$$

Here k = a number that describes the variability of the flow depth due to bed forms, bars, and slight curvature of the canal alignment; and f_b = freeboard, the vertical distance from the water surface to the top of the bank.

For stability, $h \le H_c$ so the sliding strength criterion for stable banks under most conditions is

$$y \le \frac{1}{k}\left(\frac{5C_u}{\gamma_s} - f_b\right) \quad (15)$$

The variable k is the ratio of the maximum depth of flow at the bank to the average depth of flow over the bed in the reach. If the flow is truly one-dimensional, k would be unity. Local scour on the outside of bends results in values appreciably greater than unity. For sharp bends, $k > 2$ in sandbed channels. Banks on the outside of bends cave more frequently than at other locations. On the opposite side of the bend where the point bar is developes in sandbed channels, the value of k is less than unity and can be as low as 0.2 for sharp bends. Bank caving rarely occurs on the inside of bends. In canals, the formation of alternate bars results in the development of a meandering thalweg increasing the value of k opposite the downstream end of the bars. More increases in k result when the canal is operated at intermediate discharges.

Most alluvial banks are not homogeneous. If the soil is graded from fine at the top to coarse at the bottom in the manner that water segregates its sediment in suspension, the stable bank is shaped from steep to flat in a smooth curve. For other non-homogeneous banks, different modes of failure occur due to stratigraphy (Williams and Wolman 1984). With sand on the bottom and clay on top, bank migration can result primarily from failure of bank cantilevers which are formed by basal scour.

Because of the lack of homogeneity in alluvial soils and the expense of obtaining and testing many undisturbed samples, it is practical to define the saturated undrained shear strength for river and canal banks as

$$C_u = \frac{H_c\gamma_s}{5} \quad (16)$$

and obtain its value from measurements of H_c and γ_s taken at caving banks immediately after rapid drawdown. If the bank caves while the water level is high, the expression

$$C_u = \frac{H_c(\gamma_s - \gamma)}{5} \quad (17)$$

should be employed. In his development of this expression, Atkinson (1981) used the value 4 instead of 5.

Similarly and because of bankline irregularities, one can use Eq. 11 as the definition of the tractive strength C_t and measure the depth and slope where such shear failure can be identified. Small exposed roots bent along the bank in the direction of flow are a good indication of failure.

At times, the determination of the sliding strength can be simple. For

example, a 14-km (8.7-mile) reach of the Citanduy River in Java, Indonesia has 18 bends in which the outside banks are alluvium. All bends with maximum bank heights less than 9.5 m (31 ft) are stable. All bends with maximum bank heights greater than 10.5 m (34.5 ft) are caving. The bank height is defined as the vertical distance from the floodplain level to the bottom of the deepest part of the pool. The top 2 m (6 ft) is silt with a dry density of 1,000 kg/m^3 (62.4 lb/cu ft) and a saturated density of 1,600 kg/m^3 (100 lb/cu ft). For this material,

$$C_u = \left(\frac{9.5 \times 1{,}600}{5}\right)(9.81) = 29.8 \text{ kPa (624 lb/sq ft)}$$

and this value is used as a guide to establish the design criteria for new alluvial channels. Normally, bank materials are not so strong. For this river, the bankfull discharge is 1,000 m^3/s (35,000 cu ft/sec). Lacey's regime width is 153 m (502 ft). The actual top width is 75 m (246 ft).

Meandering

The tractive and sliding strength criteria place a lower limit on the width of a stable channel. Either the bank height or the bank shear stress becomes too large for stability as the width decreases. Neither limits how wide a channel can become. That is, in one-dimensional flow theory, a wider channel has lower banks and smaller bank shear stresses than a narrower one. The major factor that limits the maximum width is that a sediment carrying channel takes on more features of a three-dimensional flow as it becomes wider. A meandering thalweg is created and an inner channel develops at intermediate flow. Ultimately, these meandering features change the one-dimensional channel, the flow cutting into the banks at numerous locations and piling up the eroded sediment at others. A straight canal designed too wide can end up as a narrower meandering one.

Straight narrow alluvial channels also exhibit meander characteristics by developing alternate bars at large spacings relative to channel width. These can be tolerated in canals within limits if the height of the bars does not exceed some fraction of the depth of flow. Otherwise, the local scour opposite the crests of the bars causes local failure of the banks and the beginning of bankline meandering.

The severe consequences of meandering tendencies in straight man-made channels is illustrated in a photograph by Alt (1982: 119) of the channelized Walla Walla River in flood. Alternate bars are causing the flood to cut into levees on either side creating the meandering pattern in and outside the levees.

In studies of the movement of expanded clays and plastic particles in straight laboratory channels, van Hoften (1968) concluded that ". . . at higher width-to-depth ratios (above 17), more pronounced [alternate] bars appeared, while at lower ratios the patterns were more subdued. . . ."

Simons and Richardson (1971, figure 9-19) presented empirical evidence from large flumes, canals and rivers to indicate that the height of alternate bars increases dramatically with channel width-to-depth ratio. Some large canals flowing half full with b/y = 70 have alternate bars with heights as great as 70% of the depth.

Low discharges running in the larger Pakistan canals often adopt a sinuous veg (Mahmood et al. 1985; Mahmood et al. 1985) which may later erode the banks by concentrating the flow against the banks. To prevent such occurrences, low flows are restricted to values not less than 55% of the design discharge (Mahmood and Shen 1971).

Jaeggi (1984) has gathered empirical evidence from rivers and model channels to indicate that alternate bars form when the bed slope is greater than some critical value depending primarily on the channel width to bed-material particle size ratio. He illustrated that alternate bars in laboratory channels have large amplitudes in comparison to bed forms obtained at higher flows. Extrapolation to the range of regime canals, Jaeggi's criterion for the ". . . minimum condition for the slope at which alternate bar formation will occur . . ." indicates that regime canals in Pakistan should not have enough slope to create alternate bars.

In contrast, Fredsøe (1978) used stability analysis to predict whether channels remain straight or tend to meander or braid. In this mathematical exercise, the tendency for alternate bars to grow or wash away is assessed from their response to presumed characteristics of two-dimensional flow. The results are that channels always remain straight for small width-to-depth ratios and braid at large ratios. In between, alternate bars grow and channels meander.

In a similar type of mathematical study of alternate bars and meanders, Olesen (1983) concluded that his findings were an affirmation of ". . . the general observation that narrow channels remain stable whereas wider channels tend to form alternate bars and other large scale bed forms."

With these studies of alternate bars in mind, the conclusion is that there is not just one width which results in a stable or regime channel but a range between a minimum value for which bank height or tractive force controls and a maximum for which meandering tendency creates bank erosion (k becomes too large). The concept of a range of regime widths is in agreement with the findings of the Canal and Headworks Data Observation Program (Mao and Flook 1971).

Design Criteria

Both Jaeggi's and Fredsoe's investigations indicate that meandering tendencies are less in narrower channels. Thus, the narrowest channel which satisfies the tractive strength and sliding strength criteria and transports the desired amounts of water and sediment on the chosen slope is the best choice for hydraulic design. This is in keeping with minimizing the costs of right-of-way and excavation. The narrowest channel is least likely to have deposition on the banks.

One may want to choose a wider alluvial channel because of other factors; for example, to avoid excavation in soil that is an aquifer. These are not addressed here.

EXAMPLE

Consider the selection of an alluvial canal to transport a flow Q of 1,000 cu ft/sec (28.3 m^3/s) and a sediment concentration C of 290 mg/L with a median sieve D_{50} size of 0.2 mm. The soil forming the banks is a clay loam for which the tractive strength C_t is 0.09 lb/sq ft (4.3 Pa), the undrained

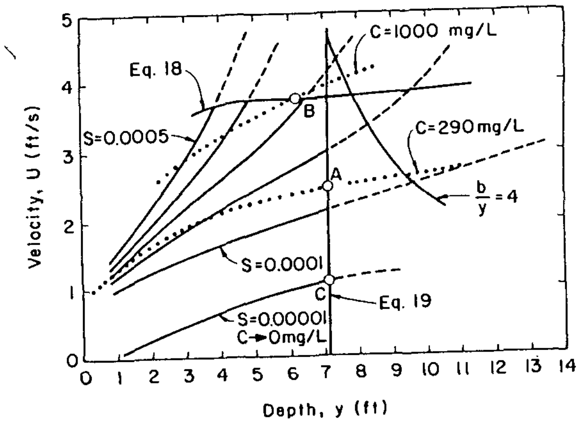

FIG. 2. Depths, Velocities, Slopes, and Concentrations for Fine Sand (0.2 mm) Bed Canals

shear strength C_u is 200 lb/sq ft (9.6 kPa) and the saturated unit weight γ_s is 100 lb/cu ft (1,600 kg/m^3). The freeboard f_b is 1 ft (0.3 m). What should the depth y, width b and slope S be?

Basic Laws

The flow of water and sediment in any alluvial channel is governed by the laws of conservation of mass and Newton's laws of motion. These are conservation of mass for water and for sediment; Newton's laws for the motion of water and of sediment in suspension and on the bed; and Newton's laws for the motionless sediment on the banks (Stevens and Nordin 1987). Herein, these are employed without elaboration except for the stability of the banks.

Depth and Velocity

The depth of flow for a given bed slope is determined by selecting a suitable friction equation for this very fine sand. One looks for field data obtained for flow and bed conditions similar to those encountered in this design. The ASCE Sedimentation Manual (1975) is valuable in this respect. More recently, contributions have been made by Ackers and White (1973), White, Paris and Bettess (1982), and van Rijn (1985). The method of van Rijn is used here to prepare the depth-slope-velocity curves in Fig. 2. These curves are obtained using Eq. 8 and are valid for all sizes of canals in the regime distribution system downstream. The method takes into account the formation of ripples and dunes on the bed.

Sediment Transport

Colby's curves (1964) for the transport of sand as bed material are chosen to estimate the depth and velocity required to transport 290 mg/L of 0.2 mm sand the channel in the canal (also shown in Fig. 2). The temperature of the water is taken as 16° C.

Minimum Width

The tractive strength criterion, Eq. 11, is that

$$y \le \frac{0.09}{0.75\ \gamma S} \qquad (18)$$

and the sliding strength, Eq. 15, or

$$y \le \frac{1}{1.25}\left(\frac{5 \times 200}{100} - 1\right) = 7.2\ \text{ft}\ (2.2\ \text{m}) \qquad (19)$$

assuming $k = 1.25$ is a valid estimate for such a straight sandbed canal. The lines representing the upper limit for both criteria are drawn on Fig. 2. The line $b/y = 4$ is added as a reminder that ϵ in Eqs. 11 and 18 must be changed from 0.75 to a larger value if a narrower channel ($b/y < 4$) is chosen. Also, the friction and transport functions may not be applicable for very narrow and deep channels.

It is advisable to be well below critical flow (Froude number is unity) so that waves do not form. Kennedy (1963) concurred with Simons and Albertson's (1963) recommendation that the Froude number should be not greater than 0.3.

Selection

There is a range of slopes and associated depths (Fig. 2) that will transport a sediment concentration of 290 mg/L. The narrowest suitable channel on the flattest slope is that represented by point A. The depth is 7.2 ft (2.2 m) and the slope is 0.00013. Then in Fig. 2, the velocity is 2.45 ft/sec (0.75 m/s). Using Eq. 10 with $z = 0.5$, the bed width must be 55.0 ft (16.8 m). The Froude number is 0.16.

The Lacey width for the canal is 84 ft (25.5 m). For the design conditions of 1,000 cu ft/sec and 290 mg/L and the friction and transport relations used here, the stream power, γQS increases, at least up to a depth of 14 ft (4.3 m). There is no minimum. The sliding strength criterion requires that the minimum slope be 0.00013.

When there is no combination of depth, velocity and slope which gives the desired flow and sediment transport within stable banks, lining the canal banks or bed and banks must be considered.

Sensitivity

If the sediment load the canal must carry is 1,000 mg/L instead of 290 mg/L, the velocity must be much higher than 2.45 ft/sec (0.75 m/s) and the canal narrower than 55.0 ft (16.8 m). The 1,000 mg/L curve (Fig. 2) intersects the tractive strength criterion line at a depth $y = 6.30$ ft (1.92 m) and velocity $U = 3.75$ ft/sec (1.14 m/s). The bed width b is 40.8 ft (12.4 m) and the slope S is 0.000315. This is the narrowest canal that can carry the larger sand load.

Conversely, if the load of 0.2 mm sand is vanishingly small, the canal must be wide. The slope curve $S = 0.00001$ and the concentration curve $C \to 0$ mg/L coincide. They intersect the limiting sliding strength line at a depth $y = 7.2$ ft (2.2 m) and velocity $U = 1.12$ ft/sec (0.341 m/s). The bed width b is 124 ft (37.8 m).

In general, regime canals with large sand loads must be narrower than

TABLE 1. Bifurcations for a Sand Concentration of 290 mg/L

Discharge, cu ft/sec (m^3/s) (1)	Bed width, ft (m) (2)	Depth, ft (m) (3)	Velocity over bed, ft/sec (m/s) (4)	Slope (5)
1,000 (28.3)	55.0 (16.8)	7.20 (2.19)	2.45 (0.747)	0.00013
500 (14.2)	38.9 (11.9)	5.40 (1.65)	2.30 (0.701)	0.00016
250 (7.08)	27.5 (8.38)	4.20 (1.28)	2.11 (0.643)	0.00019
125 (3.54)	19.4 (5.91)	3.20 (0.975)	1.95 (0.594)	0.000215
62.5 (1.77)	13.8 (4.21)	2.50 (0.762)	1.75 (0.533)	0.000235

canals with very small sand loads. The widest regime canals are those carrying a vanishingly small sediment load.

If the Engelund and Hansen (1967) roughness and transport functions are employed to size this canal, the results are much different. To carry the sand load in lower regime (dune bed and low Froude number), the canal must be on a slope of 0.00022 with $U = 3.00$ ft/sec (0.914 m/s), $y = 5.0$ ft (1.5 m), and $b = 65.5$ ft (20.0 m). The tractive and sliding strength criteria are not factors in the selection unless one wants to choose the other possibility, a canal carrying the sand load with a plane bed and high Froude number.

Bifurcations

When the canal system is in "absolute regime" with the same bed and bank materials throughout all canals, all smaller distributary canals can be sized assuming the bed width b is proportional to the square root of the discharge (Lacey's finding). The tractive and sliding strength criteria are satisfied as long as the depth is less than 7.2 ft (2.2 m) and the velocity U is less than 3.7 ft/sec (1.1 m/s). When for any reason the bank material changes, the stability must be checked.

Bifurcations of the canal that carries 1,000 cu ft/sec and 290 mg/L with a bed width of 55.0 ft (16.8 m) has

$$b = 1.74\ Q^{0.5} \qquad (20)$$

and has depths, velocities and slopes which lie on the $C = 290$ mg/L curve (Fig. 2 and Table 1). All these smaller canals are stable from failure due to excessive tractive stress and from sliding.

The power relations

$$U = 1.07Q^{0.121} \qquad (21)$$

$$\text{and} \quad y = 0.513Q^{0.381} \qquad (22)$$

fit the bifurcation velocities and depths very closely and are similar to the Lacey regime relations $U \sim Q^{1/6}$ and $y \sim Q^{1/3}$. The slope, which must increase with each bifurcation to carry the sand, does not fit a power relation well.

Bifurcations for a canal with $C = 1,000$ mg/L yields similar relations but with $U \sim Q^{0.133}$ and $y \sim Q^{0.371}$.

When one is forced to chose a slope flatter than that required to transport the influx of sediment, some sand is stored in the canal. If the main canal

TABLE 2. Bifurcations for a Slope of 0.00013

Discharge, cu ft/sec (m^3/s) (1)	Bed width, ft (m) (2)	Depth, ft (m) (3)	Velocity over bed, ft/sec (m/s) (4)	Concentration, mg/L (5)
1,000 (28.3)	55.0 (16.8)	7.20 (2.19)	2.45 (0.747)	290
500 (14.2)	38.9 (11.9)	5.70 (1.74)	2.18 (0.664)	210
250 (7.08)	27.5 (8.38)	4.52 (1.38)	1.93 (0.588)	185
125 (3.54)	19.4 (5.91)	3.58 (1.09)	1.72 (0.524)	155
62.5 (1.77)	13.8 (4.21)	2.80 (0.853)	1.55 (0.472)	140

with C = 290 mg/L is bifurcated using Eq. 20 but the slope is held constant at 0.00013, the smaller canals are wider and carry less sand (Table 2). The amount of sand stored in this entire distribution system is $(290 - 140)(10^{-6})(1{,}000)(62.4)(86{,}400)/100 = 8{,}100$ cu ft (230 m^3) per day of full operation.

ADDITIONAL RESEARCH

Additional research is needed to identify appropriate values of the tractive strength and saturated undrained shear strength of soils through which alluvial channels flow. Also, it is desirable to be able to estimate these strengths given only knowledge of the suspended sediment load supplied to and carried by the channel. The writer determines the strengths in the field in channels which are caving or eroding. Only the saturated and dry unit weight and the Atterburg limits of the soil are determined in the laboratory. The Unified Soil Classification System (U.S. Army Corps of Engineers 1953) is a beneficial guide to cataloguing strengths.

The variability of the bed level at the banks due to the existence of bends, bed forms, and alternate bars needs to be defined precisely. Alternate bars and bends create the largest values of k. More information is needed on the formation of alternate bars.

The maximum width at which a channel can function well is vague. At greater widths, the three-dimensionality of the flow creates stability problems. At present, it seems best to limit the bed width to the minimum.

CONCLUSIONS

The minimum width of an essentially straight alluvial channel transporting water with or without a bed-material load is related to the tractive strength and the sliding strength of the bank soils, either alluvial or residual. In addition, the variation of the bed level at the banks due to bed forms, alternate bars, and other three-dimensional flow effects is a factor. Other conditions on the bed are of lesser importance. The maximum width is not so well-defined but depends on the depositional characteristics of the suspended sediment and the development of meandering tendencies in wider channels. For design, the minimum allowable width is usually the best choice.

With adequate field research, the tractive and sliding strength properties of the bank soils and the variation of the bed level at the banks could replace the regime-type equations and the minimum stream power and similar hypotheses as the explanation of channel width. The regime equations are simplistic in that they do not explain the physics which governs width. The extremal methods give no recognition to the fact that stable channels with tough banks can be narrow and channels with weak banks must be wide.

Use of bank soil properties to determine stable channel widths indicates that more than one width and slope are possible to carry a given water discharge with or without bed-material load. When the channel banks are formed with sediment carried in the water, it is mainly the properties of the suspended sediment which give the banks their morphology.

For designing stable canals, the procedures outlined allow for the selection of the most suitable friction and sediment transport equations for the given situation and for the selection of a stable hydraulic geometry with or without sediment transport.

The method of determining alluvial canal widths described herein requires astute field observations, the strength of the regime method of design, used in a sound theoretical framework, Newtonian mechanics. One is free to select the friction and transport functions and the sliding and tractive strengths that fit the observed field conditions best.

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APPENDIX II. NOTATION

The following symbols are used in this paper:

A = cross-sectional area of flow;
b = bed width of channel;
C_t = tractive strength of soil on bank;
C_u = saturated undrained shear strength of soil in banks;
D_{50} = median size, by weight, of sediment particles;
F_s = Blench's side factor;
f = d'Arcy-Weisbach friction factor;
f = Lacey's silt factor;
f_b = canal freeboard;
g = acceleration due to gravity;
H_c = critical bank height;
h = canal bank height;
k = coefficient describing variations in depth of flow at banks;
k_c = Shield's coefficient for initiation of motion;
k_s = coefficient in channel width predictor equations;

P = wetted perimeter;
Q = water discharge;
Q_b = water discharge along banks;
Q_s = sediment load;
q = water discharge per unit width of channel;
q_s = sediment load per unit width of channel;
R = hydraulic radius;
S = channel bed slope;
S_s = specific gravity of sediment solids;
U = depth-averaged velocity over bed;
V = average velocity in cross section;
V_0 = nonsilting velocity;
y = depth of flow over bed;
z = side slope (z horizontal to 1 vertical);
γ = unit weight of fluid;
γ_s = unit weight of soil;
ϵ = ratio of local shear stress to $\gamma y S$;
θ = side slope angle;
τ_m = maximum shear stress on bank; and
ϕ = internal friction angle.

SEDIMENT ENTRAINMENT IN CHANNEL WITH RIPPLED BED

By Takashi Asaeda,[1] Associate Member, ASCE, Masanori Nakai,[2] Shyam K. Manandhar,[3] and Nobuyuki Tamai,[4] Member, ASCE

ABSTRACT: An expression for the entrainment in a channel with rippled bed has been developed considering the entrainment mechanism. The flow structure behind the ripple has been modeled on an eye-shaped line vortex. Afterwards, the pick-up rate of the sediment particle and its motion has been calculated under the vortex activity. The ripple characteristics, such as, configuration, frequency of formation and the shear stress (due to the vortex) on the sand surface have been obtained as functions of the bulk parameters. Combining these characteristics, the entrainment rate at the lee-side of the ripple has been calculated. Also the entrainment rate from the stoss side has been taken as a basis for the calculations concerned with the total entrainment rate. Then, the ratio of the lee-side entrainment to the total value has been obtained as a function of the ripple characteristics described above. It can be concluded that the results have been found to be satisfactory when compared with former investigations and experimental results.

INTRODUCTION

Among the available methods of the suspended sediment analysis (Akiyama and Fukushima 1986; Ashida and Fujita 1986; Itakura and Kishi 1980; Tsujimoto and Nakagawa 1986), the most successful and widely applied has been the diffusion model. This model gives us a reasonable explanation of various concerned problems. However, the understanding of the mechanism of sediment suspension is still far from satisfactory. The local concentration of suspended sediment has been related to the intensity of the vertical component of turbulent eddies (Ikeda and Asaeda 1983; Sekine and Kikkawa 1987), suggesting the interaction between sediment suspension and macro-turbulence. However, most of the previous studies do not make reference to the bed features, although the bed in some previous experiments was certainly covered with ripples, which is evident when comparing the given conditions with the theory (Yalin 1985). Thus, there is still considerable interest in investigating the relationship between suspension and bedforms. To this end, the vortices on the lee side of the ripples, complicated and three-dimensional in nature, have been modeled on a simple two-dimensional line vortex. The sediment entrainment rate caused by vortex action was obtained. Then the results were applied to obtain the suspension rate in channels with rippled beds.

PROPOSED ANALYSIS FOR ENTRAINMENT IN CHANNEL

The flow pattern over the rippled bed is very complex. A typical example of the bottom streamlines over a rippled bed (Allen 1968) is shown in Fig.

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Note. Discussion open until August 1, 1989. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on April 4, 1986. This paper is part of the *Journal of Hydraulic Engineering*, Vol. 115, No. 3, March, 1989. ©ASCE, ISSN 0733-9429/89/0003-0327/$1.00 + $.15 per page. Paper No. 23270.

```
) INPUT "Choose units for transport, either #/s or kg/s ";A$
)  UNIT$=LEFT$(A$,1) : PRINT : PRINT
:  PRINT : PRINT
} INPUT "Specific gravity of sediment solids, Ss";SS
;  PRINT : PRINT
} INPUT "Bed slope, S ";S : PRINT : PRINT
```

ıe bed material is characterized by the size gradation curve. The size for ıich x percent by weight passes a given sieve size is denoted D_x. This program ɜquires the entery of 11 sizes (in units of millimeters) in equal increments of) percent.

```
)  PRINT " Enter data on gradation of bed material" : PRINT
ι0 PRINT " Units for sediment sizes are millimeters."
20 FOR I=0 TO 10 : J=I*10
30     PRINT "D(";J;") = ";
40     INPUT D(I)
50 NEXT I
```

ˀLCULATIONS

ı the Meyer-Peter and Muller formulation, the effective grain size D_m is ɔmputed with the expression

$$D_m = \sum p_i D_i$$

ı which p_i = fraction by weight of the total sample having the mean size D_i.

```
70 FOR I=0 TO 10
30     IF I=0 OR I=10 THEN P(I)=0.05 ELSE P(I)= 0.1
70     DM=DM+D(I)*P(I) : PS=PS+P(I)
00 NEXT I
10 DM=DM/PS
```

ɿoose the units.

```
50 IF UNIT$="#" THEN 520
```

alculations in SI units.

ut $\qquad S_s = \gamma_s / \gamma$

```
70 A=8*(9.810001/1000)^.5*(SS/(SS-1))
30 DM=DM/1000 : D90=D(9)/1000 : TC=.047*(SS-1)*1000*DM
70 INPUT "Value of unit discharge, m2/s ";Q : PRINT : PRINT
```

ince

$$U = \left(\frac{8g}{f} yS\right)^{1/2}, \quad q = yU, \text{ and } f = 0.116 \left(\frac{D_{90}}{y}\right)^{1/3}$$

he solution for y given D_{90}, S and q is

$$y = \left(\frac{0.116\ (D_{90})^{1/3}}{8gS}\right)^{0.3} q^{0.6}$$

```
0    Y=((.116*(D90)^.333333/(8*9.81*S))^.3)*Q^.6
0    F=.116*(D90/Y)^.33333
0    T=1000*Y*S : IF T<=TC THEN GS=0 : GOTO 410
0    GS=A*(T-TC)^1.5
```

tput for SI units

```
0 CLS : PRINT "BED LOAD BY THE MEYER-PETER AND MUELLER FORMULA"
0 PRINT : PRINT
0 PRINT "Bed slope = ";S : PRINT
0 PRINT "Specific gravity of sediment = ";SS : PRINT
5 PRINT "The mean bed-material size is ";DM*1000;" millimeters"
0 PRINT "Critical shear stress = ";TC;" kg/m2" : PRINT
0 PRINT "Discharge = ";Q;" m2/s"
1 PRINT "Depth = ";Y;" m"
2 PRINT "Friction factor = ";F
3 PRINT "Shear stress = ";T;" kg/m2" : PRINT
4 PRINT "Bed load = ";GS;" kg/s/m"
```

r this same bed material, do you want to compute the transport rate for any re discharges?

```
0 INPUT "Another value of discharge?  Y or N";Q$
0 IF Q$="Y" OR Q$="y" THEN 290  ELSE 800
```

lculations in English units.

```
0 A=8*(32.2/62.4)^.5*(SS/(SS-1))
0 DM=DM/.3048/1000 : D90=D(9)/.3048/1000 : TC=.047*(SS-1)*62.4*DM
0 INPUT "Value of unit discharge, ft2/s ";Q : PRINT : PRINT
0     Y=((.116*(D90)^.33333/(8*32.2*S))^.3)*Q^.6
0     F=.116*(D90/Y)^.33333
0     T=62.4*Y*S : IF T<=TC THEN GS=0 : GOTO 650
0     GS=A*(T-TC)^1.5
```

tput for English units.

```
0 CLS : PRINT "BED LOAD BY THE MEYER-PETER AND MUELLER FORMULA" :PRINT :PRINT
0 PRINT "Bed slope = ";S : PRINT
0 PRINT "Specific gravity of sediment = ";SS : PRINT
0 PRINT "The mean bed-material size is ";DM*304.8;" millimeters"
0 PRINT "Critical shear stress = ";TC;" #/ft2" : PRINT
0 PRINT "Discharge = ";Q;" ft2/s"
0 PRINT "Depth = ";Y;" ft"
0 PRINT "Friction factor = ";F
0 PRINT "Shear stress = ";T;" #/ft2" : PRINT
0 PRINT "Bed load = ";GS;" #/s/ft" : PRINT
```

```
 this same bed material, do you want to compute the transport rate for any
e discharges?

 INPUT "Another value of discharge?  Y or N";Q$
 IF Q$="Y" OR Q$="y" THEN 540

 END
```

24 May 89

Subpavement (C)

BED LOAD BY THE MEYER-PETER AND MUELLER FORMULA

Bed slope = .00625

Specific gravity of sediment = 2.65
Effective size of the bed material is 29.5~~7[illegible]5~~ mm

Critical shear stress = .4694~~724~~ #/ft2

Discharge ft2/s	Depth ft	Velocity ft/s	Friction factor	Shear stress lb/m2	Bed load lb/s/ft
2.10	0.61	3.42	0.0844	0.239	0.00
4.20	0.93	4.52	0.0735	0.363	0.00
6.30	1.19	5.31	0.0677	0.463	0.00
8.40	1.41	5.96	0.0639	0.550	0.21
10.50	1.61	6.51	0.0612	0.629	0.59
12.60	1.80	7.01	0.0590	0.701	1.03
14.70	1.97	7.45	0.0572	0.769	1.52
16.80	2.14	7.86	0.0557	0.833	2.03
18.90	2.29	8.24	0.0544	0.894	2.56

0

$$1000\,\frac{lb}{sec}\times\frac{ft^3}{(62.4)\,lb}\,\frac{1}{(2.65)}\times\frac{acre}{(43560)\,ft^2}\;12\,hr\;\frac{(3600)\,sec}{hr}$$

Bed slope = .00625

Specific gravity of sediment = 2.65
Effective size of the bed material is 29.5~~7[illegible]5~~ mm

Critical shear stress = .4694~~724~~ #/ft2

Discharge ft2/s	Depth ft	Velocity ft/s	Friction factor	Shear stress lb/m2	Bed load lb/s/ft
2.00	0.60	3.36	0.0852	0.232	0.00
4.00	0.90	4.43	0.0742	0.352	0.00
6.00	1.15	5.21	0.0684	0.449	0.00
8.00	1.37	5.84	0.0646	0.534	0.15
10.00	1.57	6.39	0.0618	0.611	0.49
12.00	1.75	6.87	0.0595	0.681	0.90
14.00	1.92	7.31	0.0577	0.747	1.35
16.00	2.08	7.71	0.0562	0.809	1.83
18.00	2.23	8.08	0.0549	0.869	2.33
20.00	2.37	8.43	0.0538	0.925	2.84

0

Embankment Stability

Embankment Stability

Overview

The proposed embankment has been analyzed to determine its stability during flood events and its long term stability. The analysis consists of two separate studies. The first study determined the stability of the embankment during a flood event. The results of that study were then used as part of the long term stability, or slope stability, analysis. The two analyses are discussed below.

Seepage Analysis

An analysis has been performed to determine the stability of the embankment when subjected to transient seepage forces. For this project, the effects of a Probable Maximum Flood (PMF) have been analyzed. This analysis is only valid for the studied PMF, therefore, larger storms may produce seepage forces in excess of the forces analyzed here. This analysis is based on the available data. If site or subsurface conditions are significantly different from conditions observed during the subsurface exploration conducted at the site, then this analysis is not valid.

Purpose

This analysis was performed to determine if transient seepage forces will cause instability in the embankment. Seepage forces occur when the water flows through or under an embankment. If the seepage rates through the embankment are too rapid, piping erosion may occur. Also, excess pore pressure beneath the embankment may produce high uplift pressures resulting in piping or block failures at the downstream toe.

The proposed Hiko Springs Wash embankment will only be subject to seepage forces when water is ponded behind the embankment after a storm. The ponded water will tend to flow through and under the embankment. Larger storms will increase the reservoir head, thereby increasing the driving force producing greater seepage rates and deeper penetration into the embankment and foundation soils.

Data

Data used in this analysis includes data from field and laboratory tests on soil samples (Ref. 1), results of hydrological studies, the pre-determined geometry of the embankment, and data from published literature. Five significant data items are discussed below.

The in-place soils are horizontally layered by the natural process of deposition. Some layers may have higher permeability rates than others. When the soil is excavated, mixed, and recompacted, the horizontal layering is eliminated, reducing the permeability. This remolding and compacting of the onsite soil reduces the permeability by about 90 percent. Therefore, the embankment will have a lower permeability than the underlying soils. For benchmark analysis, the permeability of the embankment fill material was taken to be 2.0×10^{-3} cm/sec. The permeability of the in-place soil was 2.6×10^{-2} cm/sec horizontally and 1.3×10^{-2} cm/sec vertically.

The native sand that will be used to construct the Hiko Springs embankment has a high permeability. This reduces the effect of a "rapid drawdown". Embankments made of low permeability soil, such as clay or fine sand, tend to hold water even after the water level in the reservoir has dropped. This difference in water level decreases the embankment's stability. The high permeability of the sand in this embankment allows the water level inside the embankment to drop almost as rapidly as the water level in the reservoir, preventing a "rapid drawdown" failure of the embankment.

The moisture content of the in-place natural soils at the site is approximately 1 percent. Because of this low in-place moisture content, the sand can store a great deal of water, slowing the initial advance of the saturation front.

The water table at the site is at least 200 feet below the ground surface. The depth of the water table coupled with the high vertical permeability of the sand allows for vertical drainage of seepage waters.

Although the PMF represents a flood event of great magnitude, the period of reservoir inundation during the PMF will be approximately 48 hours. Flood waters will fill the detention basin to maximum reservoir head in a period of about 6 hours then the reservoir stage will steadily decrease as the detention basin drains after approximately 48 hours. Consequently, a long-term, steady-state seepage condition cannot develop.

Methods

SEEP/W, a computer program published by Geo-Slope of Calgary, Alberta, Canada, was used to perform the seepage analysis. SEEP/W is a finite element program that can be used to model pore water pressure distribution and the movement of water within porous materials such as soil and rock.

The typical maximum height embankment section was evaluated in this analysis which consists of six test cases plus an initial conditions test case. The initial conditions test case established pore water pressure distribution within the embankment before the start of the storm. The first test case used soil properties based on the results of field and laboratory tests. This first test case is the most representative prediction of seepage behavior during and after a PMF. In the other five test cases, input data was changed and effects of changed input data on the seepage behavior was studied.

Results

For the benchmark analysis (Case 1), the analysis indicates that transient seepage forces caused by a PMF would not cause any instability in the embankment. If fact, the analysis indicates that the saturation front will not advance more than 40 feet into the embankment. Seepage gradients, a measure of the force with which the water is flowing through the soil, were low and were all downward, indicating that seepage waters tend to drain down into the foundation soils. Figure 1 shows the maximum advance of the piezometric surface at any time during and after the PMF. Figure 2 shows the direction of seepage and pore water pressure contours in the soil 15 hours after the start of the PMF. Figure 2 shows that initially seepage waters move vertically with little horizontal penetration of the saturation front.

Case 2 was identical to the benchmark case except a much higher horizontal and vertical permeability (2.6×10^{-2} cm/sec) was used for the embankment fill. The permeability of the in-place foundation soils was the same as for Case 1. In addition, the volumetric water content of the embankment fill and in-place foundation soils was increased from 0.025 (a very dry soil) to 0.14 (a moist soil) prior the start of the PMF event. This test case resulted in a maximum advance of the saturation front of approximately 60 feet into the embankment, however seepage did not advance beyond the centerline of the embankment. Test cases three through six were modifications of this test case.

Case 3 modelled the effects of a clogged outlet or longer duration storm. The reservoir held the peak PMF water level for an additional 6 hours, and the water did not completely drain for an additional 20 hours. Therefore, the total reservoir drain time was approximately 74 hours. This test case produced an advance in the saturation front of approximately 15 feet beyond the centerline of the embankment. However, seepage waters did not approach the downstream face or the toe of the embankment. Seepage gradients were very low and generally downward.

In Case 4, a low permeability soil layer was included 40' below the embankment. Although the subsurface investigation performed at the site did not indicate the presence of any low permeability soil layers, this test case was analyzed to evaluate a "what if" condition. In the analysis, this low permeability layer produces horizontal flow of seepage beneath the embankment rather than a downward flow into the foundation soils. Figure 3 shows the results. In this test case, the saturation front advanced approximately 70 feet beyond the centerline of the embankment. Once again, seepage waters did not approach the downstream face or the toe of the embankment. Seepage gradients were as high as 0.3, higher than any other test case. However, seepage gradients indicative of piping erosion are typically much higher, on the order of 0.85.

For Case 5, the water table was raised from a depth of 200 feet to a depth of 80 feet below existing grade. This test case resulted in no significant change from the results of test Case 2.

The last test case modelled the effects of a high horizontal to vertical permeability ratio for the in-place foundation soils. Previous test cases used an estimated ratio of 2.0. For this test case the horizontal to vertical permeability ratio was increased to 10. A horizontal permeability value of 2.6×10^{-3} cm/sec (unchanged) was used with a vertical permeability of 2.6×10^{-3} cm/sec. This ratio of permeabilities tended to produce a horizontal advance in the saturation front of approximately 30 feet beyond the centerline of the embankment, but seepage waters did not penetrate as deeply into the foundation soils. Once again, there was no instability caused by seepage pressures.

The spillway section of the embankment has a different downstream geometry than the analyzed section. The test cases showed that no significant seepage will occur in the downstream half of the embankment, therefore, no seepage analysis was performed on a typical spillway section.

Discussion of Need for Embankment Drains

Typically, embankments and dams have drains in the downstream half to reduce seepage pressures and the potential for seepage induced erosion. The drains usually consist of a layer of sand or gravel starting near the centerline of the dam and continuing out to the toe. The drain provides an outlet for relief of excess pore water pressures allowing pore water to flow through the drain rather than through the embankment soil. The drain material is much less likely to be eroded, therefore, the drain reduces the potential for seepage induced erosion or piping.

The results of this seepage analysis indicate that during and after a PMF, there is very little potential for seepage waters to advance beyond the centerline of the embankment. Therefore, the analysis indicates that internal embankment drains are not needed. However, the practice of embankment design is reliant engineering judgement and experience as well as numerical analyses and calculations. Generally, it is standard practice to include drains in an embankment of this size to account for variability in material properties and construction practice. Therefore, we recommend that some internal drainage provisions be incorporated in the design of the embankment.

Since gravel, suitable for drain construction is not available at the site, it will be imported. To minimize the import costs, we recommend that a series of strip drains be constructed in lieu of a blanket drain. A longitudinal strip drain should be constructed parallel to the centerline axis of the dam in a location downstream of the centerline. Transverse strip drains, extending from the longitudinal strip drain to the downstream toe of the embankment, will allow seepage waters to safely escape. Since the native soils are primarily coarse grained sands, the gradation of the drain rock will be determined in accordance with the procedures outlined in Reference 2. Calculations are attached at the end of this section.

Conclusion

The embankment is adequately stable before, during, and after the PMF. No excessive seepage gradients will occur within or under the embankment as a result of the PMF.

Slope Stability Analysis

This analysis was performed to determine the stability of the embankment's slopes, including slope stability during seismic events. The study includes the effects of the PMF on the stability of the embankment's slopes.

Purpose

This analysis determined if the embankment would experience slope failures at the end of construction, over the long term, during a seismic event, or during the PMF. The slopes of an embankment can become unstable if they are too steep, if the soil does not have adequate strength, if seepage forces are excessive, if the water level fluctuates quickly, or during a seismic event.

The geometry of the embankment was determined by the height of the reservoir during flood events, balancing cut and fill quantities for the project, providing stable slopes, and providing an adequate spillway. Figure 4 shows the geometry of the embankment.

Data

Data used in this analysis includes data from field and laboratory tests on soil samples (Ref. 1), data from published literature, and the pre-determined geometry of the embankment. Significant data items are discussed below.

The in-place sand at the site, except for the upper 2 to 3 feet, is dense and will have high strength properties. The remolded, compacted sand used as embankment fill will also have a high strength. Based on review of data (Ref. 1) and additional work performed for this analysis, we estimate the effective angle of internal friction and cohesion for the in-place foundation soils to be 39 degrees and 20 psf, respectively. For the embankment fill, an effective angle of internal friction of 33.7 degrees and an effective cohesion of 193 psf was used. Total unit weights for the in-place foundation soils and the embankment were estimated to be 125 pcf and 129 pcf, respectively. For the analysis, it was assumed that any negative pore water pressures would not increase the strength of the soils. In addition, for test Cases 6 and 9, soil strength parameters were reduced to evaluate the effect of poor quality construction or changed soil properties.

For the long-term and seismic analyses, there is no water in the reservoir and no positive pore pressures in the embankment.

For reasons other than slope stability, the embankment has relatively shallow slopes. If a balance between cut and fill was not necessary, the embankment could have steeper slopes.

During and after the PMF, there is no significant seepage in or under the embankment. Whereas seepage pressures could reduce the stability of the embankment, the seepage analysis indicates that there will be no "rapid drawdown" condition. As previously discussed, the elevation of the piezometric surface inside the embankment will drop almost as rapidly as the water level in the reservoir. For this analysis' rapid drawdown test case, it was assumed that the piezometric surface in the embankment would be 45 feet higher than the water level in the reservoir. This assumption reflects considerable conservatism.

The seismic coefficient chosen for this analysis was 0.15g. References suggest a value of 0.13g. The slightly higher value was used to ensure a conservative design.

Methods

SLOPE/W, a computer program published by Geo-Slope of Calgary, Alberta, Canada, was used to perform the slope stability analysis. SLOPE/W is a program that uses limit equilibrium to solve for the factor of safety of earth and rock slopes. Several methods of analysis can be used by the program. This analysis used three methods: simplified Bishop, simplified Janbu, and Morgenstern-Price. The simplified Bishop method satisfies only moment equilibrium. The simplified Janbu method satisfies only force equilibrium. The Morgenstern-Price method satisfies both force and moment equilibrium. The two simplified methods have been in use for a longer period of time and are more conservative. The Morgenstern-Price method is more accurate. It has not been as widely used until recently because it can not be conveniently solved without a computer. In this analysis, the three methods calculated nearly equal factors of safety.

The analysis evaluated nine test cases. Seven of the test cases evaluated either the downstream or the upstream slope under different loading situations. Cases 6 and 9 were analyzed to evaluate the effect of reduced soil strength on the stability of the embankment.

The upstream face of the spillway section is nearly identical to the upstream face of the typical maximum height embankment section. Therefore, no analysis was performed on the upstream face of the spillway section.

Results

The following table shows a description of each test case and the results.

Case No.	Description, Maximum Height Typical Embankment Section Unless Noted.	Soil Strength Parameters		Calculated F.S.	Min. Allow. F.S.
		Embankment	Foundation		
1	Downstream face, end of construction and long term (see Figure 4)	Phi =33.7 deg C = 193 psf W=129 pcf	Phi =39 deg C = 20 psf W=125 pcf	2.12	1.4 to 1.5
2	Downstream face, seismic load	"	"	1.47	1.1
3	Upstream face, end of construction and long term (see Figure 5)	"	"	2.36	1.4 to 1.5
4	Upstream face, seismic load	"	"	1.56	1.1
5	Upstream face, rapid drawdown (see Figure 6)	"	"	1.36	1.1 to 1.3
6	Downstream face, end of construction and long term, soil strength reduced approx. 20%	Phi =33 deg C = 50 psf W=120 pcf	Phi =33 deg C = 50 psf W=120 pcf	1.87	1.4
7	Spillway section, downstream face, end of construction and long term (see Figure 7)	Phi =33.7 deg C = 193 psf W=129 pcf	Phi =39 deg C = 20 psf W=125 pcf	2.00	1.4 to 1.5
8	Spillway section, downstream face, seismic load	"	"	1.45	1.1
9	Spillway section, downstream face, end of construction and long term, soil strength reduced approx. 20%.	Phi =33 deg C = 50 psf W=120 pcf	Phi =33 deg C = 50 psf W=120 pcf	1.74	1.4

Conclusion

The embankment's slopes are adequately stable in all cases. The rapid drawdown load case has the factor of safety that is closest to the minimum allowable factor of safety.

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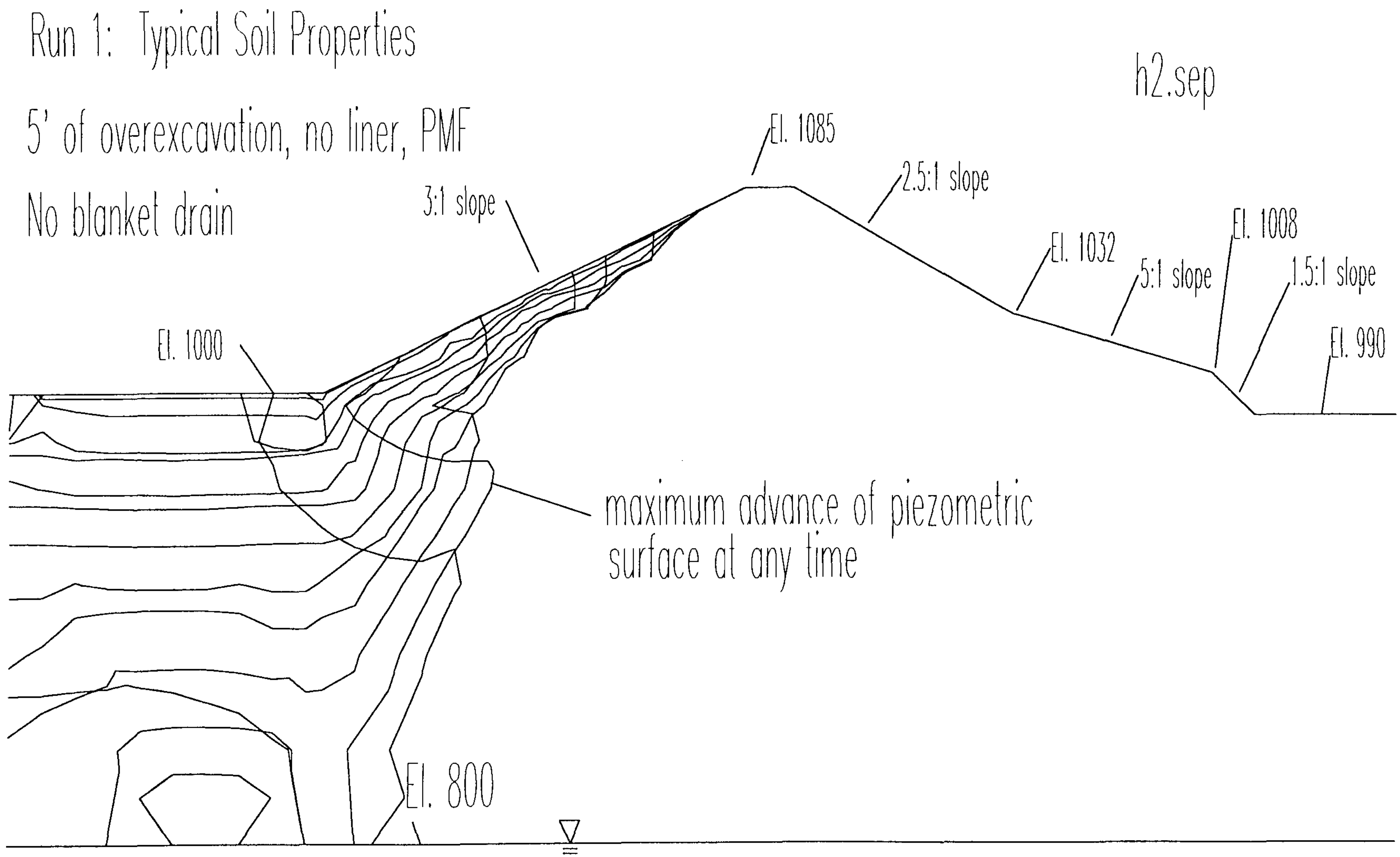

FIGURE 1: **RESULTS OF TEST CASE 1 OF SEEPAGE ANALYSIS. TYPICAL SOIL PROPERTIES WITH PMF.**

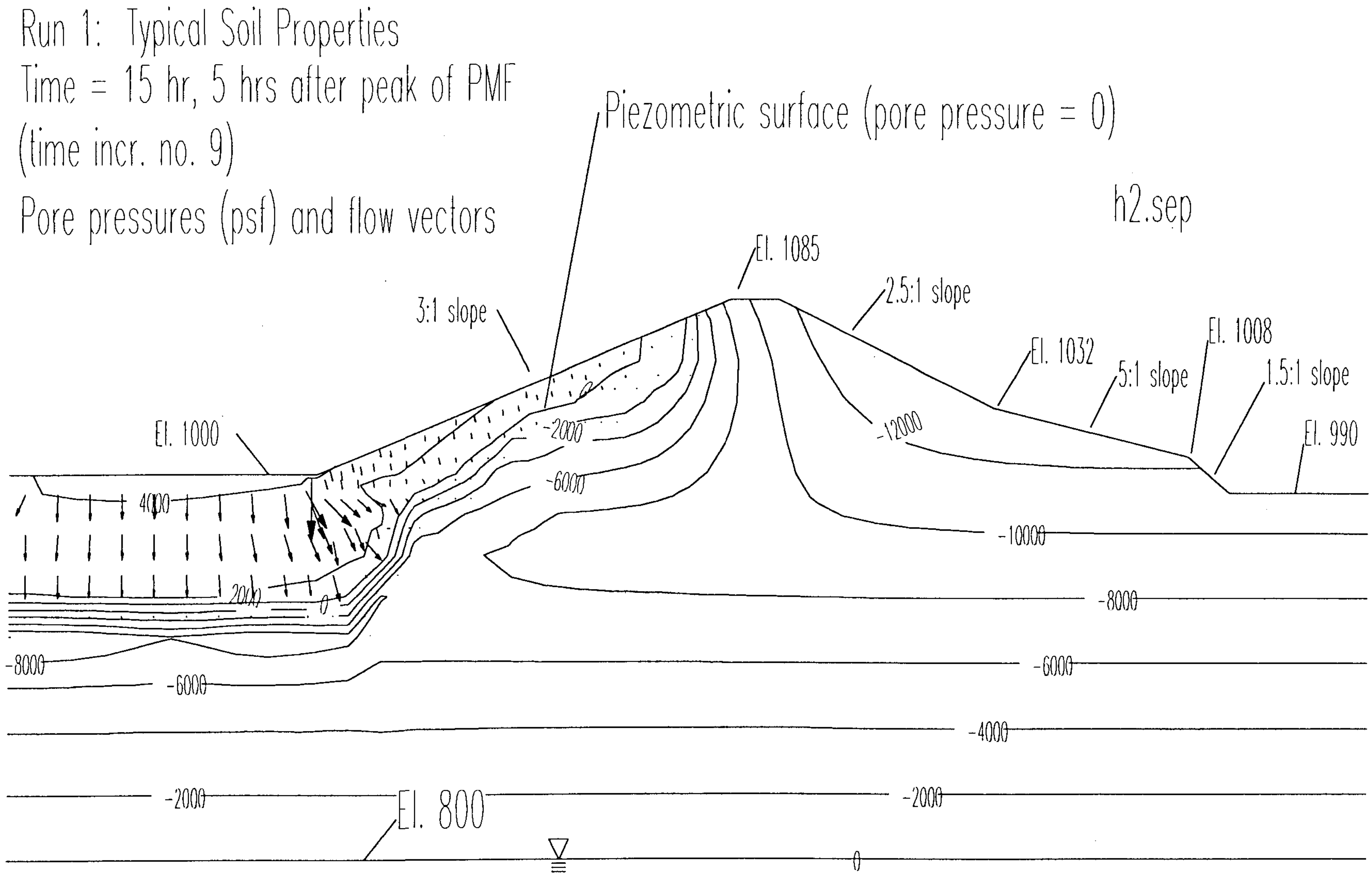

FIGURE 2: **SEEPAGE CONDITIONS 15-HOURS AFTER START OF PMF (CASE I OF SEEPAGE ANALYSIS).**

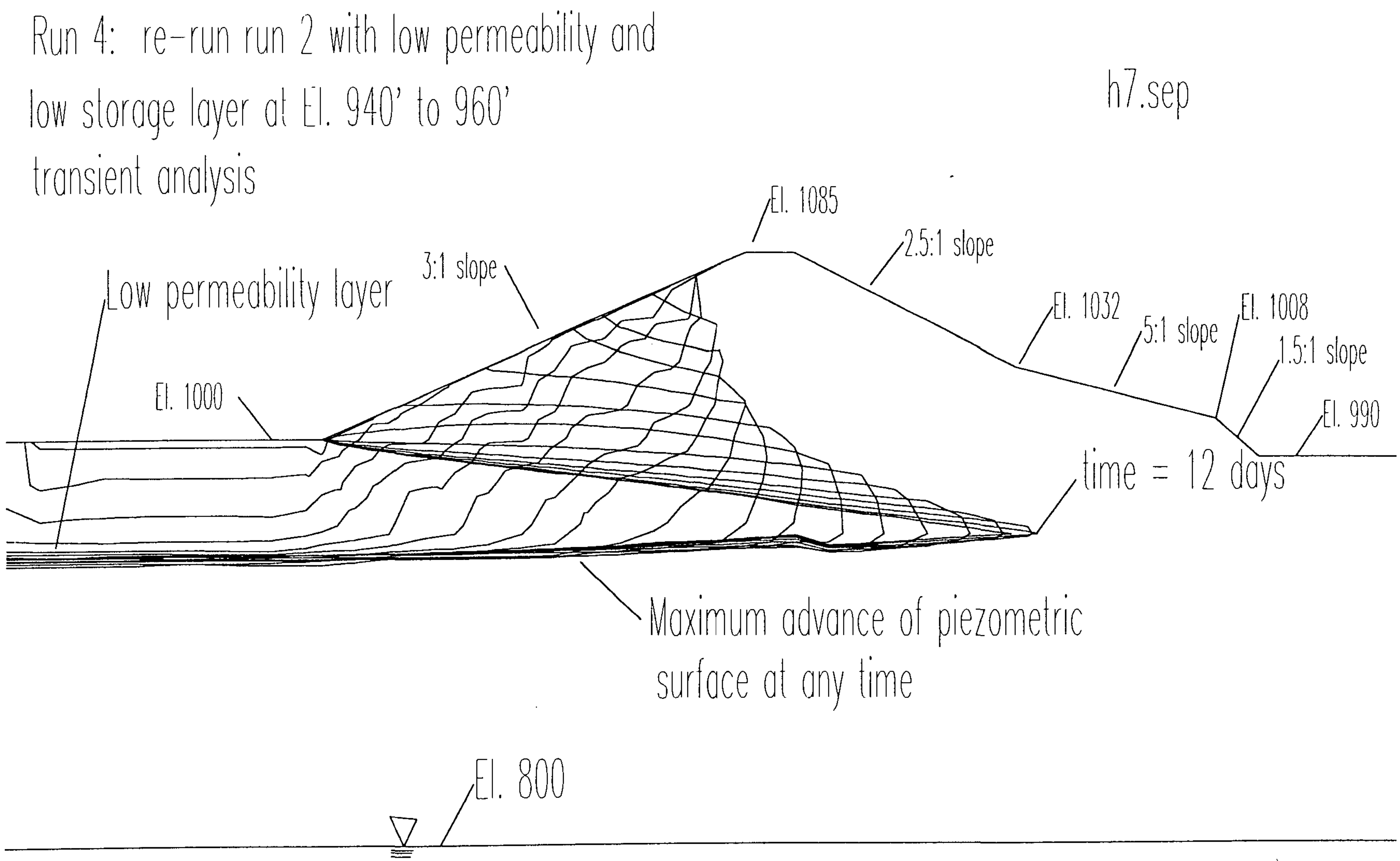

FIGURE 3: **RESULTS OF CASE 4 OF SEEPAGE ANALYSIS. LOW PERMEABILITY LAYER AT 40-FT DEPTH.**

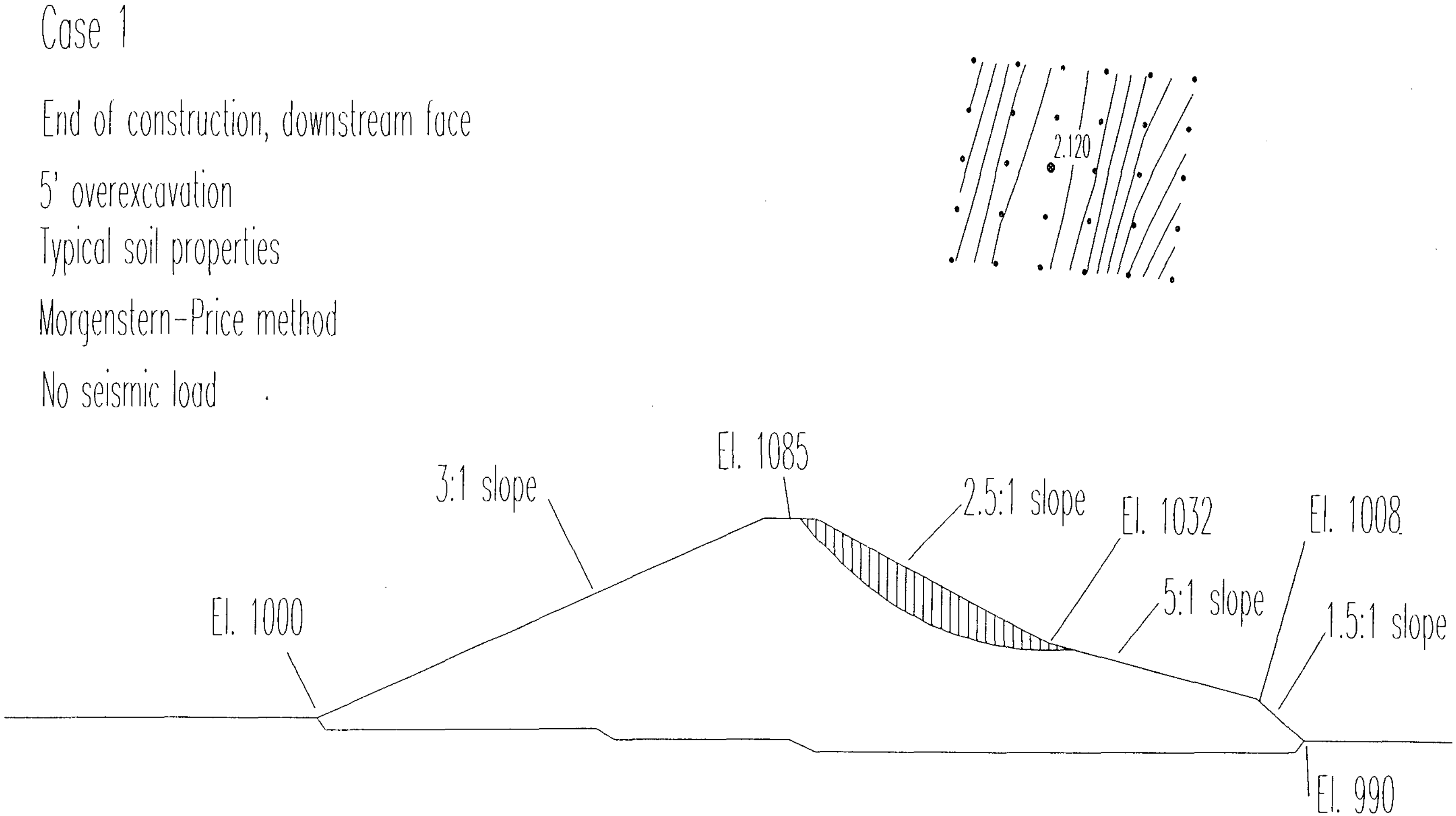

FIGURE 4: **RESULTS OF CASE 1 OF SLOPE STABILITY ANALYSIS. END OF CONSTRUCTION AND LONG TERM STABILITY OF DOWNSTREAM FACE.**

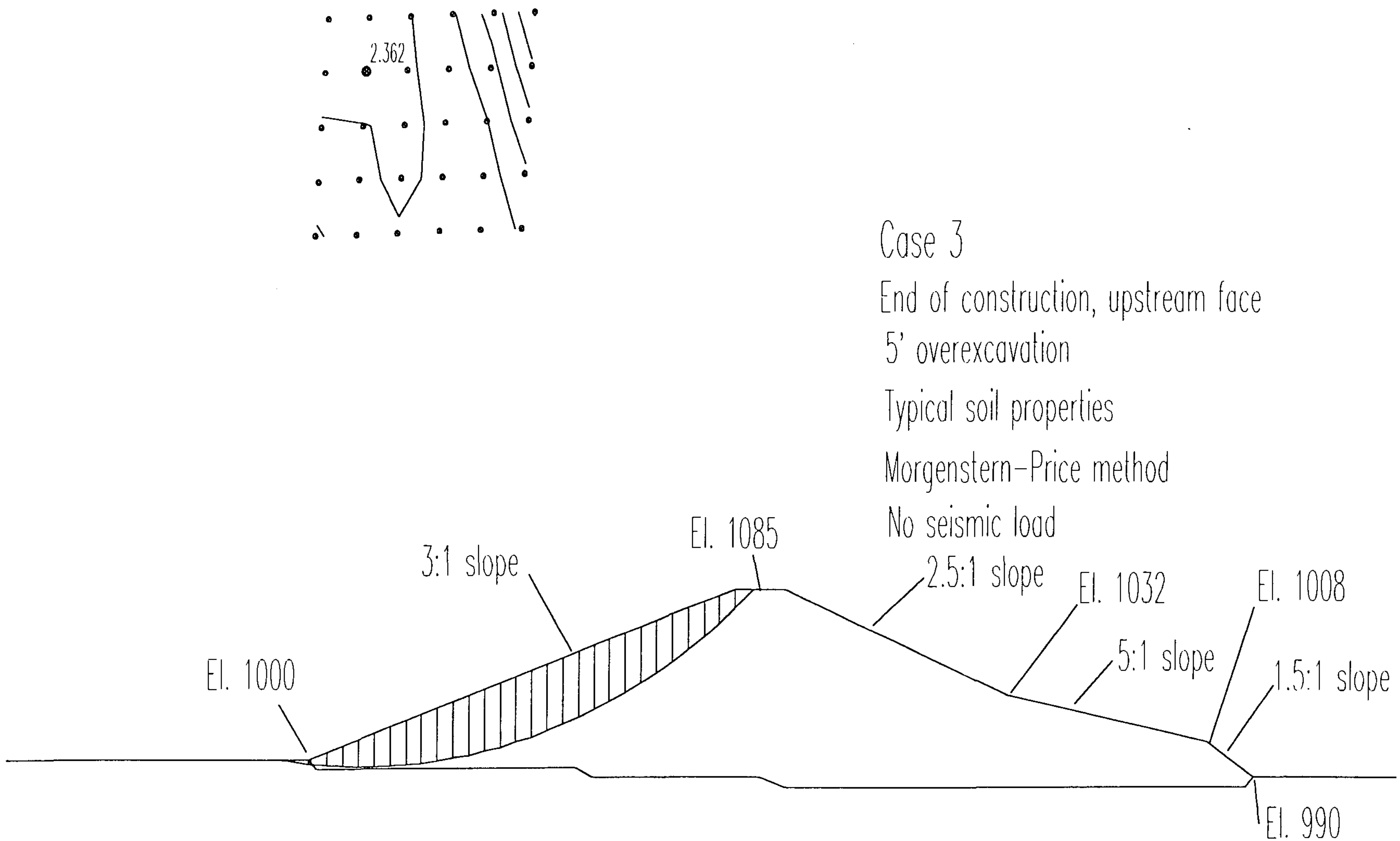

FIGURE 5: **RESULTS OF CASE 3 OF SLOPE STABILITY ANALYSIS. END OF CONSTRUCTION AND LONG TERM STABILITY OF UPSTREAM FACE.**

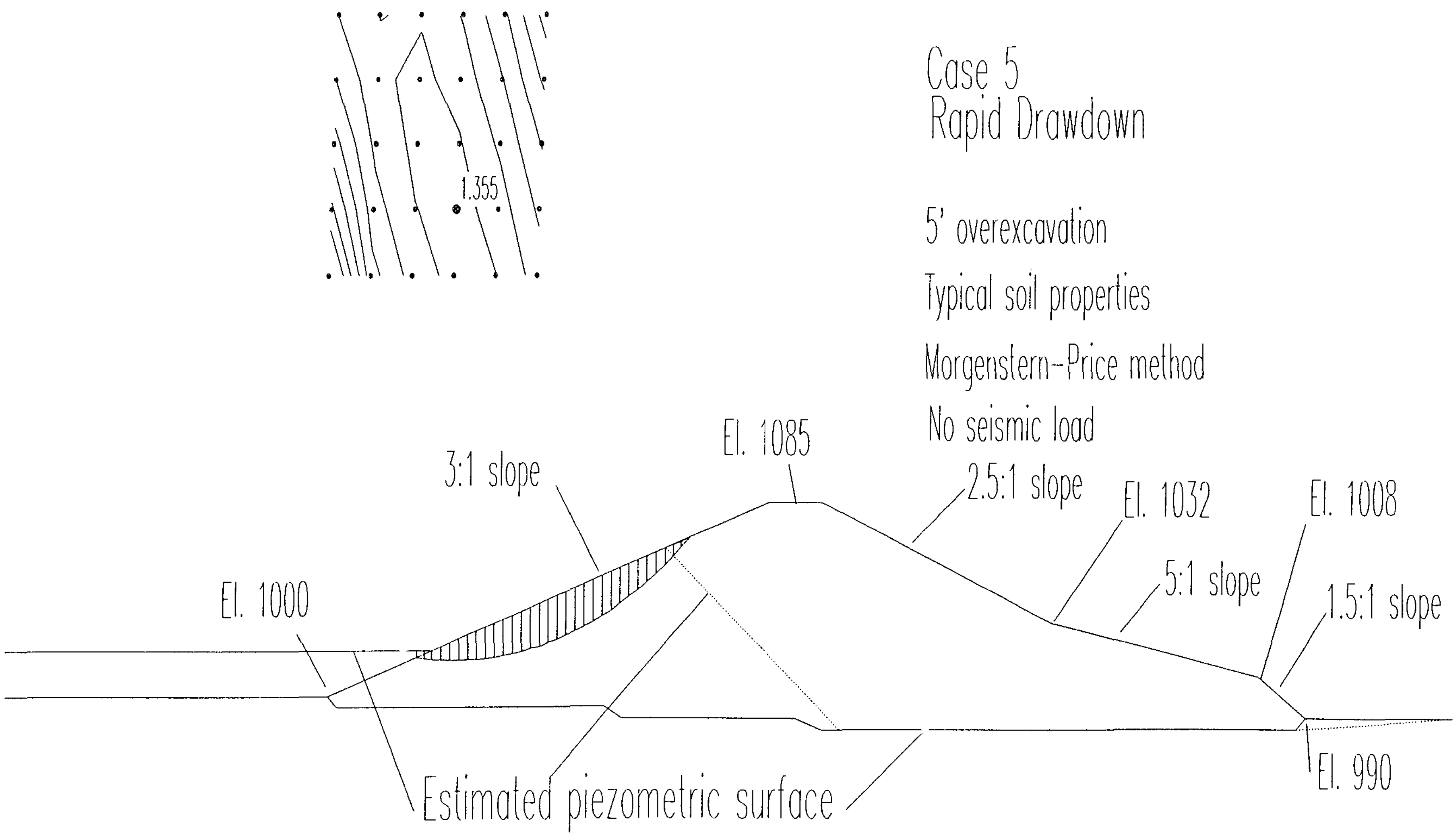

FIGURE 6: RESULTS OF CASE 5 OF SLOPE STABILITY ANALYSIS. RAPID DRAWDOWN STABILITY OF UPSTREAM FACE.

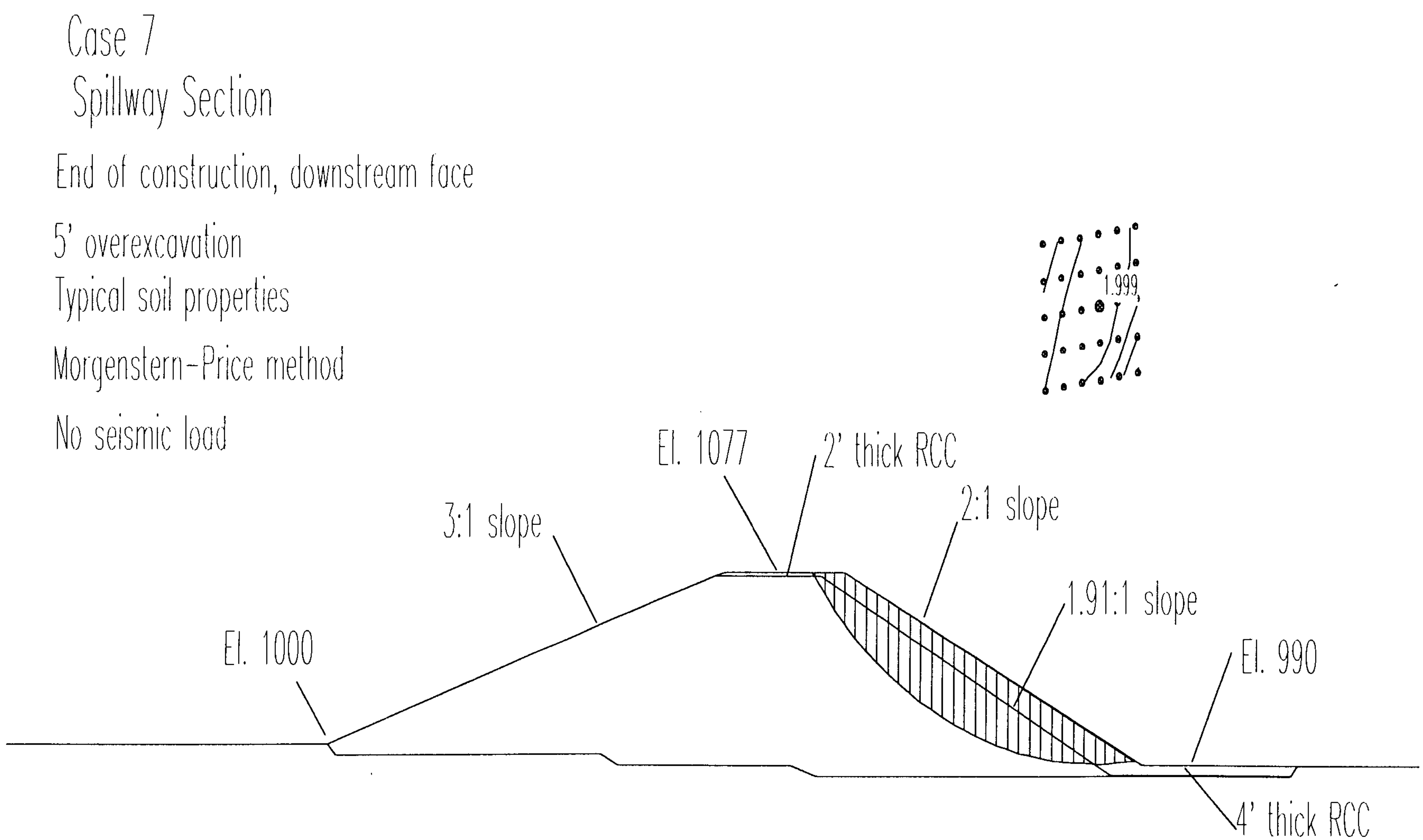

FIGURE 7: **RESULTS OF CASE 7 OF SLOPE STABILITY ANALYSIS. END OF CONSTRUCTION AND LONG TERM STABILITY OF DOWNSTREAM FACE, SPILLWAY SECTION.**

BLACK & VEATCH
ENGINEERS-ARCHITECTS

Owner *Hiko Springs Detention Basin* Computed By *DDM*
Plant ______ Unit ______ Date *5-4* 19*94*
Project No. ______ File No. ______ Checked By ______
Title *Filter selection* Date ______ 19 ___
Page ______ of ______

From "Advanced Soil Mechanics", Das p 157, & 156

SATISFY 2 conditions

$$\frac{D_{15(F)}}{D_{85(s)}} \leq 4 \text{ to } 5 \quad \text{(Cond 1)}$$

$$\frac{D_{15(F)}}{D_{15(s)}} \geq 4 \text{ to } 5 \quad \text{(Cond 2)}$$

For Average of soils.

$\therefore\ 5 D_{15(s)} = 5(.25) = 1.25$

$5 D_{85(s)} = 5(8.4) = 42$

- Curves b & c, defining the Range of good filter, are geometrically similar to the average sieve analysis.

PLOT THE RANGE of FILTER MATERIAL BASED ON Avg. of SIEVE ANAL

Sieve (mm)	Average	Factor x grain size = Curve B. (grain size)		Interpolate for plotting on computer	Curve C			Interpolate for plotting
1000								
500								
150								
100								
50								
30	98	(5)(30) = 150		98	29(30)	870		100
20	94.8	(5) 20 = 100		94.7	29(20)	580	520	93.3
10	89.3	50	30	78.86	29(10)	290	150	76.7
4.75	75.6	23.75	20	69.61		137.8	100	65.2
2.36	56.5	11.8	4.75	32.78		68.4	50	45.8
0.85	31.1	4.25	2.360	20.25	29(.85)	24.7		
0.425	18.9	2.125			110(.425)	46.8		
0.31 equiv	15	1.25	.85	10.6	135(.31)	42	30	13.2
0.15	9.5	0.75	.425	8.68	170(.15)	25.5	20	7.9
0.075	6.2	0.375			190(.075)	14.25		

DO NOT WRITE IN THIS SPACE

P-GN-172A

REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED

Spillway Design

Overtopping Protection/Spillway Design

Overview

The following is a discussion of the factors involved in spillway selection including information on roller-compacted concrete mix designs and information regarding hydraulic performance of the proposed spillway.

Function

Although the 100-year flood event is typically considered to be the design storm for detention basins in Southern Nevada, it is necessary to consider the impact of storm events potentially greater than the 100-year event. When storm events exceed the design event for a dam or detention basin, overtopping will occur. Such an event can be disastrous particularly when it involves an earthen embankment dam. To prevent destruction of the dam due to events greater that the 100-year flood, overtopping protection or emergency spillways are commonly provided.

The embankment dam proposed for the Hiko Springs Detention Basin will be classified as a "High Hazard Dam" by the Nevada Division of Water Resources. The high hazard classification applies to dams in Nevada that exceed 20 feet in height, or 20 acre-ft of reservoir storage. State law requires that high hazard dams be provided with overtopping protection designed to safely pass the Probable Maximum Flood (PMF).

Previous Work

In the Design Memorandum, Boyle Engineering proposed the use of a 740-ft wide emergency spillway to protect the embankment from the PMF. The structural section consisted of a 20-ft width of soil cement, with a 1-ft thick reinforced concrete overlay. A soil cement apron 10-ft thick and 40-ft long was to be provided at the toe of the spillway. In the Design Memorandum, Boyle indicated that remedial action may be required in the event of a spillway discharge.

Based on our review, we believe that the spillway design proposed by Boyle would require approximately 64,000 cubic yards of soil cement, and approximately 8,100 cubic yards of reinforced concrete. Using current unit prices for soil cement of $15 to $17 per cubic yard, and concrete flatwork at $275 to $300 per cubic yard, we believe that the spillway cost (in today's dollars) would exceeded $3,000,000. Further in considering the hydraulics of the proposed design, it is doubtful that the apron provided at the toe of the spillway would be adequate in protecting the dam during an event of significant spillway discharge.

Black & Veatch Approach

For regional detention basins constructed in Southern Nevada, spillways frequently account for 25 to 40 percent of the total project cost. In order to determine the most cost effective solution to providing PMF overtopping protection, alternative spillway designs were developed for comparative cost analysis. A discussion of construction methods, materials, and hydraulic performance information follows. Calculations, references, and additional information are attached.

Alternative Evaluation

In considering the materials available for construction of the spillway, it is important to understand that this spillway is a relatively tall structure. Although it is subject to only moderate unit discharges, the velocities generated due to the height will be very high.

Conventional Reinforced Concrete. Due to the material and labor expense associated with conventional concrete, it became evident that the lowest cost concrete alternative is obtained by increasing the discharge efficiency of the spillway and reducing the width. By using an ogee crest, the spillway width could be reduced to approximately 430 feet. Design guidelines established in Reference 11 recommend that chute and apron slabs for a spillway of this magnitude constructed on soil foundations be a minimum of 2 feet thick for the purpose of stability under high velocity flows. Even with a reduction in slab thickness to 1.5 feet, the cost of this alternative would exceed $3,000,000 without consideration of scour below the spillway apron. Concrete construction costs are based on familiarity with the recently completed Laughlin Wastewater Treatment Plant. Concrete construction, material, and labor costs may be higher than expected because high capacity, long reach concrete pumping equipment would probably be required.

Roller-Compacted Concrete w/ Conventional Concrete Training Walls. Due to the availability of driving head, the minimum width for this broad crested weir design is 550 feet. This design will require approximately 51,000 cubic yards of RCC and 540 cubic yards of reinforced concrete. Construction of the training walls is complicated by the need to drill and epoxy grout dowels into the RCC for anchorage of the training walls. Furthermore, formwork will require construction of stepped forms and walls will likely have to be constructed in small sections due to the difficulty associated with concrete placement in sloping forms. The minimum cost of this alternative is estimated to be $2,303,000.

Roller-Compacted Concrete w/ Apron Convergence and RCC Side Slopes. As with Alternative #2, the minimum width for this design is 550 feet. However, due to the converging side slopes, the apron width is reduced to approximately 290 feet. The result is that less RCC is required for this design than for Alternative #2. In addition, concrete training walls along the crest, discharge slope, and apron are not required due to the "U-shape" of the structure. The estimated minimum cost for this alternative is $1,943,000.

Based on this analysis, Black & Veatch determined Alternative #3 to be the lowest cost design. Concurrent with this analysis, RCC mix designs were developed and trial batches were produced. The RCC mix designs are discussed in the following subsection.

RCC Mix Designs

Since the Hiko Springs site consists only of well graded and silty sands, spillway construction using RCC will require importing of coarse aggregate. The availability of aggregate in the Laughlin area is quite limited, however, based on our investigation to date, we believe that suitable aggregate can be obtained from the Bilbray Pit, located approximately 2 miles from the project site.

After obtaining test data from the Bilbray pit and reviewing the available geotechnical information for the project site, we began developing theoretical aggregate gradations for the RCC mix design program. Based on the analysis, we have determined that a blended aggregate containing approximately 50 percent import coarse material and 50 percent onsite soils will be suitable for RCC.

Black & Veatch developed two RCC mix designs based on a "soils approach", using the blended aggregate with varying cement and fly ash contents. Material samples were obtained and trial batches were completed by Kleinfelder, Inc. The goal of the RCC mix program is to develop a mix with a laboratory compressive strength of approximately 2,700 psi at 28 days. Preliminary indications are that mix proportions similar to that used in Trial

Batch #2 will be used for final design. Mix proportions and test results are listed in the following table and additional information is included in Reference 13.

RCC Mix Design - Results		
Ingredient	**Trial Batch #1**	**Trial Batch #2**
Coarse Aggregate	50 %	50 %
Fine Aggregate	50 %	50 %
Cement	6 %	7 %
Fly Ash	2-1/2 %	3 %
Moisture Content	Opt +0.2 %	Opt +0.2 %
7-Day F'c	1,860 psi	2,050 psi
28-Day F'c	3,460 psi	3,600 psi
Unit Weight	145.2 pcf	152.1 pcf

Mix proportions will be further adjusted in the Contractor's final mix design.

Hydraulic Performance

The hydraulic performance of a large spillway for which frequent operation is anticipated is usually evaluated though the study of scale models. In considering the function of the Hiko Springs spillway, we know that spillway operation will occur only during rare events and model studies for the purpose of optimizing hydraulic performance under these conditions are generally not conducted. However, through the review of published data from other model studies and application of hydraulic principals, we can predict the hydraulic performance of the spillway with an adequate degree of accuracy to formulate the necessary design parameters.

Due to the natural topography and the required embankment height for the Hiko Springs Detention Basin, the total drop from the crest of the spillway to the toe of the dam will be nearly 90 feet. Flow over the crest of the spillway will accelerate down the face towards the toe of the dam. Due to the embankment height and the potential for extremely erosive velocities at the toe of the spillway, we felt that a spillway face incorporating 2-ft stair steps may be useful in reducing spillway velocities.

To evaluate spillway performance and assess the benefit of constructing a stepped-face spillway, Black & Veatch obtained technical papers, model studies, and prototype data from the USBR Hydraulics Laboratory in Denver. The USBR is currently in the fourth year of a five-year research program to assess the performance of overtopping protection for existing embankment dams using stair steps and wedge-shaped blocks. The USBR is conducting the research program in cooperation with the Electric Power Research Institute (EPRI) and Colorado State University.

To supplement the USBR research, Black & Veatch completed a hydraulic analysis of both smooth-face and stepped-face spillways for this project. Although the analytical methods available only provide an approximation of hydraulic performance, the results obtained are certainly valuable for comparison with the USBR data.

As a benchmark for the analysis, we first considered the hydraulics of a 2:1 (horizontal : vertical) smooth-faced spillway. An apron slab was extended downstream a distance of 120 feet from the toe of the spillway. A Manning n-value of 0.017 was used for the spillway slope and for the apron slab. Hydraulic analysis was completed for a PMF discharge of 33,400 cfs using HEC-2. Results were checked by spreadsheet calculation using the Standard Step Method as discussed in Reference 4. The results from both methods were very consistent, indicating that velocities at the toe of a smooth-face spillway will be approximately 55 to 60 fps. Calculations and additional data are attached.

For the comparative analysis, it was necessary to equate the step roughness to the Manning n-value. Currently, USBR research indicates that once uniform flow depth is reached at some distance below the spillway crest, the Darcy-Weisbach friction factor for a 2:1 step is about 0.11. Using the results from the smooth face benchmark analysis, we equated the Darcy-Weisbach friction factor to a Manning n-value of 0.34. The HEC-2 analysis was then completed using an n-value of 0.34 for the stepped spillway face and n-value of 0.017 for the apron slab. The results were again checked using the spreadsheet Standard Step method. Velocities computed from the two methods were consistent from the spillway crest to about the third point of the slope, but then began to diverge. The resulting velocities at the spillway toe ranged from approximately 40 to 46 fps for the Standard Step and HEC-2 analyses, respectively. Then, following using USBR data (Reference 7), the velocity at the toe was estimated for comparison. A summary of the results is provided below. Calculations and references are attached.

Summary of Velocities at Spillway Toe			
Method	**Smooth Face Spillway**	**Stepped Face Spillway**	**Velocity Reduction**
HEC-2 Analysis	58.1 fps	46.3 fps	20.3 %
Standard Step Method (Spreadsheet)	56.4 fps	39.7 fps	29.6 %
USBR (Ref. 7)	N/A	47.7 fps	-

In review of the results, it is probably reasonable to assume that a stepped spillway face will reduce toe velocities by approximately 20 percent. It is important to note that the velocity estimated based on USBR research (Reference 7) does not account for contraction losses that will occur as flow converges from the crest to the apron of the spillway.

Scour Considerations

In most instances, spillways for operating reservoirs are designed to discharge into a stilling basin below the dam where the tailwater depth is sufficient to produce a hydraulic jump, thereby dissipating the increased energy of the fall.

Referring to the previous velocity estimates, the flow stream at the toe of the spillway will have a Froude number of about 5.4. Using Figure 11 (Reference 9), the required tailwater depth for a good hydraulic jump in a USBR Type II stilling basin would be approximately 18 feet. Due to the natural width and slope of the wash, spillway discharges will rapidly leave the spillway toe, spreading out into the downstream wash. Consequently, it is not possible to maintain adequate tailwater to produce a hydraulic jump unless the floor of the stilling basin is located at near full tailwater depth below the natural grade of the wash.

Since a good hydraulic jump will not occur, the high velocity flows leaving the spillway toe will be very turbulent and extremely erosive to the native sandy soils. As a result, the best approach is to provide a durable spillway apron to convey flows away from the dam and to provide a deep cutoff at the edge of the apron, allowing a sacrificial scourhole to form. This type of design has already been used for two large detention basins in Southern Nevada.

To approximate the required depth of scour below the spillway apron, a scour analysis was completed following the procedures outlined in Reference 10. As is commonly the case in estimating scour depths, empirical equations are evaluated, however, considerable engineering judgement is also required. At this time, the scour depths computed using six different methods range from 4.7 to 38.9 feet. In review of the results it appears that a scour depth of 25 to 30 feet is reasonable for design.

Constructability

The spillway as shown on the preliminary drawings will be constructed of RCC in 12-inch lifts. The following comments relate to constructability.

- Due to the height of this spillway, RCC placement by truck will not be allowed. As a result, it is likely that a truck-mounted, long reach belt crane will be used. The geometry of the spillway is favorable for good production with this type of placement because a 200-ft boom will be capable reaching most of the structure without having to be relocated. Longer geometries reduce productivity because the crane has to be moved or a more expensive moving crawler belt crane is used. The majority of the spillway will be constructed with the crane position below. The spillway crest will be constructed from the top of the dam. The spillway abutments were laid back at 5:1 to allow equipment access to the crest.

- The discharge face of the spillway will be formed in 2-ft vertical steps, the equivalent slope will be 2:1 (Horz : Vert). The lift width of the face will vary with the 1.9:1 slope of the embankment such that the lift width at the toe will be approximately 17.5 feet and the lift width near the crest will be 12 feet.

- The Contractor will be required to demonstrate the proposed forming system during construction of the scour hole.

- The spillway will be water cured. Total water usage for mixing and water curing the RCC spillway is estimated to be approximately 9,000,000 gallons.

- The lift width of the side slopes will be 12 feet.

- The lift width of the toe protection will be 10 feet. Fillets will be provided at the inside of the two outside corners to allow for the compactor turning radius.

- With the exception of the 3:1 slope at the upstream crest, all other spillway slopes will be unfinished. The Contractor will be required to remove loose ravel, however, the slopes will not be trimmed, nor will the lift faces be compacted. The appearance of these slopes will be rugged.

References

1. "Facilities Plan for Hiko Springs and Unnamed Wash Laughlin - Big Bend Area, Clark County Nevada"; Boyle Engineering Corporation; May 1989.

2. "Design Memorandum for Hiko Springs Wash in Laughlin, Clark County, Nevada; Boyle Engineering Corporation; April 1991.

3. Design of Small Dams; USDI Bureau of Reclamation; 1987.

4. Open-Channel Hydraulics; Ven Te Chow; McGraw-Hill; 1959.

5. Open-Channel Hydraulics; Richard H. French; McGraw-Hill; 1985.

7. "Hydraulics of Stepped Spillways for RCC Dams and Dam Rehabilitation"; Kathleen H. Frizell; USDI Bureau of Reclamation.

8. "Hydraulics of Stepped Concrete Overtopping Protection for Embankment Dams"; Kathleen H. Frizell; USDI Bureau of Reclamation.

9. Hydraulic Design of Stilling Basins and Energy Dissipators; UDIS Bureau of Reclamation; 1984.

10. "Computing Degradation and Local Scour"; USDI Bureau of Reclamation; January 1984.

11. Structural Design of Spillway and Outlet Works; U.S. Army Corps of Engineers; November 1964.

12. "Engineering and Design Roller-Compacted Concrete"; U.S. Army Corps of Engineers; February 1992.

13. "Final Geotechnical Investigation Proposed Hiko Springs Wash Detention Basin, Laughlin, Nevada"; Kleinfelder Inc.; August 4, 1994.

BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Alternatives

Project: 25574
Date: 5/19/94
By: S. Canney

CONCRETE ALTERNATIVE - OGEE CREST

Conventional reinforced concrete chute spillway, ogee crest used to reduce spillway width. Maximum discharge head is 7.5 ft. Estimate does not include cost of scour protection beyond end on apron

Crest Elevation	1077	
Toe Elevation	990	
Slope	2	ft/ft
Crest Width	430	ft
Crest Length	65	ft
Crest Thickness	1.5	ft
Ogee Height	6	ft
Chute Thickness	1.5	ft
Wall Height	8	ft
Apron Length	120	ft
Apron Thickness	2	ft
Chute Length	181.1	ft

Hydraulic Parameters

Discharge Coefficient		3.8	
T.O. Dam Elevation		1085	
Discharge	Q =	33,562	cfs
Unit Discharge	q =	78	cfs

	Quantity		Unit Price	Cost
Crest	1553	cy	$290	$450,306
Ogee	573	cy	$330	$189,200
Chute	4327	cy	$290	$1,254,770
Apron	3822	cy	$275	$1,051,111
Crest Walls	12		$275	$3,310
Chute Walls	155	cy	$375	$58,305
Apron Walls	89	cy	$375	$33,333
Total Concrete Spillway	**10,443**	**cy**		**$3,040,335**

Scour Protection not included

Alternative #1

SPILL$.WK4

BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Alternatives

Project: 25574
Date: 5/19/94
By: S. Canney

RCC - STRAIGHT WIDTH, REINFORCED CONCRETE TRAINING WALLS

Roller Compacted Concrete 12" lifts, 2' formed steps and conventional concrete training walls. Maximum discharge head is 7.5 ft.

Roller Compacted Concrete

Crest Elevation	1077	
Toe Elevation	990	
Bottom of Scour Hole	960	
Slope	2	ft/ft
Crest Width	550	ft
Crest Length	65	ft
Crest Thickness	3	ft
Apron Length	120	ft
Apron Thickness	6	ft
Lift Width at Crest	10	ft
Lift Width at Toe	17.25	ft

Hydraulic Parameters

Discharge Coefficient		3	
T.O. Dam Elevation		1085	
Discharge	Q =	33,890	cfs
Unit Discharge	q =	62	cfs

Reinforced Concrete

Training Wall Height	8	ft
Length of Toe Walls	150	ft

	Quantity	Unit Price	Cost
RCC			
Crest	4,972 cy	$40	$198,889
Face	23,314 cy	$45	$1,049,125
Apron	15,200 cy	$40	$608,000
Scour Hole	7,556 cy	$40	$302,222
Reinforced Concrete			
Crest Walls	51 cy	$500	$25,615
Chute Walls	153 cy	$500	$76,662
Apron Walls	95 cy	$450	$42,560
Toe Walls	236 cy	$375	$88,667
Total Concrete Spillway	**51,246 cy**		**$2,303,073**

Cost of training wall concrete increased due to labor associated with installation of deep epoxy grouted dowels and formwork setup on stepped face.

Alternative #2

SPILL$.WK4

BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Alternatives

Project: 25574
Date: 5/19/94
By: S. Canney

RCC - 550' CREST CONVERGING TO 300' APRON

Roller Compacted Concrete, 12" lifts, 2' formed steps on face, side slopes smooth. Crest width of 550', maximum discharge head 7.5 ft.

Face & Side Slopes EL 990 to EL 1075

	Lift Elevation	Total Length (ft)	Total Width (ft)	Lift Width Face (ft)	Lift Width S Slopes (ft)	Lift Volume (cy)
	990	300	120	17.3	12	303
	991	303	120	17.2	12	304
	992	306	120	17.1	12	305
	993	309	120	17.0	12	306
	994	312	120	16.9	12	307
	995	315	120	16.8	12	308
	996	318	120	16.7	12	309
	997	321	120	16.7	12	310
	998	324	120	16.6	12	311
	999	327	120	16.5	12	312
	1000	330	120	16.4	12	313
	1001	333	120	16.3	12	313
	1002	336	120	16.2	12	314
	1003	339	120	16.2	12	315
	1004	342	120	16.1	12	316
	1005	345	120	16.0	12	317
	1006	348	120	15.9	12	317
	1007	351	120	15.8	12	318
hp	1008	354	120	15.7	12	319
	1009	357	117	15.7	12	317
	1010	360	114	15.6	12	315
	1011	363	111	15.5	12	312
	1012	366	108	15.4	12	310
	1013	369	105	15.3	12	308
	1014	372	102	15.2	12	306
	1015	375	99	15.2	12	304
	1016	378	96	15.1	12	302
	1017	381	93	15.0	12	300
	1018	384	90	14.9	12	297
	1019	387	87	14.8	12	295
	1020	390	84	14.7	12	293
	1021	393	81	14.7	12	291
	1022	396	78	14.6	12	288
	1023	399	75	14.5	12	286
	1024	402	72	14.4	12	284
	1025	405	69	14.3	12	281
	1026	408	66	14.3	12	279
	1027	411	63	14.2	12	277
	1028	414	60	14.1	12	274
	1029	417	57	14.0	12	272
	1030	420	54	13.9	12	269
	1031	423	51	13.8	12	267
HP	1032	426	48	13.8	12	264
	1033	429	47.5	13.7	12	264
	1034	432	47	13.6	12	264
	1035	435	46.5	13.5	12	264
	1036	438	46	13.4	12	263
	1037	441	45.5	13.3	12	263
	1038	444	45	13.3	12	263
	1039	447	44.5	13.2	12	263
	1040	450	44	13.1	12	262
	1041	453	43.5	13.0	12	262
	1042	456	43	12.9	12	261
	1043	459	42.5	12.8	12	261
	1044	462	42	12.8	12	261
	1045	465	41.5	12.7	12	260
	1046	468	41	12.6	12	260
	1047	471	40.5	12.5	12	259
	1048	474	40	12.4	12	259
	1049	477	39.5	12.3	12	258
	1050	480	39	12.3	12	258
	1051	483	38.5	12.2	12	257
	1052	486	38	12.1	12	256
	1053	489	37.5	12.0	12	256
	1054	492	37	11.9	12	255
	1055	495	36.5	11.8	12	255
	1056	498	36	11.8	12	254
	1057	501	35.5	11.7	12	253
	1058	504	35	11.6	12	253
	1059	507	34.5	11.5	12	252
	1060	510	34	11.4	12	251
	1061	513	33.5	11.3	12	250
	1062	516	33	11.3	12	250
	1063	519	32.5	11.2	12	249
	1064	522	32	11.1	12	248
	1065	525	31.5	11.0	12	247
	1066	528	31	10.9	12	247
	1067	531	30.5	10.8	12	246
	1068	534	30	10.8	12	245
	1069	537	29.5	10.7	12	244
	1070	540	29	10.6	12	243
	1071	543	28.5	10.5	12	242
	1072	546	28	10.4	12	241
	1073	549	27.5	10.3	12	240
	1074	552	27	10.3	12	239
	1075	555	26.5	10.2	12	238
Total Face & Side Slopes						[illegible]3,825 cy

Scour Hole EL 960 to EL 984

Lift Elevation	Length (ft)	Width (ft)	Volume (cy)
960	320	10.25	121
961	330	10.25	125
962	340	10.25	129
963	350	10.25	133
964	360	10.25	137
965	370	10.25	140
966	380	10.25	144
967	390	10.25	148
968	400	10.25	152
969	410	10.25	156
970	420	10.25	159
971	430	10.25	163
972	440	10.25	167
973	450	10.25	171
974	460	10.25	175
975	470	10.25	178
976	480	10.25	182
977	490	10.25	186
978	500	10.25	190
979	510	10.25	194
980	520	10.25	197
981	530	10.25	201
982	540	10.25	205
983	550	10.25	209
984	560	10.25	213
Total Scour Hole Volume			**4,176** cy

Toe Protection EL 984 to El 1008 (both sides)

Lift Elevation	Length (ft)	Width (ft)	Volume (cy)
984	166	10.5	129
985	159.5	10.5	124
986	153	10.5	119
987	146.5	10.5	114
988	140	10.5	109
989	133.5	10.5	104
990	127	10.5	99
991	120.5	10.5	94
992	114	10.5	89
993	107.5	10.5	84
994	101	10.5	79
995	94.5	10.5	74
996	88	10.5	68
997	81.5	10.5	63
998	75	10.5	58
999	68.5	10.5	53
1000	62	10.5	48
1001	55.5	10.5	43
1002	49	10.5	38
1003	42.5	10.5	33
1004	36	10.5	28
1005	29.5	10.5	23
1006	23	10.5	18
1007	16.5	10.5	13
1008	10	10.5	8
Total Toe Protection			**1711** cy

Apon Slab EL 984 to 990

Lift Elevation	Length (ft)	Width (ft)	Volume (cy)
984	120	310	1378
985	120	307	1364
986	120	304	1351
987	120	301	1338
988	120	298	1324
989	120	295	1311
990	120	292	1298
Total Apron Slab			**9364** cy

Spillway Crest EL 1074 to 1077

Lift Elevation	Length (ft)	Width (ft)	Volume (cy)
1073	558	12	248
1074	561	12	249
1075	564	75	1567
1076	567	70	1470
1077	570	65	1372
Total Spillway Crest			**4,906** cy

Abutments EL 1077 to 1085 (both sides)

Lift Elevation	Length (ft)	Width (ft)	Volume (cy)
1077	27	84	168
1078	30.5	78.5	177
1079	34	73	184
1080	37.5	67.5	188
1081	41	62	188
1082	44.5	56.5	186
1083	48	51	181
1084	51.5	45.5	174
1085	55	40	163
Total Abutments			**1,609** cy

TOTALS	Quantity (cy)	Unit Price	Total
Sccour Hole	4,176	$40	$167,037
Face & Side Slopes	23,825	$45	$1,072,130
Toe Protection	1,711	$40	$68,444
Apron Slab	9,364	$40	$374,578
Crest Slab	4,906	$40	$196,249
Abutments	1,609	$40	$64,364
	45,592		$1,942,803

Alternative #3

SPILLS.WK4

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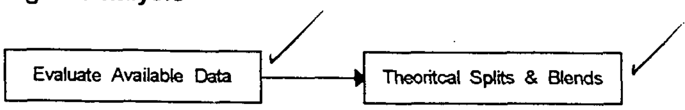
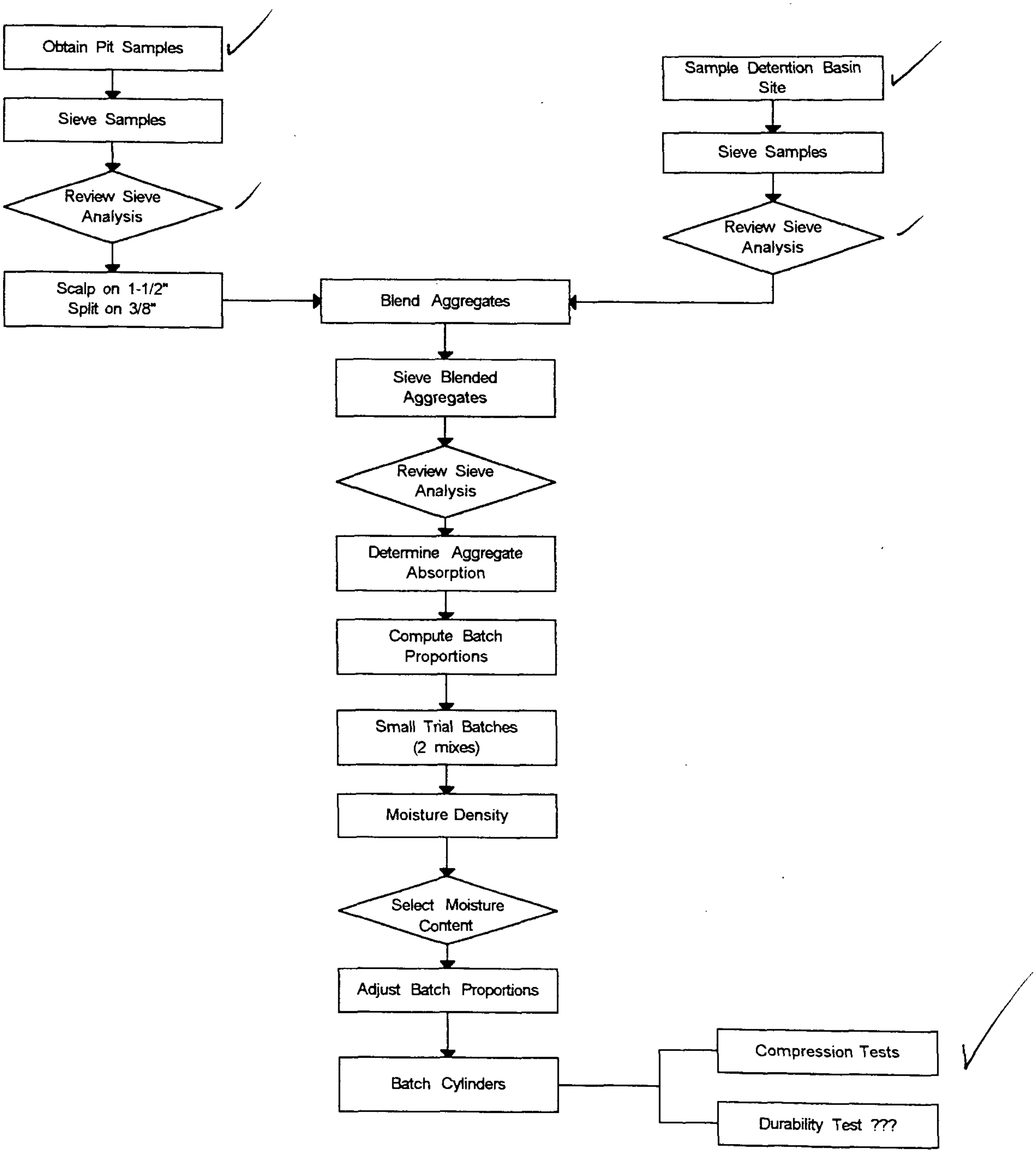
Clark County Department of Public Works
Hiko Springs Wash Detention Basin
RCC Mix Design Plan

Project: 25574.300
Date: 5/25/94
By: S. Canney

Aggregate Analysis



Mix Designs

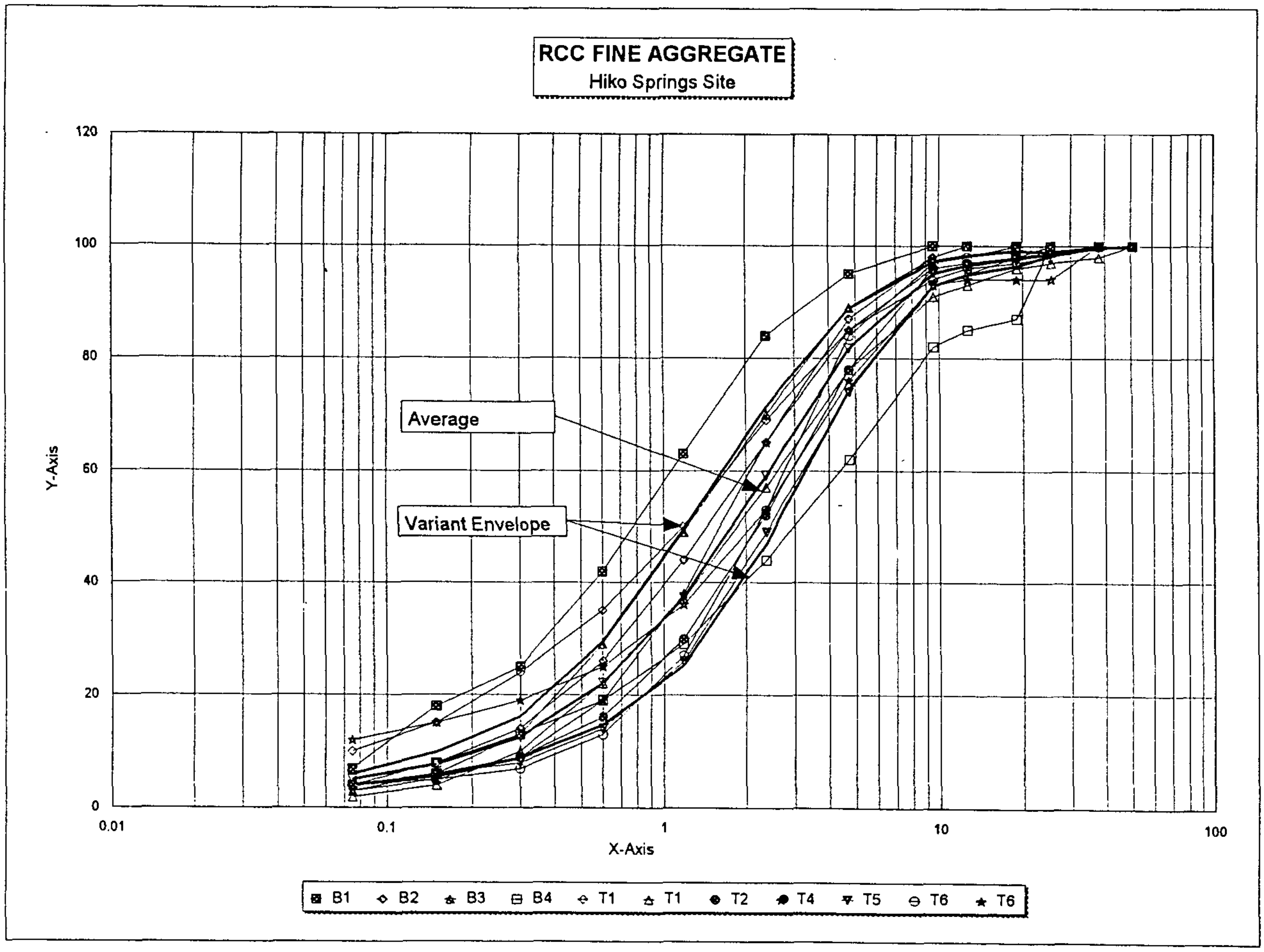


BLACK & VEATCH

Clark County Department of Public Works
Hiko SpringDetention Basin
RCC Gradation Analysis - Evaluation of Onsite Borrow

Project: 25574.3
Date: 27-May-94
By: S. Canney

Sieve Size U.S.	Sieve Size mm	Borings				Test Pits							Average	Variant Envelope	
		B1	B2	B3	B4	T1	T1	T2	T4	T5	T8	T6		Coarser	Finer
2	50.800	100	100	100	100	100	100	100	100	100	100	100	100.0	100.0	100.0
1.5	38.100	100	100	100	100	100	98	100	100	100	100	100	99.8	99.7	99.8
1	25.400	100	100	100	100	98	97	100	100	99	100	94	98.7	98.3	99.0
0.75	19.050	100	100	100	87	97	96	98	98	98	100	94	97.9	96.5	99.2
0.5	12.700	100	100	100	85	96	93	97	97	95	98	94	96.7	94.9	98.4
0.375	9.525	100	98	98	82	94	91	96	96	93	97	93	95.1	92.9	97.3
4	4.750	95	87	89	62	85	78	78	85	74	84	76	81.8	74.6	89.0
8	2.360	84	65	70	44	69	57	52	65	49	53	53	59.2	46.9	71.5
16	1.180	63	44	49	29	50	37	30	38	26	27	36	37.4	25.4	49.5
30	0.600	42	26	29	19	35	22	16	19	14	13	25	22.1	14.7	29.5
50	0.300	25	14	13	13	24	10	9	9	8	7	19	12.6	8.9	16.2
100	0.150	18	8	6	8	15	4	6	5	6	5	15	7.8	5.6	9.9
200	0.075	7	4	3	4	10	2	4	3	4	4	12	5.1	4.2	6.0



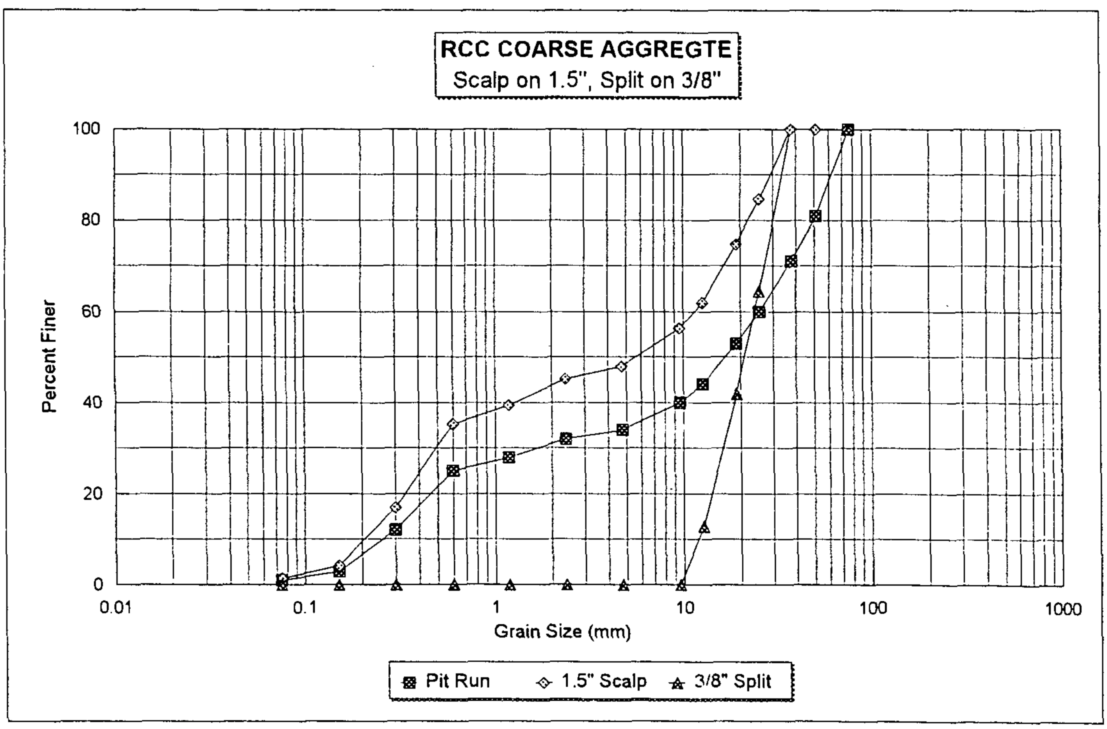
BLACK & VEATCH

Clark County Department of Public Works
Hiko SpringDetention Basin
RCC Aggregate Analysis
Coarse Fraction Import Splits - Bilbray Pit

Project: 25574.300
Date: 25-May-94
By: S. Canney

Scalp on 1.5", Split on 3/8"

Sieve Size U.S.	Sieve Size mm	Pit Run		Scalp on 1.5"		Split on 3/8"		
		%Passing	Retained	Retained	%Passing	3/8 Retained	Redistribute Retained	%Passing
3	76.200	100	0.0	0	100	0.0	0.0	100.0
2	50.800	81	19.0	0	100	0.0	0.0	100.0
1.5	38.100	71	10.0	0	100.0	0.0	0.0	100.0
1	25.400	60	11.0	15.5	84.5	15.5	35.5	64.5
0.75	19.050	53	7.0	9.9	74.6	9.9	22.6	41.9
0.5	12.700	44	9.0	12.7	62.0	12.7	29.0	12.9
0.375	9.525	40	4.0	5.6	56.3	5.6	12.9	0.0
4	4.750	34	6.0	8.5	47.9		0.0	0.0
8	2.360	32	2.0	2.8	45.1			0.0
16	1.180	28	4.0	5.6	39.4			0.0
30	0.600	25	3.0	4.2	35.2			0.0
50	0.300	12	13.0	18.3	16.9			0.0
100	0.150	3	9.0	12.7	4.2			0.0
200	0.075	1	2.0	2.8	1.4			0.0
		0	1.0	1.4	0.0			
				0.0				
				100		43.7	100.0	



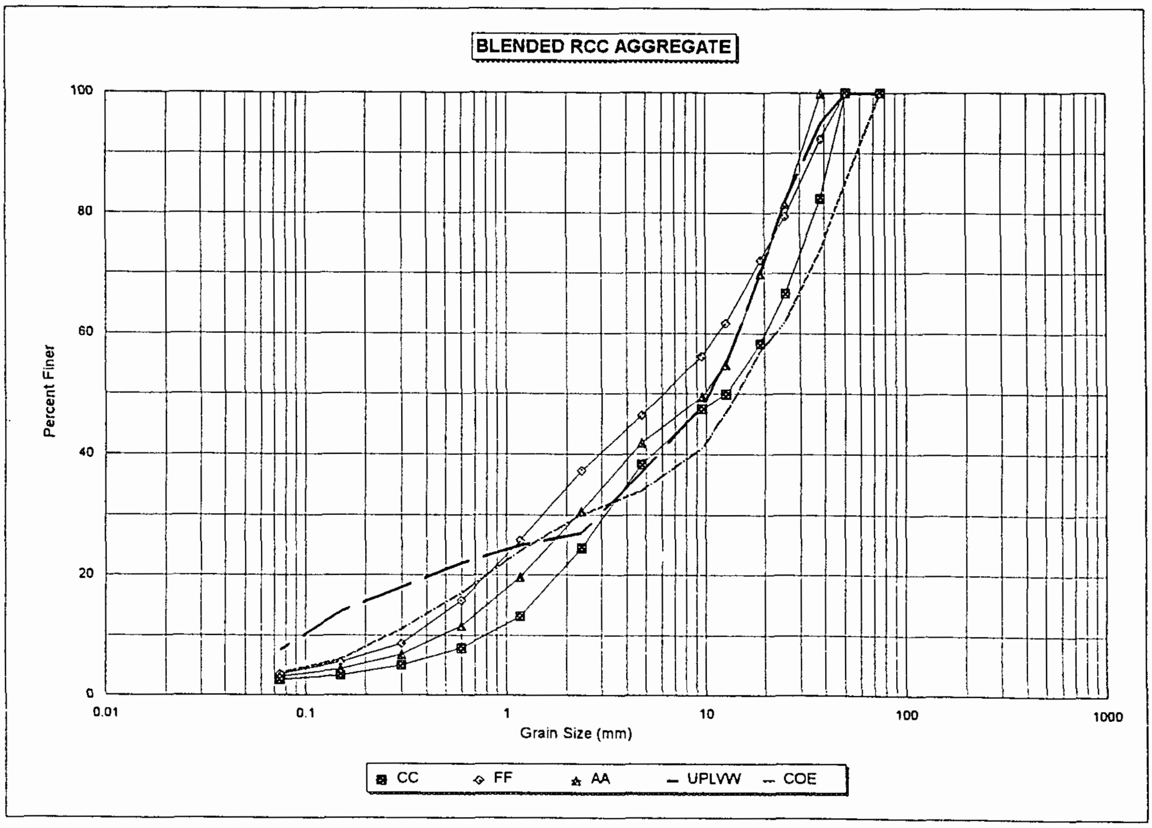
RCCGRAD.WK4

BLACK & VEATCH

Clark County Department of Public Works
Hiko Spring Detention Basin
RCC Aggregate Analysis
Blended Aggregate

Project: 25574.30
By: S. Canney

Sieve Size U.S.	Sieve Size mm	COARSE AGGREGATE Bilbray Pit 1.5"Max 3/8 Split (50%)			FINE AGGREGATE Hiko Springs Site (50%)			BLENDED AGGREGATE BAND								
		Coarser	Finer	Average	Finer	Coarser	Average	CF	CC	CA	FF	FC	FA	AF	AC	AA
3	76.200	100	100	100.0	100	100	100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2	50.800	100	100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1.5	38.100	65.0	85.0	100.0	99.8	99.7	99.8	82.4	82.4	82.4	92.4	92.4	92.4	99.9	99.9	99.9
1	25.400	35.0	60.0	64.5	99.0	98.3	98.7	67.0	66.7	66.8	79.5	79.2	79.3	81.8	81.4	81.6
0.75	19.050	20.0	45.0	41.9	99.2	96.5	97.9	59.6	58.3	58.9	72.1	70.8	71.4	70.6	69.2	69.9
0.5	12.700	5.0	25.0	12.9	98.4	94.9	96.7	51.7	50.0	50.8	61.7	60.0	60.8	55.6	53.9	54.8
0.375	9.525	2	15	4	97.3	92.9	95.1	49.6	47.5	48.6	56.1	54.0	55.1	50.6	48.5	49.6
4	4.750	2	4	2	89.0	74.6	81.8	45.5	38.3	41.9	46.5	39.3	42.9	45.5	38.3	41.9
8	2.360	2	3	2	71.5	46.9	59.2	36.8	24.5	30.6	37.3	25.0	31.1	36.8	24.5	30.6
16	1.180	1	2	2	49.5	25.4	37.4	25.3	13.2	19.2	25.8	13.7	19.7	25.8	13.7	19.7
30	0.600	1	2	1	29.5	14.7	22.1	15.2	7.9	11.6	15.7	8.4	12.1	15.2	7.9	11.6
50	0.300	1	1	1	16.2	8.9	12.6	8.6	5.0	6.8	8.6	5.0	6.8	8.6	5.0	6.8
100	0.150	1	1	1	9.9	5.6	7.8	5.5	3.3	4.4	5.5	3.3	4.4	5.5	3.3	4.4
200	0.075	1	1	1	6.0	4.2	5.1	3.5	2.6	3.1	3.5	2.6	3.1	3.5	2.6	3.1



Kleinfelder, Inc.
6850 South Paradise Road
Las Vegas, NV 89119-3735

Phone:(702) 736-2936

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No:31-128118 Phase:

Date: 6/10/94

Project :Hiko Springs Detention Basin
Location :

Permit No:

Black and Veatch Engineers-Architects
Attn:Mr. Steve Canney

Phone: (000) 000-0000
Fax: (702) 657-2126

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	82
Contractor	N/A	Slump (in)	N/R	Concrete Temperature (°F)	79
Mix Number	N/R	Max. Size Agg. (in)	2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	10%	Water Added (gal)	5.
Truck/Ticket	N/R / N/R	Design Strength at 0 days	N/R psi	Batch Size (cubic yards)	0.1
Source of Sample	50% NW Basin, 50% Bilbary Pit (+3/8") 7% Cement (Type V), 3% Class "F" Fly Ash			Time Batched	2:00
				Time Sampled	2:15
				Time in Truck	0:15
Sampled by	Troy Carpenter			Date Sampled	June 3, 1994
Submitted by	Weston Hallum			Date Submitted	June 4, 1994

Cylinder Number	Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in²)	Ultimate Load (lb)	Compressive Strength (psi)
13601 A	June 10, 1994	7	6.02" X 12.0"	28.46	57,800	2030
13601 B	June 10, 1994	7	6.02" X 12.0"	28.46	58,600	2060
13601 C	June 17, 1994	14	" X "	0.00		
13601 D	July 1, 1994	28	" X "	0.00		
13601 E	July 1, 1994	28	" X "	0.00		
13601 F	September 1, 1994	90	" X "	0.00		
					Average 7 Day Strength (psi) »»>	2050

Remarks:Water Added = % Moisture, 0.2 Over Optimum
Unit Weight @ 7 days = 149.2 pcf, as Cured Condition

Unless prior arrangements are made, HOLD samples will be discarded if design strength is attained.

Reviewed by: Marilee Pontoni
Date: 6-10-94

As a mutual protection to our clients, the public and ourselves, all reports are submitted as the confidential property of our clients, and authorization for publication of statements, conclusions, or extracts from or regarding our reports is reserved pending our written approval. Samples will be disposed of after testing is completed unless prior arrangements are agreed to in writing. Tests by our personnel are performed in general accordance with ASTM, C172, C143, C138, C231, C173, C31 and C1064 standards unless otherwise noted. Copyright 1994.

Kleinfelder, Inc.
6850 South Paradise Road
Las Vegas, NV 89119-3735
Phone: (702) 736-2936

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LAS VEGAS

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No: 31-128118 Phase: Date: 6/10/94
Project : Hiko Springs Detention Basin
Location :

Permit No:

Black and Veatch Engineers-Architects
Attn: Mr. Steve Canney

Phone: (000) 000-0000
Fax: (702) 657-2126

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	80
Contractor	N/A	Slump (in)	N/R	Concrete Temperature (°F)	75
Mix Number	N/R	Max. Size Agg. (in)	2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	8.5	Water Added (gal)	5.
Truck/Ticket	N/R / N/R	Design Strength at 0 days	N/R psi	Batch Size (cubic yards)	0.1
Source of Sample	50% NE Center Basin, 50% Bilbary Pit (+3/8")			Time Batched	1:30
	6% Cement (Type V)			Time Sampled	1:45
	2 1/2% Class "F" Fly Ash			Time in Truck	0:15
Sampled by	Troy Carpenter			Date Sampled	June 3, 1994
Submitted by	Weston Hallum			Date Submitted	June 4, 1994

Cylinder Number	Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in²)	Ultimate Load (lb)	Compressive Strength (psi)
13600 A	June 10, 1994	7	6.02" X 12.0"	28.46	52,200	1830
13600 B	June 10, 1994	7	6.02" X 12.0"	28.46	53,800	1890
13600 C	June 17, 1994	14	" X "	0.00		
13600 D	July 1, 1994	28	" X "	0.00		
13600 E	July 1, 1994	28	" X "	0.00		
13600 F	September 1, 1994	90	" X "	0.00		
					Average 7 Day Strength (psi) »»	1860

Remarks: Water Added = % Moisture, 0.2% Over Optimum
Unit Weight at 7 days = 143.8 pcf, as Cured Condition

Unless prior arrangements are made, HOLD samples will be discarded if design strength is attained.

Reviewed by: Matthew Pontoni

Date: 6-10-94

As a mutual protection to our clients, the public and ourselves, all reports are submitted as the confidential property of our clients, and authorization for publication of statements, conclusions, or extracts from or regarding our reports is reserved pending our written approval. Samples will be disposed of after testing is completed unless prior arrangements are agreed to in writing. Tests by our personnel are performed in general accordance with ASTM, C172, C143, C138, C231, C173, C31 and C1064 standards unless otherwise noted. Copyright 1994.

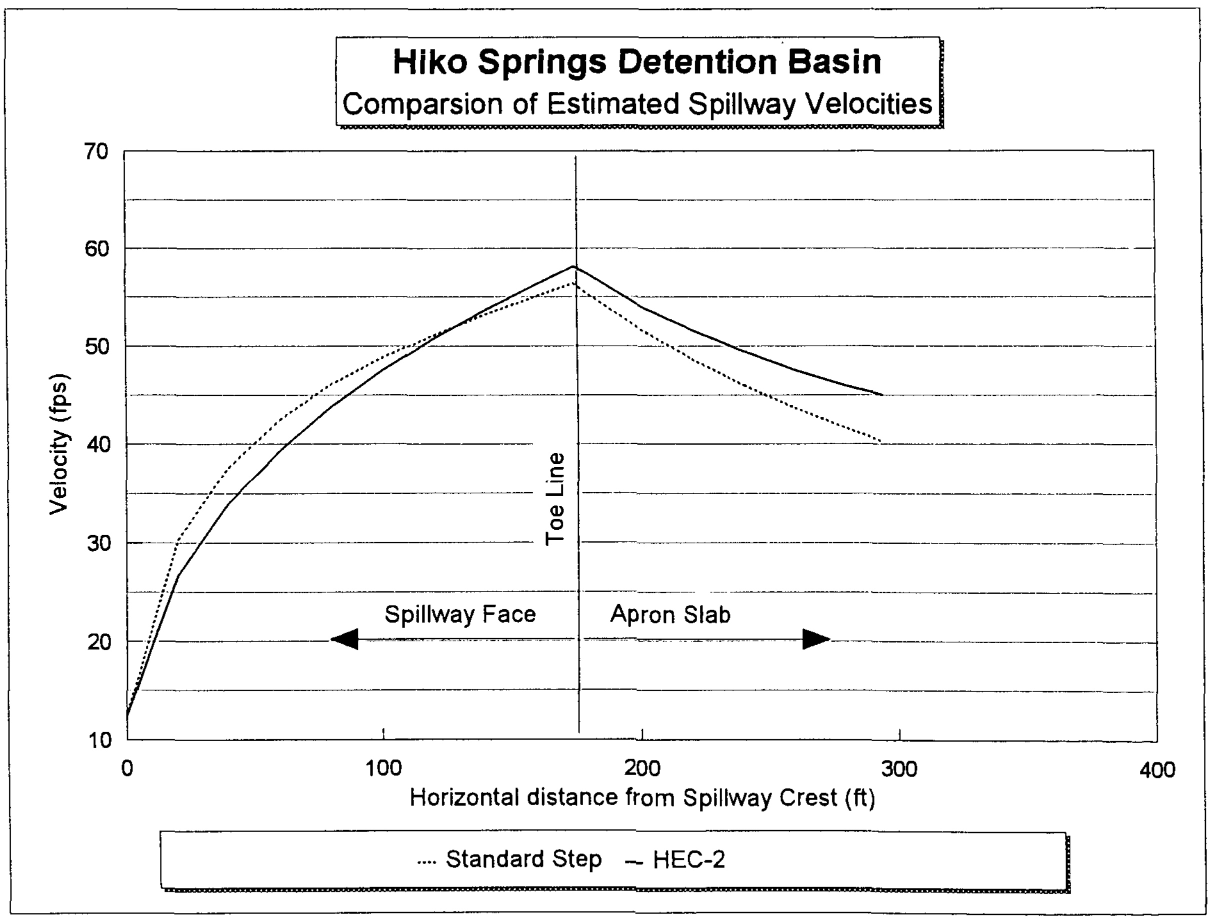
BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Analysis

Project: 25574.300
Date: 11-Jun-94
By: S. Canney
Page:

SUMMARY:

The chart below is a graphical comparision of spillway velocities computed from the Standard Step method and HEC-2 analysis for a smooth faced spillway. In both cases a Manning's n of 0.017 was used. The purpose of this plot to verify the consistancy of results obtained from the two methods.



STDSTEP1.WK4

Smooth Face

BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Analysis

Project: 25574.300
Date: 11-Jun-94
By: S. Canney

Discharge:	33,400	cfs
Crest Width:	550	ft
Slope:	0.5	ft/ft
Manning's n:	0.017	*(Stepped Face)*
Manning's n:	0.017	*(Apron Slab)*
Side Slope:	1.5	horz to 1.0 vert
Depth at Crest Yc	4.86	ft
Critical Velocity Vc	12.50	fps
alpha	1.0	

This spreadsheet computes water surface profiles and EGL from the crest of the spillway to the end of the spillway apron. The procedure is one of trial and error solution for flow depth Y, at various distances from the spillway crest. Computions are based on the Standard Step Method. The proceedure is based on the methods presented by Chow for the spillway at the La Tuna Canyon Debris Basin in Los Angeles County California.

Location From Crest (ft)	Step Distance (ft)	Chute Width (ft)	Trial & Error Depth (ft)	Flow Area (sf)	Wetted Perimeter (ft)	Hydraulic Radius (ft)		Velocity (fps)	Factored Velocity Head	Energy Head	Energy Change	Friction Slope	Average Friction Slope	Invert Slope		Distance Check
	dx	b	y	A	P	R	R^1.333	V	alpha*V^2/2g	E	dE	Sf	Sf	So	So-Sf	dx
0		550.00	**4.8563**	2706.33	567.51	4.77	8.03	12.50	2.43	7.28		0.00254		0.500		
20	20	520	**2.1085**	1103.09	527.60	2.09	2.67	30.28	14.24	16.34	9.06002	0.04464	0.04718	0.500	0.45282	20.0079
40	20	490	**1.8028**	888.25	496.50	1.79	2.17	37.60	21.96	23.76	7.41366	0.08475	0.12939	0.500	0.37061	20.0042
60	20	460	**1.6997**	786.20	466.13	1.69	2.01	42.48	28.03	29.72	5.96662	0.11702	0.20178	0.500	0.29822	20.0072
80	20	430	**1.6769**	725.28	436.05	1.66	1.97	46.05	32.93	34.61	4.88202	0.14008	0.25711	0.500	0.24289	20.0995
100	20	400	**1.6995**	684.13	406.13	1.68	2.00	48.82	37.01	38.71	4.10340	0.15481	0.29489	0.500	0.20511	20.0057
120	20	370	**1.7530**	653.20	376.32	1.74	2.09	51.13	40.60	42.35	3.64165	0.16316	0.31797	0.500	0.18203	20.0058
140	20	340	**1.8322**	627.98	346.61	1.81	2.21	53.19	43.92	45.76	3.40529	0.16672	0.32989	0.500	0.17011	20.0177
160	20	310	**1.9370**	606.10	316.98	1.91	2.37	55.11	47.15	49.09	3.33422	0.16658	0.33330	0.500	0.16670	20.0010
174	14	300	**1.9550**	592.22	307.05	1.93	2.40	56.40	49.39	51.35	2.25423	0.17247	0.33904	0.500	0.16096	14.0052
180	6	300	**1.9957**	604.67	307.20	1.97	2.47	55.24	47.38	49.37	-1.97243	0.16101	0.33348	0.005	-0.32848	6.0047
200	20	300	**2.1301**	645.84	307.68	2.10	2.69	51.72	41.53	43.66	-5.71295	0.12955	0.29056	0.005	-0.28556	20.0060
220	20	300	**2.2619**	686.24	308.16	2.23	2.91	48.67	36.78	39.05	-4.61506	0.10604	0.23559	0.005	-0.23059	20.0143
240	20	300	**2.3912**	725.94	308.62	2.35	3.13	46.01	32.87	35.26	-3.78317	0.08809	0.19413	0.005	-0.18913	20.0027
260	20	300	**2.5183**	765.00	309.08	2.48	3.35	43.66	29.60	32.12	-3.14437	0.07412	0.16221	0.005	-0.15721	20.0009
280	20	300	**2.6439**	803.66	309.53	2.60	3.57	41.56	26.82	29.46	-2.65314	0.06301	0.13713	0.005	-0.13213	20.0800
294	14	300	**2.7303**	830.27	309.84	2.68	3.72	40.23	25.13	27.86	-1.60564	0.05660	0.11961	0.005	-0.11461	14.0093

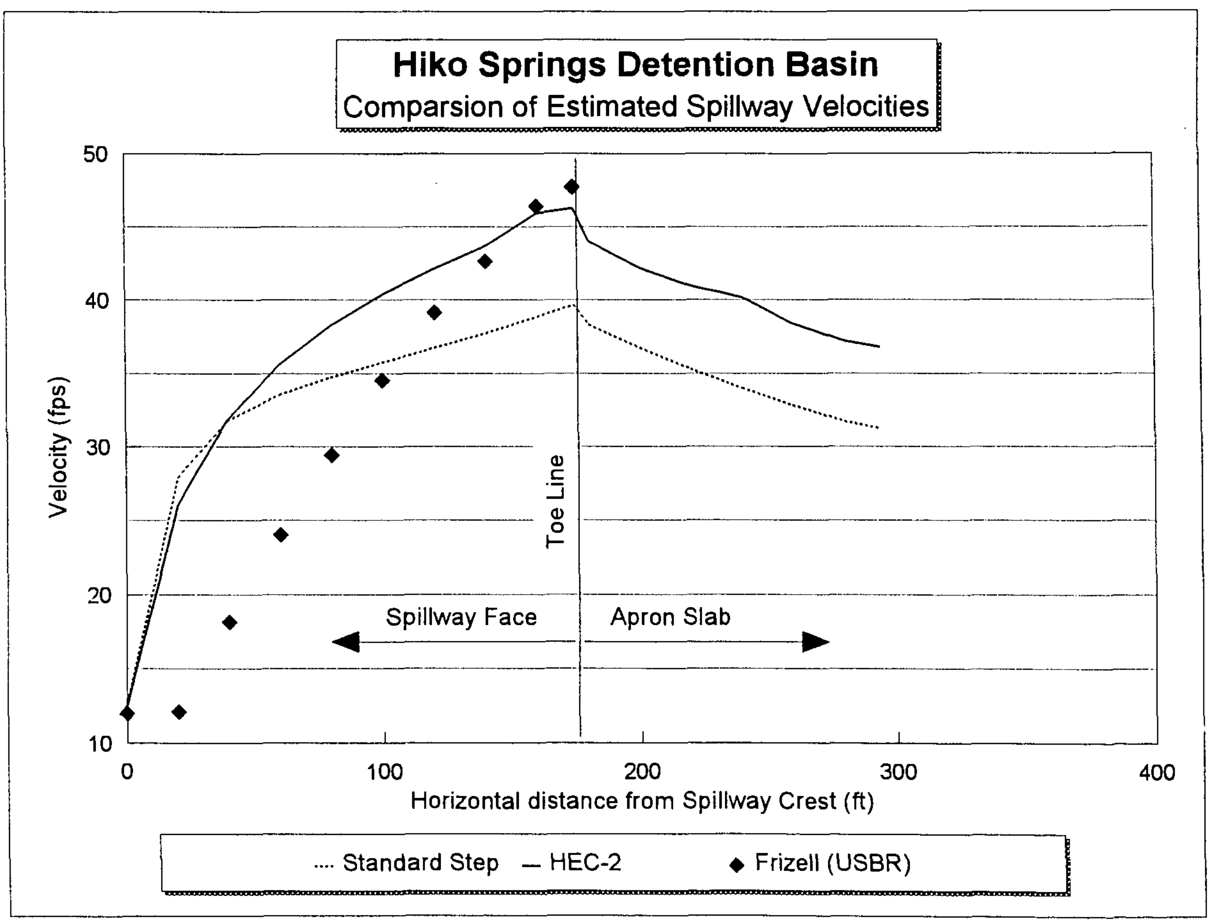
BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Analysis

Project: 25574.300
Date: 11-Jun-94
By: S. Canney
Page:

SUMMARY:

The chart below is a graphical comparision of the estimated spillway velocities for the three computational methods considered, and a stepped face spillway. For both the Standard Step method and the HEC-2 analysis Manning's n = 0.034 for the stepped face and n = 0.017 for the apron slab. The velocities computed based on extrapolation of USBR reasearch data indicate that velocities increase uniformly down the spillway face reaching a maximum velocity at the toe of approximately 47 fps. Velocity profiles computed using the Standard Step method and HEC-2 are characteristically similar, however the HEC-2 analysis produces higher velocities from approximately the third point to the toe of the spillway. In reviewing this data, and the methods employed, it is reasonable to anticipate velocities at the toe of the spillway on the order of 40 to 50 fps for the PMF event.



STDSTEP2.WK4

Stepped Face

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Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Analysis

Project: 25574.300
Date: 11-Jun-94
By: S. Canney

This spreadsheet computes Manning's n value for a given velocity and flow depth determined from the Darcy-Weisbach equation and a given Darcy-Weisbach friction factor.

Manning: V = 1.486 * R^(2/3) * S^1/2)/n

Darcy-Weisbach: V = (8*g/f)^(1/2) * (R *S)^(1/2)

V Manning = **V** Darcy - Weisbach ⟶ Solve for Manning's n

Channel Width	1	ft
Slope	0.5	ft/ft
Darcy-Weisbach Friction Factor	0.11	

Flow Depth (ft)	Velocity (fps)	Manning's n
4.00	68.4	0.039
3.75	66.3	0.038
3.50	64.0	0.038
3.25	61.7	0.037
3.00	59.3	0.037
2.75	56.7	0.036
2.50	54.1	0.036
2.25	51.3	0.035
2.00	48.4	0.034
1.75	45.3	0.034
1.50	41.9	0.033
1.25	38.3	0.032
1.00	34.2	0.031

Basd upon initial analysis of spillway discharge using the Standard Step Method and HEC-2 analysis an appropriate average value of Manning's n would be 0.034 for the stepped face of the spillway. The Standard Step Method, and HEC-2 analysis will be repeated. Flow depths and velocities determined in the analysis will be compared with the values computed on this page.

BLACK & VEATCH

Clark County Department of Public Works
Hiko Springs Wash Detention Basin
Spillway Analysis

Project: 25574.300
Date: 11-Jun-94
By: S. Canney
Page:

Discharge:	33,400	cfs
Crest Width:	550	ft
Slope:	0.5	ft/ft
Manning's n:	0.034	*(Stepped Face)*
Manning's n:	0.017	*(Apron Slab)*
Side Slope:	1.5	horz to 1.0 vert
Depth at Crest Yc	4.86	ft
Critical Velocity Vc	12.50	fps
alpha	1.0	

This spreadsheet computes water surface profiles and EGL from the crest of the spillway to the end of the spillway apron. The procedure is one of trial and error solution for flow depth Y, at various distances from the spillway crest. Computions are based on the Standard Step Method. The proceedure is based on the methods presented by Chow for the spillway at the La Tuna Canyon Debris Basin in Los Angeles County California.

Location From Crest (ft)	Step Distance (ft)	Chute Width (ft)	Trial & Error Depth (ft)	Flow Area (sf)	Wetted Perimeter (ft)	Hydraulic Radius (ft)		Velocity (fps)	Factored Velocity Head	Energy Head	Energy Change	Friction Slope	Average Friction Slope	Invert Slope		Distance Check
	dx	b	y	A	P	R	R^1.333	V	alpha*V^2/2g	E	dE	Sf	Sf	So	So-Sf	dx
0		550.00	**4.8563**	2706.33	567.51	4.77	8.03	12.50	2.43	7.28		0.01014		0.500		
20	20	520	**2.2880**	1197.61	528.25	2.27	2.98	27.89	12.08	14.37	7.08101	0.13599	0.14613	0.500	0.35387	20.0102
40	20	490	**2.1334**	1052.19	497.69	2.11	2.71	31.74	15.65	17.78	3.41443	0.19337	0.32936	0.500	0.17064	20.0094
60	20	460	**2.1489**	995.42	467.75	2.13	2.74	33.55	17.48	19.63	1.85114	0.21417	0.40754	0.500	0.09246	20.0214
80	20	430	**2.2194**	961.73	438.00	2.20	2.85	34.73	18.73	20.95	1.31677	0.22007	0.43424	0.500	0.06576	20.0229
100	20	400	**2.3168**	934.77	408.35	2.29	3.02	35.73	19.82	22.14	1.19325	0.22036	0.44042	0.500	0.05958	20.0292
120	20	370	**2.4345**	909.66	378.78	2.40	3.22	36.72	20.93	23.37	1.22753	0.21828	0.43864	0.500	0.06136	20.0058
140	20	340	**2.5729**	884.70	349.28	2.53	3.45	37.75	22.13	24.70	1.33609	0.21495	0.43323	0.500	0.06677	20.0117
160	20	310	**2.7358**	859.32	319.86	2.69	3.73	38.87	23.46	26.19	1.48922	0.21063	0.42558	0.500	0.07442	20.0123
174	14	300	**2.7675**	841.74	309.98	2.72	3.79	39.68	24.45	27.22	1.02215	0.21641	0.42705	0.500	0.07295	14.0109
180	6	300	**2.8650**	871.81	310.33	2.81	3.96	38.31	22.79	25.66	-1.56014	0.04820	0.26461	0.005	-0.25961	6.0095
200	20	300	**2.9854**	908.99	310.76	2.93	4.18	36.74	20.96	23.95	-1.70572	0.04202	0.09022	0.005	-0.08522	20.0160
220	20	300	**3.1043**	945.75	311.19	3.04	4.40	35.32	19.37	22.47	-1.47901	0.03688	0.07890	0.005	-0.07390	20.0138
240	20	300	**3.2218**	982.11	311.62	3.15	4.62	34.01	17.96	21.18	-1.29016	0.03258	0.06947	0.005	-0.06447	20.0127
260	20	300	**3.3380**	1018.11	312.04	3.26	4.84	32.81	16.71	20.05	-1.13152	0.02895	0.06153	0.005	-0.05653	20.0148
280	20	300	**3.4529**	1053.75	312.45	3.37	5.06	31.70	15.60	19.05	-0.99643	0.02586	0.05481	0.005	-0.04981	20.0047
294	14	300	**3.5042**	1069.68	312.63	3.42	5.16	31.22	15.14	18.64	-0.40975	0.02462	0.05048	0.005	-0.04548	9.0102

BLACK & VEATCH
ENGINEERS-ARCHITECTS

Owner CCDPW
Plant HIKO SPRINGS Unit
Project No. 25574 File No.
Title Spillway Scour Hole Depth

Computed By S. CANNEY
Date 6-8 19 94
Checked By
Date 19
Page 1 of 2

Reference: USBR "Computing Degradation & Local Scour"

Spillway Design Flood 33,000 cfs ($q = 110$ cfs)

per page 32, may be reasonable to use $\frac{Q_P}{2}$ = 16,500 cfs ($q = 55$ cfs)

Schoklitsch

$$d_s = \frac{K H^{0.2} q^{0.57}}{D_{90}^{0.32}} - d_m$$

$$d_s = \frac{3.15\ 92^{0.2} (110)^{0.57}}{7^{(0.32)}} - 2.1 = 58.8' \text{ @ } Q_D$$

38.9' @ ½ Q_D

Veronese

$$d_s = K H_T^{0.225} q^{0.54} - d_m$$

$$= 1.32 (92)^{0.225} (110)^{.54} - 2.1 = 44.1 \text{ @ } Q_D$$

29.7 @ ½ Q_D

Zimmerman & Maniak

$$d_s = K \left(\frac{q^{0.82}}{D_{85}^{0.23}} \right) \left(\frac{d_m}{q^{2/3}} \right)^{0.93} - d_m$$

$$1.95 \left(\frac{110^{0.82}}{5^{0.23}} \right) \left(\frac{2.1}{110^{0.67}} \right)^{.93} - 2.1 = 4.7 \text{ @ } Q_D$$

3.8 @ ½ Q_D

DO NOT WRITE IN THIS SPACE

P-GN-172A

REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED, Lacey $d_m = 0.47\left(\frac{Q}{f}\right)^{1/3}$

$f = 1.76(D_m)^{1/2} = 1.76(2)^{1/2} = 2.489$

$d_m = 0.47\left(\frac{33000}{2.489}\right)^{1/3} = 11.12'$

$d_s = Z d_m = 1.5(11.12) = 16.7$ ft @ Q_D
13.2 ft @ $\frac{1}{2}Q_D$

Blench $d_{fo} = \frac{q^{2/3}}{F_{bo}^{1/3}} = \frac{110^{2/3}}{2^{1/3}} = 18.5$ ft @ Q_D

$d_s = Z d_{fo} = \overset{0.75-}{1.25}\,(18.5) = $ 13.9 to 23.1 @ Q_D
8.72 to 14.5

DO NOT WRITE IN THIS SPACE

P-GN-172A

United States Department of the Interior
BUREAU OF RECLAMATION
DENVER OFFICE
P O BOX 25007
BUILDING 67, DENVER FEDERAL CENTER
DENVER, COLORADO 80225-0007

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
D-3751
RES-1.10

May 24, 1994

Mr. Steve Canney
Black and Veatch Engineering, Inc.
1900 East Flamingo, Suite 295
Las Vegas NV 89119

Dear Mr. Canney:

Sorry to be so late in sending you this information, but it is hot off the presses. I have included some papers on the laboratory data and the first papers on the large-scale facility at CSU. The separate graph on energy dissipation is new and incorporates a correction factor to the model data for aeration effects. The information on the friction factor and wall heights is directly from the large-scale tests. The data on aspiration characteristics of the steps would be used for stability of a thin layer of stepped concrete over an embankment.

Please don't hesitate to call if you have any questions.

RECEIVED
MAY 27 1994
BLACK & VEATCH
LAS VEGAS

Sincerely,

Kathy Frizell

Kathy Frizell

Enclosures 6

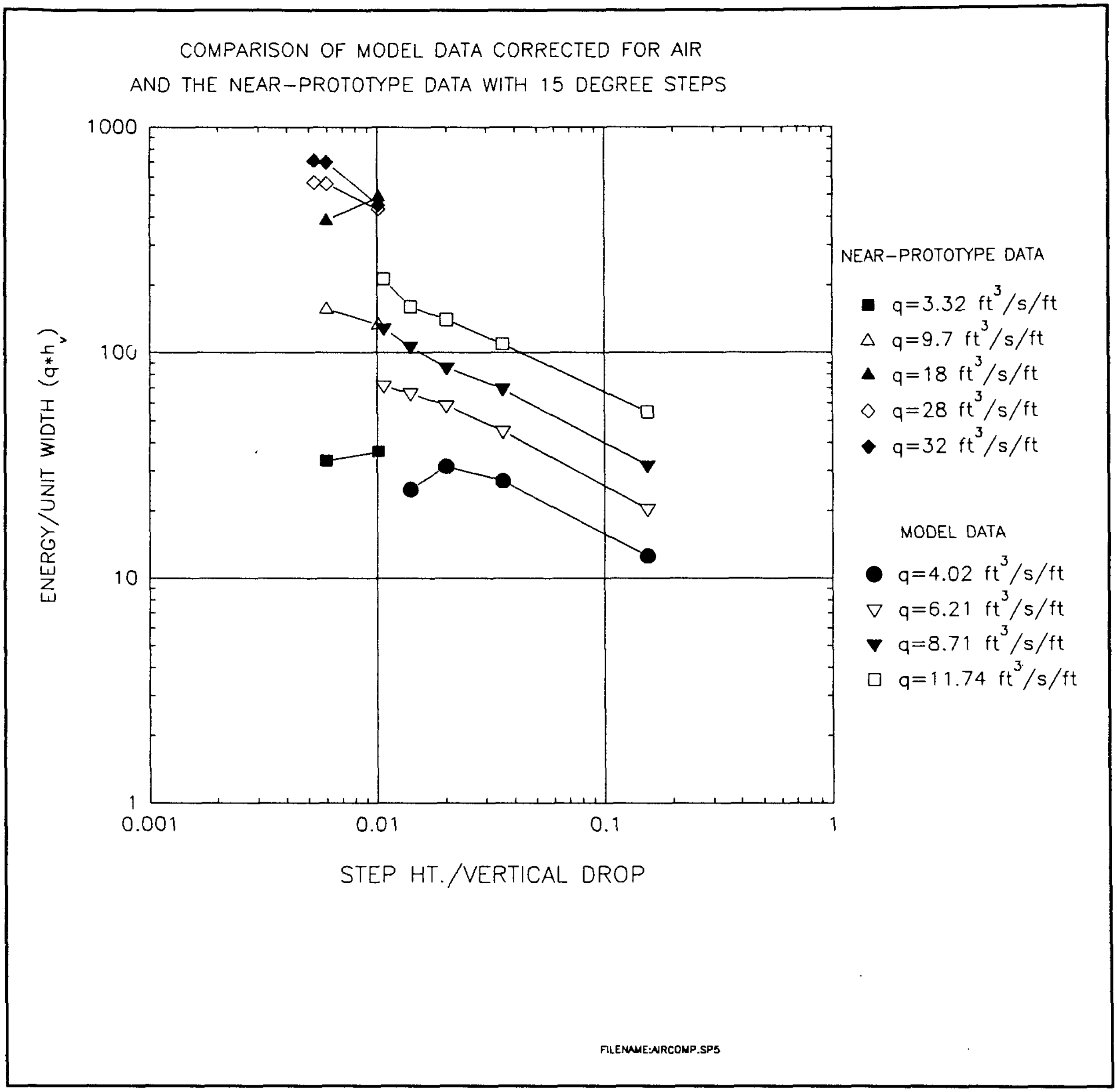
Write up to accompany design curves for energy remaining in the flow for a 2:1 sloping stepped spillway.

This graph may be used to determine the velocity at any point down a 2:1 sloping stepped spillway. The graph is based upon model results, converted to prototype values with results from large-scale testing) and large-scale testing data (from CSU flume) for 15° sloping steps. In the graph, the step height to vertical drop ratio is based upon that of horizontal steps. The step height is chosen based upon the drop associated with a horizontal step of some height, (i.e. 2 or 4'). The vertical drop is the physical drop from the crest to the step in question, usually the dam height.

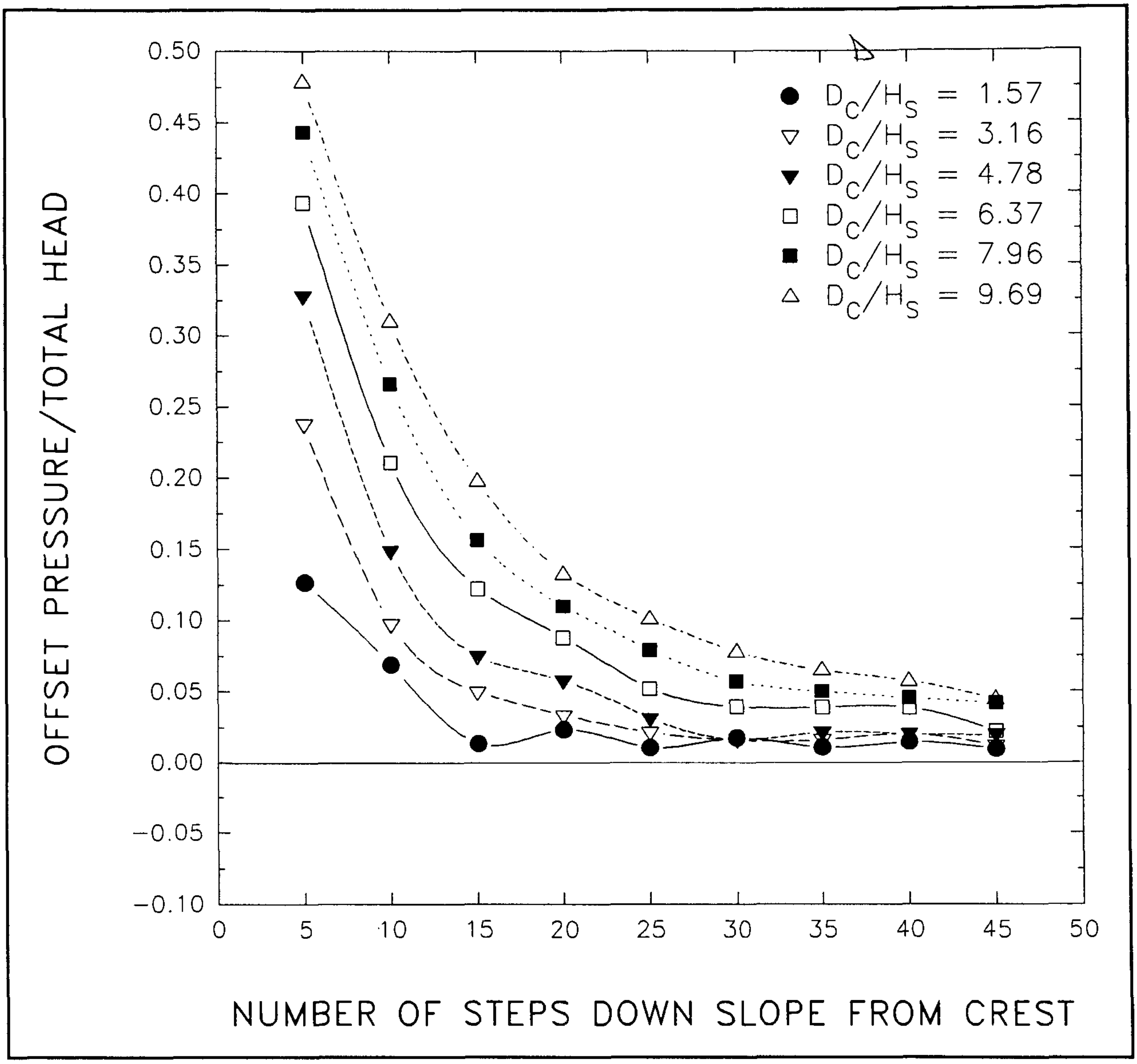
With the dam height known, and the step height selected, then the energy/unit width is determined from the graph. The energy/unit width is the unit discharge times the velocity head ($V^2/2g$). Assuming the discharge is known, the velocity is directly determined. This allows the designer to vary the step height, and spillway width for a given dam height, and determine the most economical step geometry from an energy dissipation standpoint.

The stability of the overlay is actually of most importance and may be determined from the following graphs. These graphs are used to determine the development of the aspiration with distance down the slope. The greater the aspiration (zero or negative pressure) the more uplift pressure is reduced and the more stable the overlay. The legend corresponds to the critical depth over the horizontal step height.

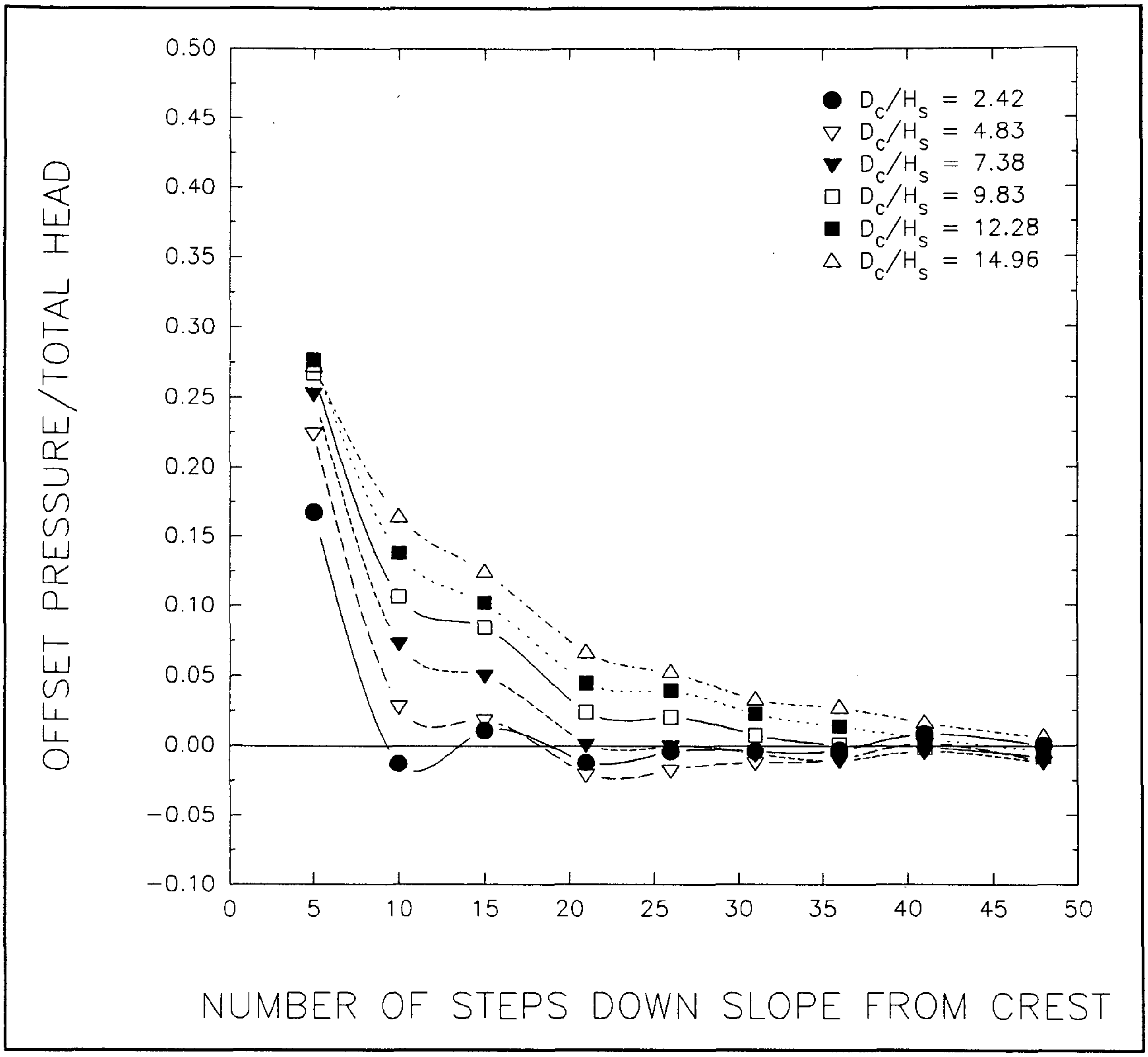
The Darcy-Weisbach friction factor, f, is about 0.11 once uniform flow depth is reached. Designing with this value will give good results for computing flow depths. An additional about 0.25 ft should be added to the wall heights for bulking, plus a factor of safety.


COMPARISON OF MODEL DATA CORRECTED FOR AIR
AND THE NEAR-PROTOTYPE DATA WITH 15 DEGREE STEPS
ENERGY/UNIT WIDTH (q*h_v)
1000
100
10
1
0.001
0.01
0.1
1
STEP HT./VERTICAL DROP
NEAR-PROTOTYPE DATA
q=3.32 ft^3/s/ft
q=9.7 ft^3/s/ft
q=18 ft^3/s/ft
q=28 ft^3/s/ft
q=32 ft^3/s/ft
MODEL DATA
q=4.02 ft^3/s/ft
q=6.21 ft^3/s/ft
q=8.71 ft^3/s/ft
q=11.74 ft^3/s/ft
FILENAME:AIRCOMP.SP5

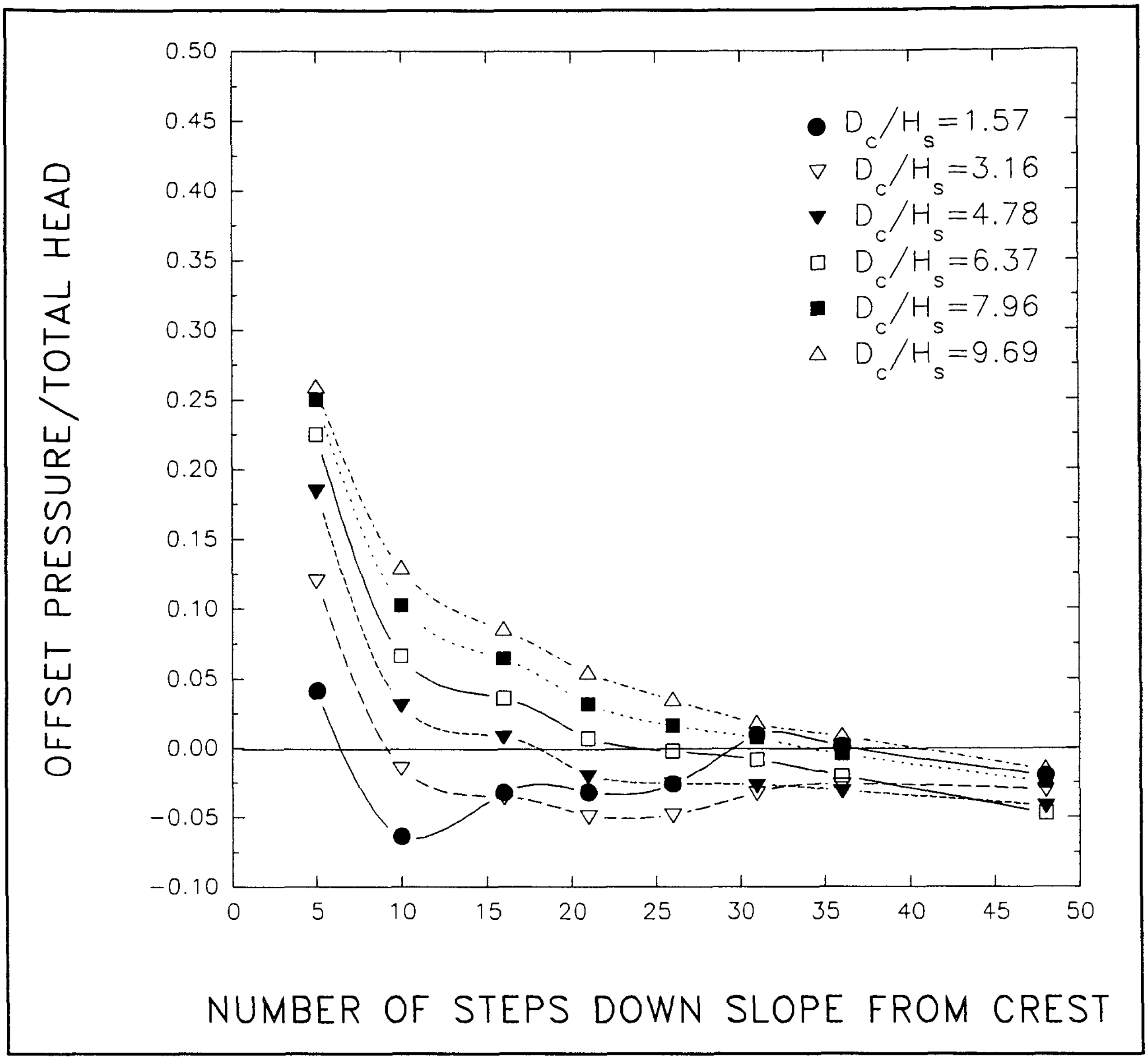
critical depth / step height



Horizontal steps



10° sloping steps



15° sloping steps

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HYDRAULICS OF STEPPED SPILLWAYS FOR RCC DAMS AND DAM REHABILITATIONS

By
K. H. Frizell[1]

ABSTRACT

Stepped spillways are natural extensions of roller-compacted concrete (RCC) placement techniques. Stepped spillways were first used with concrete dams, and designers are eager to use the same technology to pass flows over the top of embankment dams by providing erosion protection for the downstream slope of the dam. This paper will discuss the use of stepped spillways for both applications. Case histories of stepped spillway applications worldwide and the hydraulic advantages are given. Results from U.S. Bureau of Reclamation's (Reclamation) current research program to define the hydraulics of stepped spillways are presented. The forces and velocities produced by flow over the stepped spillway are quantified and an example of the benefit of reduced stilling basin lengths is presented.

INTRODUCTION

RCC has easily become the most popular method for building new concrete dams and/or rehabilitating many types of existing dams. Modern day RCC dam construction began in the U.S.A. in 1982 when the U.S. Army Corps of Engineers built Willow Creek Dam in Oregon, for flood control. Although constructed of RCC a typical smooth surface chute type spillway passes flow down the center of the dam. Earlier, Tarbela Dam, in Pakistan, had experienced major erosion damage in two spillway plunge pools. This was also repaired using huge amounts of rollcrete, a lean form of RCC, quickly and cost effectively.

Reclamation's first RCC experience was the construction of Upper Stillwater Dam about 80 miles east of

[1]Hydraulic Engineer, U. S. Bureau of Reclamation, P. O. Box 25007, Denver, Colorado, 80225

Salt Lake City, Utah. This dam was built for irrigation storage. A stepped spillway covering a portion of the downstream dam face is capable of passing the probable maximum flood (PMF).

These early successes with RCC placement, producing quick results and low costs, have made RCC extremely popular in the dam building industry. Application has now extended from new dam construction to dam rehabilitations, including existing concrete, crib, embankment, and rockfill dams. Reclamation now has increased interest in applying concrete stepped overlays to protect high embankment or rockfill dams during overtopping events. This interest is a direct result of increased PMF requirements producing deficiencies in present dams and the high costs of traditional Dam Safety remedies. A cooperative research program funded by Reclamation's Dam Safety (SOD) and Water Technology and Environmental Research (WATER) programs, and the Electric Power Research Institute (EPRI) is now being conducted to determine the hydraulic properties of stepped spillway applications.

PURPOSE AND ADVANTAGES OF STEPPED SPILLWAYS

The use of stepped spillways is not a new technology. The ancient Romans first designed low head structures where water flowed down steps. Also early masonry dams (circa 1900) in the U.S. featured stepped spillways. Reemergence of stepped spillways is attributed to the RCC horizontal lift placement techniques of which a stepped surface is a natural outcome. Usually the secondary reason is the potential for dissipation of the flow energy as it travels down the steps to the toe of the dam. Energy dissipation also provides a cost benefit due to the reduced stilling basin length or entire elimination of the required basin. The step shape has been obtained in many ways. Steps have been shaped from unformed or formed RCC, and standard formed or slip-formed conventional concrete with or without reinforcement.

The problem with using stepped spillways has been, and continues to be, the lack of general design criteria that quantifies the energy dissipation characteristics of the steps for a given unit discharge, flow depth, and hydraulic dam height. Steps have proven effective for small unit discharges, where the step height clearly influences the flow. The need to pass larger flows has pushed designs beyond the limitations of the present data base.

The main objective of Reclamation's stepped spillway research program is to define energy dissipation properties

of steps for concrete and for embankment dams while ensuring a stable, protective overlay for the embankment.

STEPPED SPILLWAYS FOR RCC DAMS

Table 1 lists many concrete dams where a stepped spillway on the downstream face of the dam is used as either the service or emergency spillway. Only those dams that have formed steps specifically for providing reduced flow velocities are listed. Many of the dams have incorporated a stepped spillway without the benefit of hydraulic model investigations. Those site-specific stepped spillways with model study data on energy dissipation will be discussed further.

Table 1. - RCC or Rehabilitated Conventional Concrete Dams with Stepped Spillways on the Downstream Face.

Dam and location (Reference, date)	Design unit discharge ($ft^3/s/ft$)	Hydraulic Height (ft)	Head (ft)	Downstream slope (H:V)	Downstream concrete facing and placement technique
Upper Stillwater,* UT (Houston, 1987)	123.33	202	9.8	0.32:1 top 0.6:1 toe	Conventional slip-formed
Monksville,* NJ (Sorenson, 1985)	100	120	8.6	0.78:1	Conventional formed
Stagecoach,* CO (Stevens)	30	140	4.72	0.8:1	Conventional formed
De Mist Kraal,* South Africa (Jordaan, 1986)	110	59	9.9	0.6:1	Conventional formed
Zaaihoek, South Africa	55	120	6.2	0.62:1	Conventional slip-formed
Lower Chase Creek, AZ	35.95	59	4.50	0.70:1	Conventional formed
Milltown Hill,* OR (Frizell, 1990)	134.2	180	11.24	0.75:1	Conventional slip-formed
Middle Fork, CO	overtops for events > 500 yrs.	174	?	0.8:1	Conventional formed
Knellpoort, South Africa	90	141.4	7.8	0.80:1	Conventional formed
Santa Cruz, NM	43	120	5.5	0.85:1	Conventional formed
Bucca Weir,* Australia	598	39	37.0	0.5:1	Conventional formed
Jequitai,* Brazil	98.9	118.0	6.07	0.80:1	Proposed formed RCC
Junction Falls Dam, WI	123	29.5	7.5	0.875:1	Conventional formed

Dam and location (Reference, date)	Design unit discharge ($ft^3/s/ft$)	Hydraulic Height (ft)	Head (ft)	Downstream slope (H:V)	Downstream concrete facing and placement technique
Les Olivettes, France	78	103.35	9.84	0.75:1	Conventional formed
Cedar Falls, WA	30	25	4.68	0.80:1	Conventional formed

*Stepped spillway designs were determined by hydraulic model studies.

Previous Hydraulic Model Studies of Stepped Spillways for Concrete Dams

Energy dissipation characteristics of several site-specific hydraulic model tests are shown in figure 1.

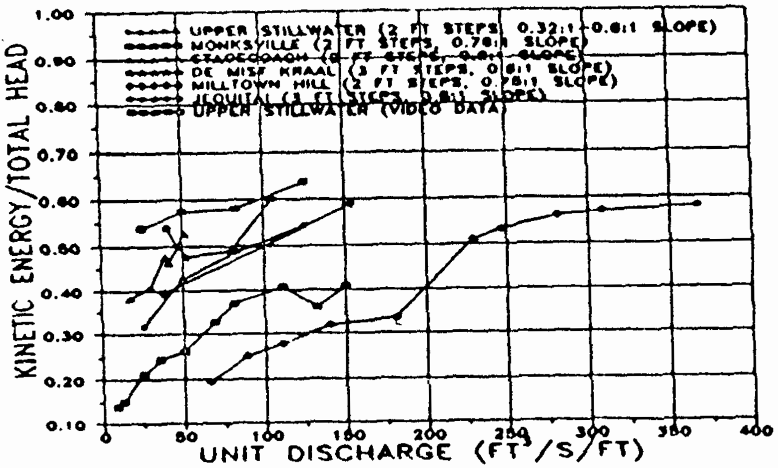

Figure 1. - Energy Dissipation Characteristics at the Toe of Stepped Spillways on Steeply Sloped RCC Dams.

These data are plotted in prototype values and show the ratio of the kinetic energy at the dam toe to the total available head versus the unit discharge. The kinetic energy was calculated using measured velocities on the steps near the dam toe. The ratio reduces to the average stepped spillway velocity over the theoretical maximum velocity, V_a/V_t, for a given dam height. Most of the information is for dams with 2-ft step heights.

There is obviously a great deal of scatter in these data (note the two curves for Upper Stillwater Dam data). Various techniques were used to measure the stepped spillway velocities. These included high speed video, pitot tubes, velocity meters, calculating continuity using measured flow and depth, and calculating the entrance velocity based on a forced hydraulic jump. Velocity data obtained using video recorded only the surface velocity, thus the higher amount of energy remaining at the toe for the Upper Stillwater video data in figure 1. The very turbulent and aerated flow makes obtaining velocity data extremely difficult and produces much of the data scatter. This figure will give the designer some general idea of the velocities at the toe of a stepped spillway taking into account the dam height and staying within the range of data shown.

One objective of Reclamation's research program is to better quantify the velocity or energy remaining in the flow at the toe of a concrete dam with a stepped spillway. This will improve safe designs of these spillways with appropriate and cost effective stilling basin lengths.

STEPPED SPILLWAYS FOR EMBANKMENT DAMS

Dam Safety inspections have concluded that a large number of both small and large embankment dams are unsafe due to predicted overtopping during extreme flood events. Construction of RCC protection for overtopping flow on existing or new embankment or rockfill dams has proven to be very cost effective. The present emphasis of the research program on stepped spillways is on the hydraulic properties produced by the steps on flatter slopes more common to embankment dams. This also has led to determining the step geometry that provides the most stable overlay with energy dissipation characteristics of secondary importance. Table 2 is a list of several embankment dams that have been protected or are planned for rehabilitation with RCC. These range in height from about 20 ft to as much as 119 ft.

Table 2. - Stepped Spillways for Protection of the Downstream Slope of Embankment Dams.

Dam and location	Unit discharge ($ft^3/s/ft$)	Hydraulic height (ft)	Head (ft)	Downstream slope (H:V)	Downstream concrete facing and placement technique
Lahontan, NV	68	110	6	≈2:1	Conventional formed
Brownwood Country Club, TX (Reeves, 1985)	24.7	19	5.5	2:1	RCC unformed

Dam and location	Unit discharge ($ft^3/s/ft$)	Hydraulic height (ft)	Head (ft)	Downstream slope (H:V)	Downstream concrete facing and placement technique
Kerrville, TX	335	21	24	0.8:1	RCC unformed
McClure, NM (Frizell, 1990)	97.26	119	10.26	2.18:1	RCC unformed
Spring Creek, CO	28.25	50	4.46	2.3:1 to 3:1	RCC unformed
Goose Lake, CO (Birch, 1990)	9.1	35	2.4	1:1	RCC formed
Upper Las Vegas Wash Retention Dam	230	37	18	2.5:1	RCC
Ringtown No. 5 Dam, PA	48	80	8.0	2.75:1	RCC unformed

HYDRAULIC RESEARCH OF STEPPED OVERLAYS

Increased PMF forecasts have resulted in numerous low and high dams with inadequate spillway capacity in all business sectors. As a result, Reclamation's Dam Safety and Research Programs have taken the lead in providing funding for investigation of stepped spillway dam overtopping protection.

Laboratory Research Facility

Reclamation's laboratory research facility includes two 1.5-ft-wide Plexiglas-walled flumes--one for steep 0.5:1 to 0.8:1 slopes appropriate for concrete dam applications and one for embankment dam slopes ranging from 2:1 to 4:1. The facility allows investigation of model unit discharges up to 14 $ft^3/s/ft$ under reservoir heads up to 2.8 ft. The total drop from the laboratory reservoir to the controlled tailwater is 15.5 ft. One reservoir serves both flumes.

Emphasis is currently focused on providing stepped protection for 2:1 sloping embankment dams. The flume facility for stepped protection of embankment dam slope investigations has been in operation since January 1990, figure 2. The flume facility for stepped spillways on steep concrete dams is 50 percent complete and is scheduled for testing in June 1992.

Stepped Spillway Protection on a 2:1 Slope

Primary importance for embankment dam overtopping protection is placed upon the stability of the stepped

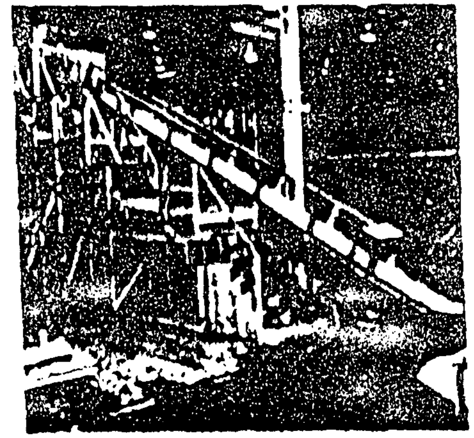

Figure 2. - Overall View of Sloping Flume Facility

concrete overlay. Research is focused on enhancing stability by providing continuous aspiration of subgrade seepage by virtue of the flow characteristics over the stepped surface. Aspiration is suction of the fluid from underneath the overlay. Suction is produced by the pressure differential created by the high velocity flow over the step offset area. For embankment dam protection, the benefit of energy dissipation and reduced velocities at the dam toe are of secondary consideration. The step geometry will be optimized to produce a zone of subatmospheric pressure to relieve buildup of seepage pressure under the overlay. A series of three step geometries is currently under investigation. For each geometry, the flow depth, pressure profiles on the steps at chosen locations, and velocity profiles (every ten steps beginning at the third step downstream from the crest) are recorded. For presentation purposes, a model unit discharge of 6.21 $ft^3/s/ft$ and overtopping head of 1.67 ft will be used throughout the paper to demonstrate and compare the test results.

Step geometry. - Flow over horizontal steps was investigated first. Model steps had a 4-in horizontal tread with a 2-in vertical rise. Following these tests the step tread was sloped downward, at 15° and 10°. The sloped tread was shown in tests by Pravdivets (Pravdivets, 1989) and Clopper (Clopper, 1989), who used individual wedge shaped blocks, to aspirate the subgrade through vent ports. The shapes tested in the flume will be continuous in width with 15° and 10° slopes below horizontal on the tread, figure 3.

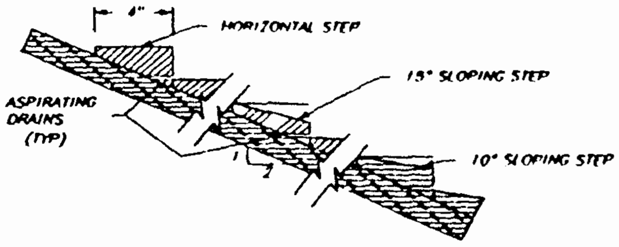

Figure 3. - Schematic of Horizontal, 15°, and 10° Sloping Steps Tested in the Flume.

Pressure Profiles. - The ability of the step shape to produce aspiration of the subgrade flows caused by passing discharges is determined by measuring the pressures on both the vertical and tread surfaces of the steps at specific measurement stations down the slope. Three stations down the flume were instrumented for the horizontal steps, two for the sloping steps. At each station, two steps are instrumented, each with 11 piezometer taps, for a total of 22 taps per station. (Note: The steps are numbered from the crest down the slope.) The mean pressure from each tap is recorded and the profiles plotted over the steps at each station.

The pressure profiles on two successive horizontal steps for 1.67 ft of overtopping head and the measured flow depth clearly show the flow characteristics, figure 4. Comparison of the flow depth with the pressure profiles shows two distinct pressure zones. One zone produces additional loading on the overlay where the jet impacts on the downstream end of the step tread, and the other zone produces reduced pressure in the offset area below the pitch line of the steps where separation of the jet off the step occurs. When considering stability of the entire stepped overlay, the impact provides additional downward force when added to the flow depth; however, in the case of the horizontal tread, the pressure in the offset area is not low enough to provide continuous aspiration of the underlying filter zone.

Sloping the step tread causes a sharp reduction in the low pressure region of each step as compared to the horizontal step. Pressure profiles (1.67 ft of head) measured on the 15° sloping steps at both stations are shown on figure 5. These profiles indicate decreased pressure, compared to the horizontal tread, at the upper

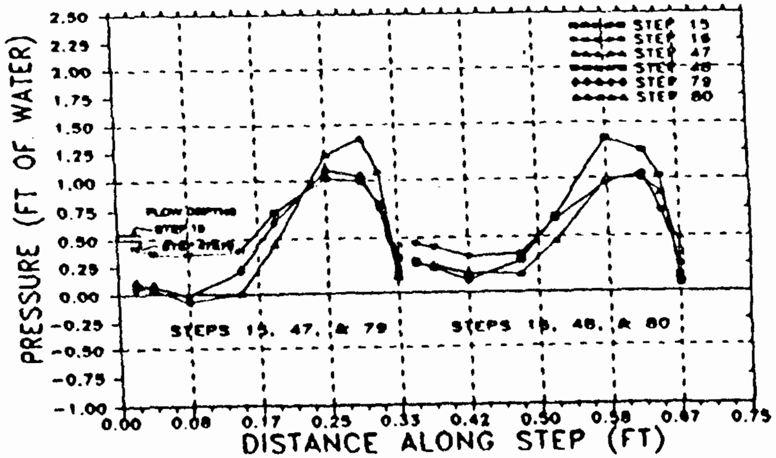

Figure 4. - Pressure Profiles on Horizontal Steps, q = 6.21 ft²/s/ft, H = 1.67 ft.

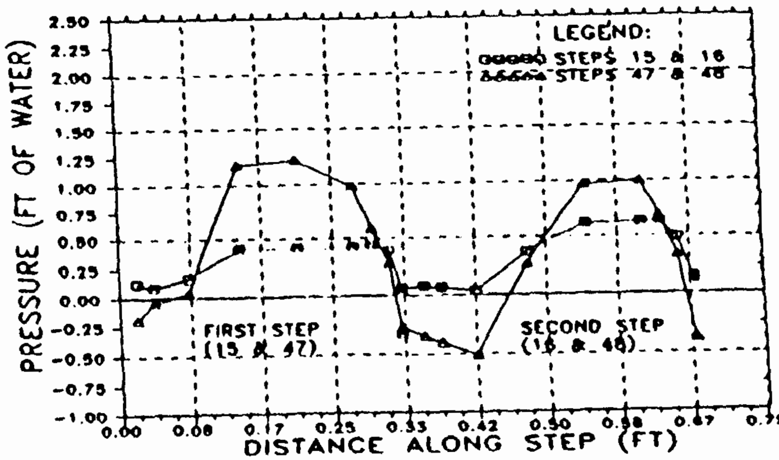

Figure 5. - Pressure Profiles for 15° Sloping Steps, q = 6.21 ft²/s/ft, H = 1.67 ft.

station (steps 15 and 16) and subatmospheric pressures at the lower station (steps 47 and 48). These pressures indicate that velocities are not high enough to produce subatmospheric pressures, thus ensure aspiration, at the upper station. The pressures are subatmospheric over a large area at the lower station and should produce excellent aspiration of the subgrade flows.

If drains are placed in areas which do not aspirate under all expected flows, two conditions may occur. First, if the seepage hydrostatic head behind the drain is greater than the pressure on the step face, the drain will function to relieve uplift pressures. Conversely, if the pressure behind the drain is lower than occurs on the step face, the drain will actively feed water into the subgrade. In general, reverse flow through a drain should be avoided. It is clear from figure 4 that placing drains in horizontal steps on a 2:1 embankment does not ensure embankment drainage. However, the pressure data measured at steps 47 and 48 from figure 5 for a 15° sloping tread show a subatmospheric pressure zone downstream of the step, thus a drain vented in this zone will aspirate for this geometry and flow condition.

Aspiration may be assured by defining the limits of active aspiration in terms of unit discharge, embankment slope, step geometry, and step position down the embankment. The designer can identify aspiration limits of different step angles and determine the placement of drains. The designer then would conduct a stability analyses, including the hydraulic forces and the required thickness of material to assure a stable overlay. The aspirating step geometry will allow the designer to place less material over the embankment and still be assured of stability. Once a stable overlay is designed, the step geometry can be optimized in terms of energy dissipation. The designer may then weigh the benefit of aspiration versus energy dissipation in determining the final step shape selection. The 10° sloping step, scheduled for the next test series, will likely provide less aspiration but have better energy dissipation properties than the 15° steps.

Velocity Profiles. - Velocity profiles are measured down the flume slope using a laser-doppler anemometer mounted on a support frame parallel to the flume slope. Measurements are taken from the tip of the step (datum) to as close to the water surface as possible. The total velocity vector and the magnitude parallel to the slope is computed from the horizontal and vertical components measured at each flow depth. A commercially available software program is then used to provide a best fit equation for each profile. The best fit equation describing the velocity profile is then used to compute the total area under the velocity profile and check for continuity. If necessary, the entire profile is adjusted by a constant, usually in the range of 0 to 3 percent, and the procedure repeated until continuity

is satisfied. Once continuity is satisfied, the velocity profiles are used to calculate the kinetic energy of the flow at each step.

Figure 6 shows the velocity profiles for a horizontal step tread at steps 3, 13, 23, and 33. Notice the near vertical profile at step 3 and the flattening and closer spacing of the profiles as the flow travels down the slope. The velocity profiles for 15° sloping steps exhibit similar traits; however, the velocities are somewhat higher. This indicates that the sloping steps do not interfere as much with the flow, particularly as the flow depth increases. Figure 7 compares the velocity profiles

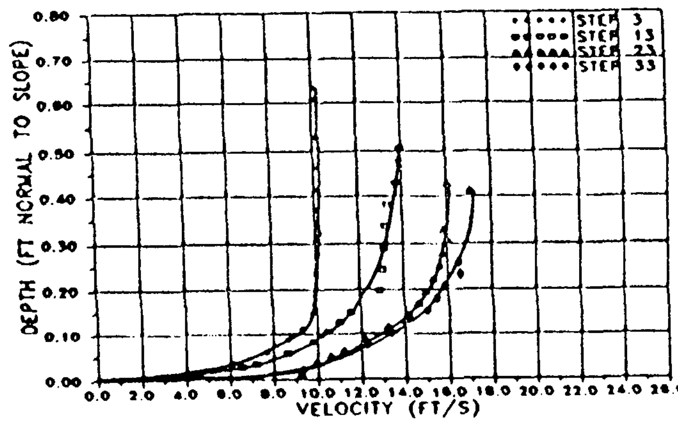

Figure 6. - Velocity Profiles for Horizontal Steps, $q = 6.21$ ft^3/s/ft, $H = 1.67$ ft.

of a smooth surface to those of horizontal and 15° sloping steps at the location of step 23. Of particular interest is the shape of the profiles below a flow depth of 0.2 ft. Here, close to the steps the effect of the step geometry in reducing the flow velocity is quite apparent.

Energy Dissipation. - The energy dissipation characteristics of the step geometries are compared by computing the kinetic energy per unit volume, $\frac{1}{2}\alpha\rho V^2$, to the total head available, $w(H+H_s)$, at each step location. The kinetic energy is calculated by integrating the area under the velocity profile and determining α, the coefficient of kinetic energy. The total head is calculated by adding the overtopping head, H, to the vertical drop from the crest to the step location where the velocity measurement is taken, H_s, and multiplying by the specific weight of water, w.

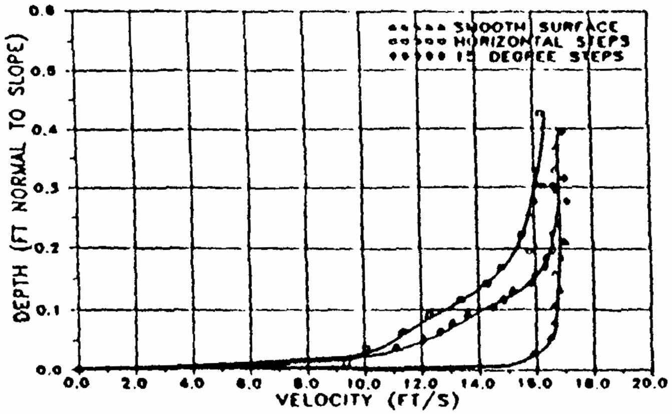

Figure 7. - Velocity Profiles at Step 23 for Smooth, Horizontal, and 15° Sloping Steps.

Figures 8 and 9 show the ratio of kinetic energy to total head along the slope for horizonal and 15° sloping steps and the unit discharges investigated. Note that the

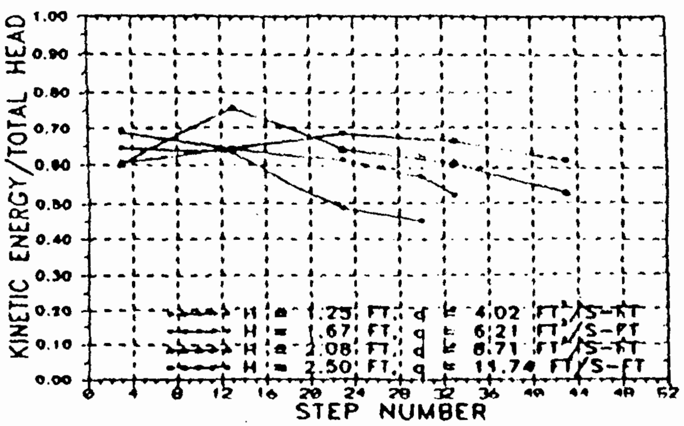

Figure 8. - Ratio of Kinetic Energy to Total Head vs. Step Number for Horizontal Steps on a 2:1 Slope.

kinetic energy remaining in the flow increases as unit discharge increases for both step geometries.

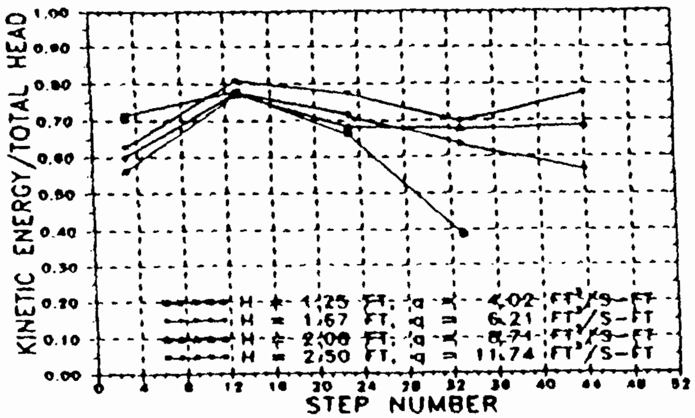

Figure 9. - Ratio of Kinetic Energy to Total Head vs. Step Number for 15° Sloping Steps.

A comparison of the smooth, horizontal, and 15° sloping steps at a unit discharge of 6.21 ft^2/s/ft is shown on figure 10. This figure shows the benefits of the step geometry in reducing the total energy available after the flow has travelled down the slope for a given length. The smooth surface spillway shows the flow is still accelerating, while the horizontal steps show the greatest reduction in energy. However, since the horizontal steps do not provide continuous aspiration of the subgrade flows, a sloping step geometry must be chosen which will optimize both aspiration and energy dissipation.

For example, lets determine the length of an uncontrolled hydraulic jump below a 46-ft-high dam (23 steps 2-ft high) for each of the three flow surfaces presented in figure 10. Such a structure would represent a 1 to 12 Froude scale of the model investigation. The calculations assume that the hydraulic jump will be contained in a Type I basin which has no end sill to force the jump (Peterka, 1978). Using figure 10 and scaling up unit discharge (prototype discharge = 258.2 ft^2/s/ft) and overtopping head (prototype head = 20.0 ft) the velocity entering the jump ... calculated as V_1 = (KE/H) * 46 ft. The depth entering the basin, $D_1 = q/V_1$. Figure 6 from Monograph 25 ...

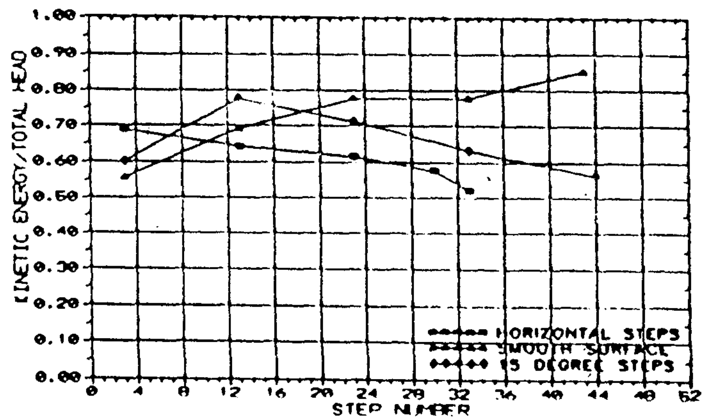

Figure 10. - Kinetic Energy to Total Head Ratio vs. Step Number for a Smooth Surface, Horizontal and 15° Sloping Steps, $q = 6.21\ ft^3/s/ft$, $H = 1.67\ ft$.

Froude number, $F = V_1/(gD_1)^{½}$, to determine the ratio of the hydraulic jump length, L, to the depth entering the basin. The calculated stilling basin lengths for the three surfaces are shown in table 3.

Table 3. - Comparison of Hydraulic Jump Lengths for Smooth Surface, 15° Sloping, and Horizontal Stepped Spillways.

Spillway	KE/H, (fig. 10)	V_1 (ft/s)	D_1 (ft)	F_1	L (ft)
Smooth surface	.771	50.27	5.14	3.91	146.5
15° sloping steps	.711	46.35	5.57	3.46	133.7
Horizontal steps	.6158	40.15	6.43	2.79	115.7

Containing the hydraulic jump within a basin with no end sill (Type I) shows a decrease in stilling basin length of 21 percent is achieved for the horizontal steps versus the smooth surface spillway. From figure 10 it is also apparent that velocities entering the basin will show the

horizontal steps to be more beneficial as the unit discharge increases. A reduced stilling basin length represents a significant savings in construction time and costs.

EMBANKMENT STABILITY

The most important feature of a stepped overlay on an embankment slope is that the underlying material of the dam remains stable. Saturation of the embankment may occur due to seepage through the overlay or by flow from the reservoir. An adequate drainage system should be utilized underneath the concrete overlay to prevent buildup of uplift pressures that may cause localized failure or general sliding of the embankment or overlay.

The recommended step design will provide continuous aspiration of subgrade flows through the overlay to prevent uplift pressures. Computer modeling of the tractive shear forces imposed on the overlay and embankment during flows is being developed.

Presently, of utmost concern with stepped spillway and overtopping designs is the location of embankment drains with respect to the tailwater and location of the hydraulic jump. Drains exiting the concrete overlay in the area of the hydraulic jump are subject to the dynamic pressures associated with the violent action of the jump. Care should be taken to not locate unprotected drains in the stilling basins or in the tailwater zone of any stepped spillway or overtopping protection.

CONSTRUCTION TECHNIQUES

The stepped spillway research was initiated with the assumption that whatever shape proved to be most efficient from a hydraulic standpoint could be constructed in a continuous placement. This assumption puts no constraints on the shape of steps investigated but may produce some challenges for the construction contractors. The steps may be formed RCC, conventional concrete placed by slip forming or even reinforced concrete conventionally placed. Besides the step shape, the construction process must allow placement of drains or vents through the overlay to allow the aspiration produced by the step geometry as indicated by the drains shown on figure 3.

NEAR-PROTOTYPE TESTING

Reclamation plans to conduct near-prototype testing of embankment overtopping protection alternatives in an outdoor flume facility at Colorado State University in Fort Collins, Colorado. Construction of the facility will begin during the summer of 1991 with completion scheduled for the winter of 1992.

The near-prototype flume with be constructed on a 2:1 slope with a drop of about 50 ft. The 5-ft flume width will allow testing of unit discharges up to about 50 $ft^3/s/ft$.

Testing is scheduled to begin in the spring of 1992 with a test program scheduled for completion in 1994. The following tests are planned:

- Wedge shaped blocks with shape optimized from present laboratory flume tests
- Large-sized riprap
- RCC, both formed and unformed
- Smooth reinforced concrete deck
- Reinforced rockfill blanket or cable tied riprap
- Cable tied blocks

CONCLUSIONS

Early stepped spillway applications were on RCC dams with steep downstream slopes. The major benefits derived were ease of construction and energy dissipation, thus producing shorter stilling basins. These were generally high RCC dams with 2-ft step heights constructed with conventional concrete. The data available (presented on figure 1) to quantify the amount of energy dissipated by flow down these steep RCC dams can only provide general guidelines for sizing stilling basins due to the great amount of scatter. Present Reclamation research will improve our ability to predict step spillway energy dissipation.

The emphasis of present research has been on producing a stable stepped spillway overlay, that still provides energy dissipation, on 2:1 embankment dam slopes. The results reported in this paper show excellent promise toward achieving this end. The sloping step geometry will provide aspiration of seepage necessary for stability. The steps on a 2:1 slope, while not dissipating as much energy as the steep concrete dam slopes, do provide advantages over a traditional smooth surface spillway. Final results from the 2:1 laboratory flume studies should be available in the fall of 1991.

After the step geometry is finalized for a 2:1 slope the placement of drains through the formed overlay will be the next challenge. It appears that present forming and consolidation techniques could be modified to accommodate the required step geometry.

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HYDRAULIC DESIGN OF STEPPED CONCRETE OVERTOPPING PROTECTION FOR EMBANKMENT DAMS

By Kathleen H. Frizell[1]

Introduction Dam Safety concerns over increasing Probable Maximum Floods (PMF) has prompted investigation into cost effective methods to discharge large flood events. The cost effectiveness of allowing an embankment dam to be safely overtopped is proven. The technology to assure the dam cam safely be protected during overtopping is now being developed. The U.S. Bureau of Reclamation is currently conducting research on stepped concrete overlays for use as protection during overtopping for embankment dams of any height.

Purpose The purpose of Reclamation's research is to develop design criteria for stepped spillway overlays that will ensure the stability of the embankment and the protective overlay during overtopping. The stability of the overlay is enhanced by producing continuous aspiration of the subgrade seepage, thus preventing uplift. The impact of the jet on the step tread produces additional downward loading which also counteracts uplift. Combining this stability factor with the additional benefit of reduced flow velocities at the dam toe due to the step roughness produces a very attractive protective scheme.

Approach A 2:1 sloping flume facility in Reclamation's hydraulic laboratory is being used to quantify the hydraulic forces associated with stepped protection for embankment dams (Frizell et. al.,1991). Development of the step shape that provides aspiration of the subgrade pressures was patterned after a wedge-shaped block used by Pravdivets (1989) and tested by the Construction Industry Research Information Association (CIRIA) (Baker, 1989). This work focused on the premise that weight was the controlling factor in the block design. The basic stability of the blocks has been established, but the work does not relate the stability to block geometry, overtopping head or unit discharge.

Reclamation has tested three step shapes in the 2:1 sloping flume facility; a step with horizontal tread, and steps with 10° and 15° slopes below horizontal, figure 1. The shape of the step has been designed for stability whether used as individual blocks or as a continuous overlay, such as would be achieved with a paving type process. Pressures on the step surfaces, velocities, and flow depths, were measured for each of these step shapes. Analyses performed on these data have produced sets of design curves for each step shape on a 2:1 slope that provide pressure loadings and quantify the energy remaining in the flow down the slope.

Design Approach A designer may choose to optimize or balance either the stability or the energy dissipation of a stepped overlay by using the results of the laboratory testing. Of the step shapes tested, the horizontal steps provide the most energy dissipation, and the steps with a 15° slope from horizontal provide the best aspiration characteristics. The decision

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regarding step design may be driven by the condition of the embankment being protected, the predicted amount of seepage underneath the overlay, the requirements for protection at the dam toe, the economic feasibility, etc. Design curves, in model values, have been developed for each step shape that provide:

- Pressure profiles on the step surfaces measured at specific locations along the slope.

- Magnitude and location of low pressures occurring just downstream of the vertical step face on the step tread.

- Energy remaining in the flow at various step locations down the flume.

- Typical hydraulic structures design manuals may then be used to determine dam toe protection, i.e. stilling basin lengths, riprap sizes, etc.

Results - 15° steps Design curves for the 15° step shape on a 2:1 slope are presented. The same types of curves have also been developed for the 10° and horizontal steps; however, will not be presented in this paper for the sake of brevity.

Surface pressure profiles were measured on steps 15 and 16, steps 47 and 48, and steps 79 and 80. These profiles provide the location and magnitude of the different pressure regions on the step when compared to the measured flow depths. An example of the pressure profile at step 16 and step 48 for an overtopping head to step height ratio of 14 is given on figure 2. The low pressure region in the offset area downstream of the step rise and the impact region towards the downstream edge of the step tread are clearly defined. The pressure profiles are essential to determining the stability of the step geometry.

The pressure profiles measured at the three locations down the flume showed that the magnitude of the low pressures increased as flow traveled down the slope. To more closely define this low pressure zone where aspiration will occur, a single pressure measurement was taken on the step tread immediately downstream of the step rise. Pressures were measured every 5 steps down the flume slope. These data were plotted as a series of dimensionless curves that relate the low pressure on the step (0.02 ft from vertical step face) to the step location down the slope, figure 3.

Figure 3, shows that the minimum surface pressure is a function of the overtopping head, H, to step height, h_s, ratio. The distance down the slope at which the minimum surface pressure is reduced to atmospheric is an important design consideration. Drains placed below this location will provide aspiration of all subgrade seepage. Drains placed above this location, while exposed to pressures above atmospheric, will still aspirate the subgrade seepage down to the minimum pressure level defined by the curves. Compiled with similar data from the 10° and horizontal steps, the designer can customize the step geometry to control the amount of seepage, thus uplift, underneath the stepped overlay.

Velocity profiles were measured every 10 steps down the flume slope to determine the kinetic energy remaining in the flow after traveling over the steps. The dimensionless ratio of kinetic energy remaining in the flow to total available head versus number of steps down the slope is shown on figure 4. Use of these curves allows a designer to calculate the average velocity at the dam toe for a given design head. A designer may then use this velocity to determine the protection required at the dam toe.

Near-Prototype Testing A large scale flume test facility is currently under construction. The facility will be 5-ft-wide, have a 50 ft drop on a 2:1 slope, and have a maximum discharge capacity between 40 to 50 $ft^3/s/ft$. (Discharge is dependent on available reservoir head.) A step shape designed from the laboratory tests will be tested in the facility beginning in the fall of 1991. First, the step shape will be tested for individual block construction. The blocks for the large scale flume facility were designed as follows:

The top curve from figure 3, or $H/h_s = 28$, was used for a 15° block design that would produce the least amount of aspiration. This would ensure that conservative tests were performed and allow replication of all model data. From this curve, the overtopping head is 28 times the step height. Assuming a unit discharge of 40 $ft^3/s/ft$, and using the equation for free flow over a broad crest, the overtopping head will be about 5.6 feet. The scaled step height is $h_s = 5.6/28 = 2.4$ inches. The run of the step exposed to the flow, about 1 foot, is determined by the embankment slope. The ratio of the step run to rise is between 4 and 6 as established by Pravdivets. The weight and thickness of the block was determined from stability analyses that used the measured impact pressures and flow depths for surface loading and assumed hydrostatic pressure under the block. The steps will be constructed in two foot wide blocks and installed into the flume on a varying pattern such that the joints in the flow direction do not line up in successive rows. This requires a half block be used at the ends of each row. The block design for the near-prototype tests is shown on figure 5. For a prototype design the block width can be tailored based on the cost and ease of construction.

Data expected from these tests are pressures both underneath the block and on the block flow surface, velocities, flow depths, air concentrations, and dynamic pressures both under the hydraulic jump and along the slope. Tests of other protective schemes are planned including large diameter riprap, uniform steps, and possibly cable-tied block systems.

Conclusions The laboratory studies to define the design of stepped protection for 2:1 embankment slopes are nearly complete. The step shape may be chosen to provide optimum aspiration of the subgrade and somewhat less energy dissipation (15° step) or to provide maximum energy dissipation and less aspiration (horizontal step).

The results presented may be used by a designer to dimension a stable 15° step geometry for providing overtopping protection for an embankment dam with a

2:1 slope. The design curves on the horizontal (Frizell, 1991) and 10° step shapes are available and a comprehensive report will soon be published.

The step shape was designed purely from a hydraulic standpoint. Individual blocks, continuously placed roller-compacted concrete, slip-formed concrete, or reinforced concrete conventionally formed may be used by the designer depending upon the site and cost effectiveness. The only requirement, other than step shape is the insertion of drains through the stepped overlay to vent the subgrade flow.

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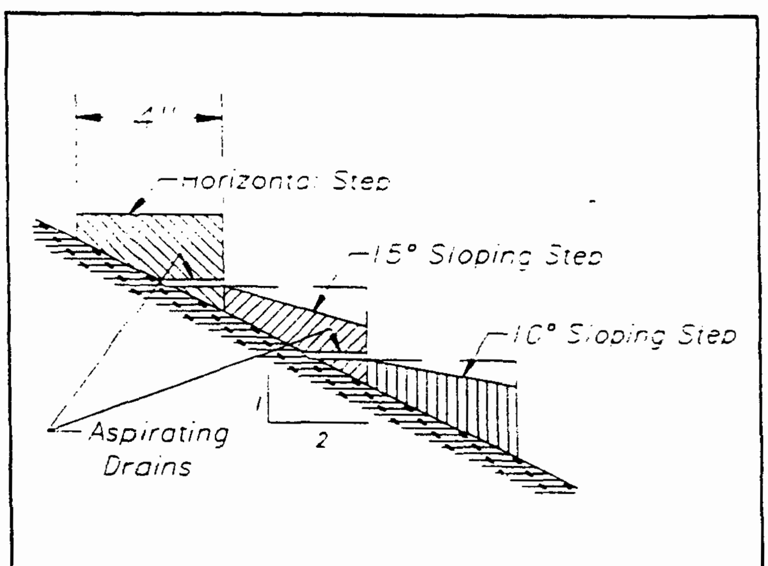

Figure 1. - Steps shapes tested in 2:1 sloping laboratory flume.

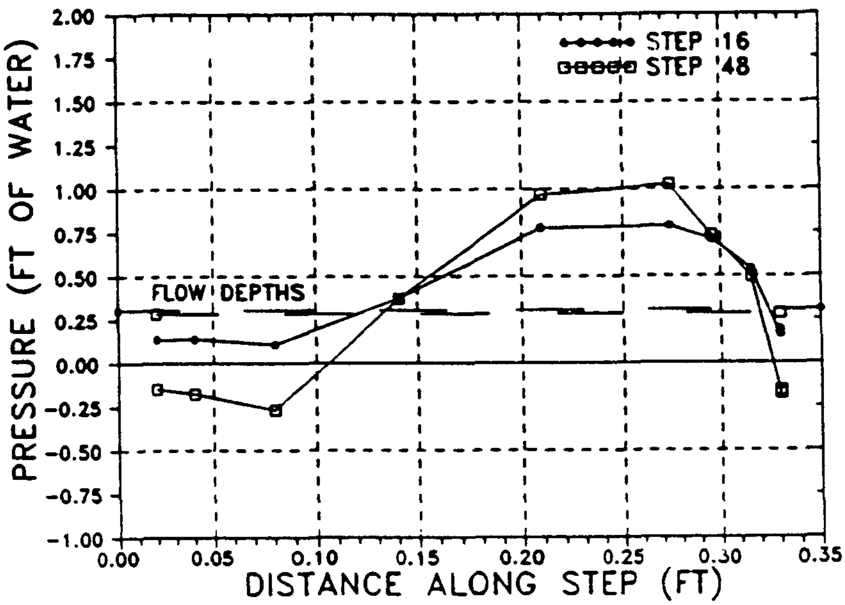

Figure 2. - Pressure profiles for 15° steps at steps 16 and 48 for overtopping head (H) to step height (h_s) ratio equal to 14.00.

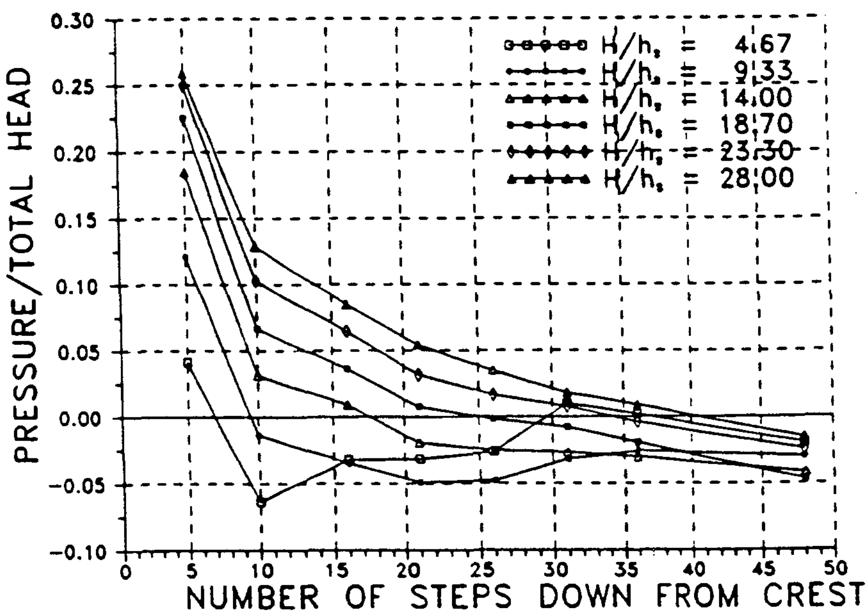

Figure 3. -. - Pressure profiles versus step down a 2:1 slope with curves of overtopping head to step height for the 15° step shape.

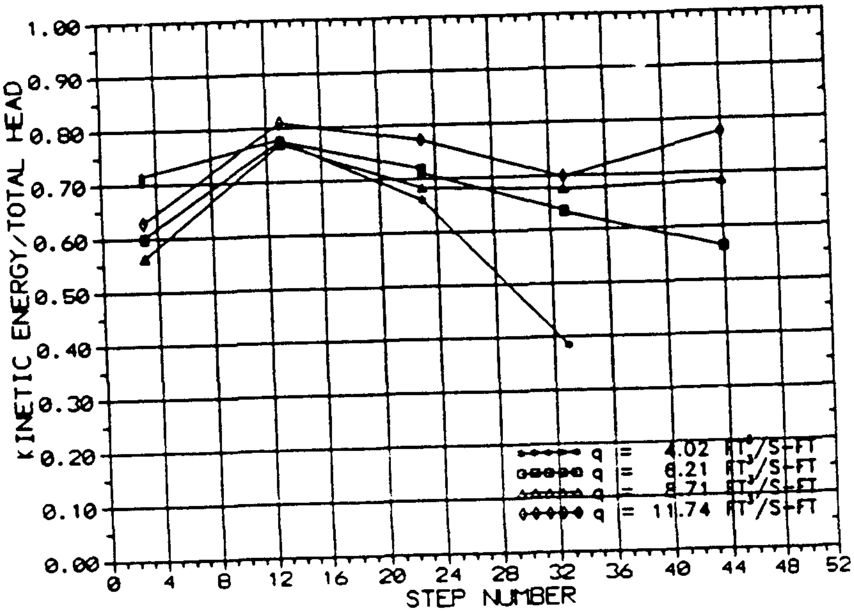

Figure 4. - Ratio of kinetic energy to total head versus step number for the 15° step shape.

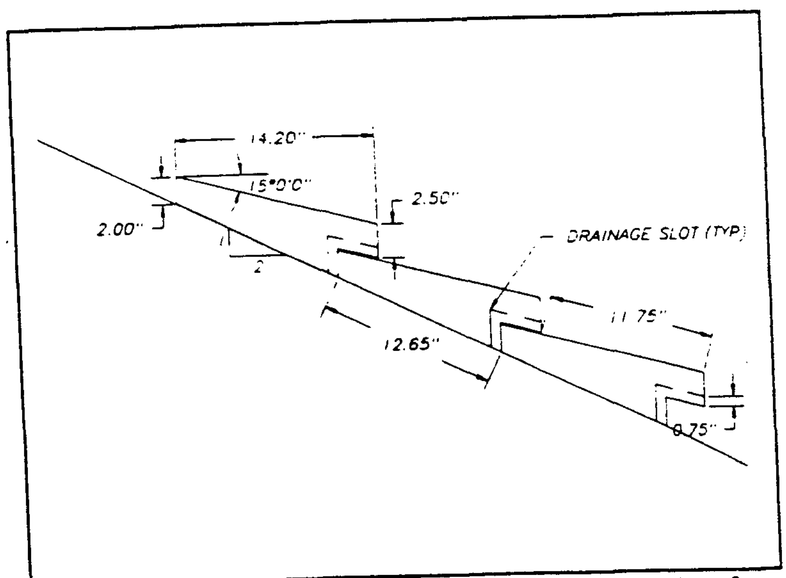

Figure 5. - Block shape developed from laboratory testing that will be used in near-prototype studies.

LARGE-SCALE EMBANKMENT OVERTOPPING PROTECTION TESTS

Kathleen H. Frizell[1] and James F. Ruff,[2] F. ASCE

Abstract

The U.S. Bureau of Reclamation (Reclamation), Colorado State University (CSU), and the Electric Power Research Institute (EPRI) have an ongoing cooperative research effort to determine low-cost, feasible methods for providing overtopping protection for embankment dams. Investigations have progressed to testing an overlapping tapered concrete block shape developed from Reclamation's laboratory flume tests and installing the blocks over gravel filter material in a near-prototype size facility. The overlapping portion of the block produces an offset, or step, where drains, located through the blocks, provide relief of uplift pressure in the underlying filter. The test program in the large facility closely matched that of the laboratory. The stability of the overlapping tapered block system has been confirmed by the large scale tests.

Purpose

The purpose of conducting large scale tests of overtopping protection methods is to confirm Froude scaling relationships or develop other relationships between laboratory data and the near prototype size facility. Should the block system developed from the laboratory data (Frizell, 1992) show stability, then the results may be comfortably extended to any size actual embankment dam.

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Large-scale Facility and Initial Tests

The outdoor overtopping facility is near-prototype size, with a height of 15.24 m (50 ft) and is located at CSU, in Fort Collins, Colorado. The facility, shown in Figure 1, consists of a concrete headbox, chute, tailbox, and sump with a pump. The concrete chute on a 2:1 (H:V) slope, has a maximum width of 3 m (10 ft) with a removable wall installed to reduce the chute width to 1.52 m (5 ft) for the current testing program. Water is supplied through a 0.91 m (3-ft) pipe from Horsetooth Reservoir. A portion of the flow can be recirculated by pumping back from the tailbox to increase the total discharge through the facility. Unit discharges up to about 2.94 $m^3/m/s$ (31.6 $ft^3/ft/s$) have been tested.

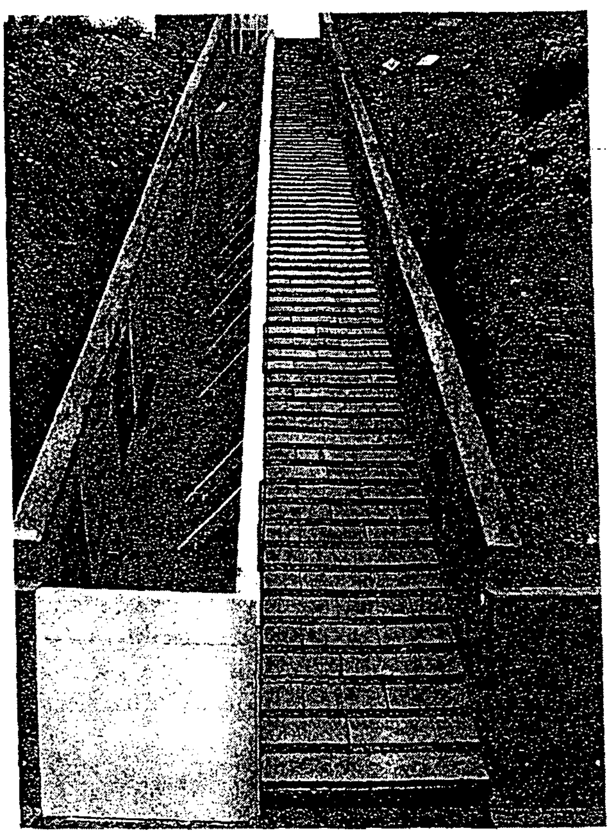


Figure 1. Fifty foot high flume facility used to test overlapping blocks for embankment dam protection.

Tests are currently being conducted on overlapping tapered concrete blocks design by Reclamation. The blocks are placed over 15.2 cm (6-in) of free-draining, angular, well graded, gravel filter material. The gravel is placed on the concrete floor with 10.1 cm (4-in) angle iron (with a gap above the floor to allow free discharge) placed every 1.81 m (6-ft) up the slope to prevent sliding. A wooden strip was installed along each wall to easily screen the gravel bedding and to prevent failure along the wall contact during operation.

The blocks, shown in Figure 2, are 0.37 m (1.23 ft) long and 63.5 mm (0.21 ft) high with a maximum thickness of 0.11 m (0.375 ft). The blocks are fabricated 0.61 m (2 ft) and/or 0.31 m (1 ft) wide with drains located through the block from the rise of the step to the underside. Two 0.61 m wide blocks and one 0.31 m wide block comprise each row in the facility. The blocks are installed shingle-fashion from the toe and are alternated so that there are no continuous seams in the flow direction except along the walls.

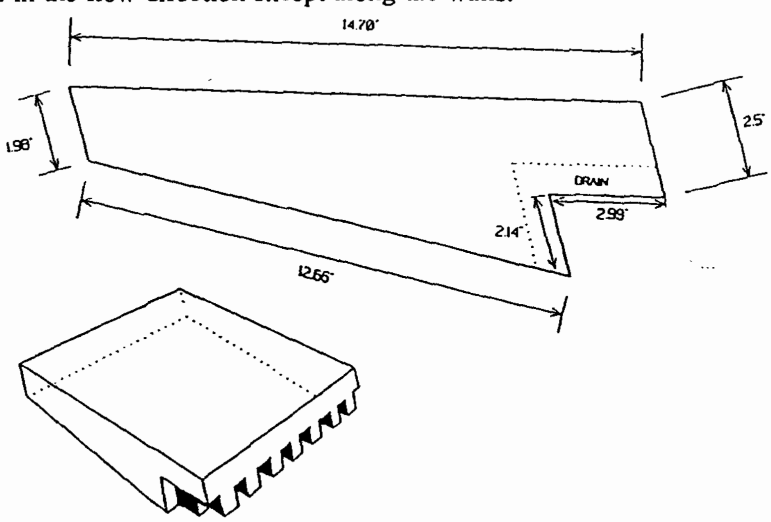


Figure 2. Wedge block dimensions.

At the crest of the structure, a small concrete cap was placed to transition from the flat approach to the first row of blocks. At the toe of the concrete slope is a fixed concrete end block to support the blocks up the slope. A row of blocks are tied down to the angle iron on the floor at about third points up the slope. Where the blocks will be under the tailwater at the toe of the slope, the blocks are pinned together longitudinally through the overlapping area parallel to the slope.

Test procedure

The laboratory tests performed by Reclamation in 1990 and 1991 are being repeated in the large scale facility. The initial tests, under flows similar to scaled laboratory flows, were conducted to obtain pressure data for block stability analyzes. The instrumented blocks (Fig. 2), and accompanying piezometer blocks buried in the gravel bedding, were installed in five locations down the slope of the facility. Pressures measured on the block faces and in the gravel bedding are used to determine the stability of the hydraulically designed block shape.

Flow description

During initial startup of the flume, under a very low discharge, the fines and dirt were flushed from the bedding material. Flushing lasted a very short time and was observed by the brief coloring of the water. After shutting off the water, slight settling of the blocks was apparent; however, there was no sliding or noticeable trend to the settling. Throughout the testing no further noticeable settling of the blocks occurred. The maximum settlement was about 2 to 3 cm (0.79 to 6.11 in).

The many discharges tested in the flume produced varied flow conditions over the blocks. The very small flows were almost entirely broken up by the block shape leaving no noticeable thickness of solid water. As the discharge increased, the boundary layer took longer to develop, eventually developing for the largest flow one third to one half the distance down the slope.

Stability

The question of stability of the protective system is the most critical for an embankment dam. Any failure or instability in the system could cause a catastrophic failure of the entire dam during an overtopping event. Laboratory data shows that the ability of the blocks to relieve the uplift pressure, combined with the impact of the water on the block surface, make the blocks inherently stable. The near-prototype tests, completed thus far to a unit discharge of 2.94 $m^3/m/s$ (31.6 $ft^3/ft/s$), indicate that the blocks are stable and will perform satisfactorily.

The stability of the block system has been analyzed as a function of the total forces acting on individual blocks down the slope. The block weight and impact pressure act on the block and slope in a downward (positive) direction to keep the blocks on the slope (Fig. 3). The uplift pressure in the bedding material underneath the block and the low pressure zone created by the block offset act in an upward (negative) direction tending to lift the blocks from the embankment surface. In the analysis, a net positive force indicates a stable block.

Pressure data were gathered to compute the magnitude of the forces acting on the block surfaces. In general, the pressures in the impact zone on the block increased with discharge and remained the same or decreased slightly with distance down the slope. Decreasing pressure magnitudes with distance down the slope are, most likely, a function of flow aeration. Of course, the weight of the block is constant. In general, the pressure in the offset area of the block decreases with discharge and distance down the slope. Between step 44 and step 74 down the embankment the pressures in the offset area became negative.

The uplift pressures were measured by using piezometer blocks buried in the gravel bedding at about the same locations down the slope as the instrumented blocks where surface pressures were measured.

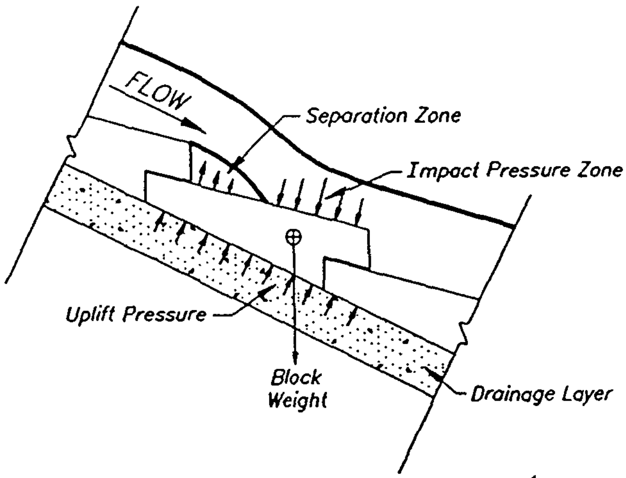


Figure 3. Forces acting on wedge block.

The underdrain pressures were assumed to be linear between the measurement locations. The underdrain pressures show a gradual increase over about the first 45 steps, as would be expected from the pressure data and low flow velocities. These data confirm the hypothesis that flow would be forced into the bedding near the top of the slope. At about 50 steps down the slope the pressures begin quickly decreasing to the fixed toe of the slope where the pressure increases slightly to about 0.15 m (0.5 ft) of positive pressure for all flow rates.

Conclusions

The overall stability of the block system down the slope is given in Figure 4. The resultant vertical force on the block at various locations down the slope is the sum of all the measured pressures integrated over the appropriate areas. These data show that the block system is stable at all locations down the slope and for all flow rates tested, with the exception of slight instability at the toe for the smallest unit discharge. In general, there is from 30 to 170 pounds of force per foot of width in the downward direction holding the blocks on the slope. In this initial analysis consideration was given to the additional benefit of block overlap. The overlap forces would further enhance the block system stability.

These initial calculations on the block stability confirm analytically the visual observation that the block system is inherently stable. This conclusion will be further investigated by more clearly defining the underdrain pressures with more measurement locations.

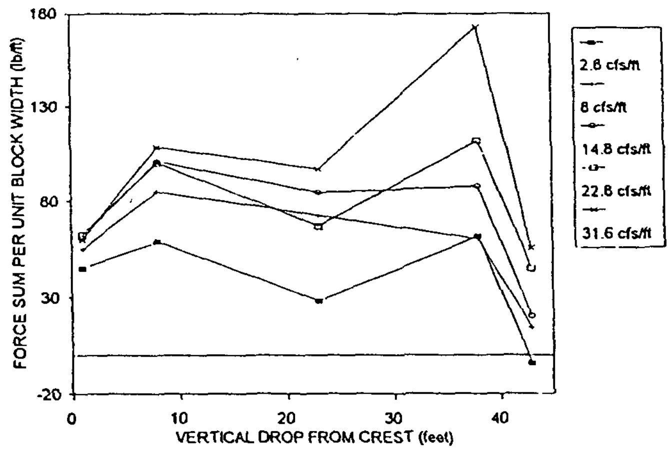


Figure 4. Block stability indicated by summation of pressure forces acting on wedge blocks at locations down the slope.

Future tests

Full model-prototype comparisons will be made at the completion of the tests in the spring of 1993. The remaining tests will primarily measure velocity, air concentration, additional pressures in the bedding material, and block stability under tailwater conditions. The final tests will address stability of the block system after satisfactorily initiating weaknesses in the block system.

Initial model/prototype comparisons show favorable scaling of the pressure field. Relationships and effect of air concentration on the velocity or pressure scaling have yet to be determined.

Upon completion of tests with the block system, the facility will be used to test large size riprap. This will allow confirmation of the numerous laboratory studies with riprap and determine the limits where riprap may be used to protect steep slopes during small overtopping events.

References

1. Frizell, K.H., 1992, "Hydraulics of stepped spillways for RCC dams and dam rehabilitations," Proceedings, 1992 ASCE Roller Compacted Concrete III Conference, pp. 423-439, San Diego, CA, February 2-5.

Outlet Works

Outlet Works Design Considerations

Overview

The following discussion covers the design of the Outlet Works. The outlet works consist of an inlet structure (Trash Rack), a conduit beneath the dam, (Box Culvert) and the discharge structure (Outlet Structure).

Previous Work

The Design Memorandum by Boyle Engineering generally describes the proposed outlet works as having " *three main components: an intake structure, two outlet pipes, and a transition structure.*" The memo goes on to describe the operation of the system as being a totally passive system with a maximum discharge of 1,000 cfs.

Boyle's preliminary design is based on achieving partial full flow in the pipes beneath the dam. This is apparently achieved by a transition from 42-inch intake pipes to 54-inch pipes at the entrance, and through the use of two 24-inch vent pipes. The two 54-inch pipes pass beneath the dam at a 7.4 percent slope. A concrete transition structure was provided at the discharge end of the outlet to provide a gradual circular-to-square transition prior to final discharge in the outlet channel.

Black & Veatch Approach

At peak reservoir pool for the 100-yr storm, the water surface elevation in the detention basin will produce an operating head on the outlet works of approximately 70 feet. Understanding this, it is apparent that discharge velocities for the outlet works have the potential to be on the order of 60 fps. In review of the Design Memorandum, it is probable that Boyle's intention to force an inlet control condition was for the purpose of reducing discharge velocities.

Our design will also be based on forced inlet control, however, we seek to simplify the design and eliminate the need for transition sections and vent piping. The design utilizes an orifice plate at the inlet to restrict flow as it enters the system. The outlet conduit is designed to flow partially full under supercritical flow conditions. The following is a summary of the system components.

Trash Rack Structure

The Trash Rack Structure located at the inlet to the outlet conduit will have steel beams and struts spaced so that the openings are approximately 2-feet square. This spacing will prevent larger floating debris from plugging the outlet conduit. The trash rack arrangement is designed for a flow rate of 850 cfs with 50 percent of the openings blocked. The rack is divided into three sections which are removable with a small crane or winch truck. The removable sections allow access to the structure floor with a small tractor-loader for removing debris. The rack will be hot-dipped galvanized after fabrication to reduce the effects of weathering. The orifice plate used to control discharge from the detention basin will be mounted to the headwall of the trashrack structure.

Outlet Conduit

An initial investigation was made into the feasibility of using pre-manufactured pipe versus cast-in-place concrete. Conceptual alternatives included the use of precast concrete and welded steel pipe. Due to the height of the fill, these alternatives would have required custom fabricated pipe. The additional engineering, fabrication, and delivery costs associated with the heavy pipe sections was determined to be costly. In addition, construction of the outlet conduit will likely set the initial critical path of the construction schedule. The lead time required for pipe design, fabrication, and delivery would impact the construction schedule and increase the duration of the construction. Upon completing the initial investigation, we determined that cast-in-place concrete is the most cost effective solution.

As previously noted, the outlet conduit is designed to pass a peak discharge of 850 cfs during the 100-year storm under partially full, supercritical flow conditions. The invert slope of the conduit will be 1 percent. At peak discharge, flow depth in the 8-ft wide box section will be 5.7 feet. Corresponding to the peak discharge, the velocity in the conduit will approximately 18.8 fps, and the Froude number is 1.4. Critical depth for this discharge is 7.1 feet.

The outlet conduit will be constructed of 4,000 psi reinforced concrete. The 380-ft conduit will be constructed in 20-ft sections to minimize shrinkage cracking. In addition, the exterior reinforcing layer in the top and bottom slabs will be discontinued at the joints allowing the structure to articulate differential stresses through slight rotations at the joints. Construction joints will be waterstopped to prevent leakage from the conduit into the embankment, and to prevent the potential migration of fine sands from the embankment into the conduit.

In general, the design of the conduit roof and floor slabs is controlled by the large shear forces produced by the embankment soil. Within the center portion of the embankment, the soil loads require a top and bottom slab thickness of 30-inches. As fill height is decreased from the center of the embankment towards the toes, the slab thickness will be reduced in 6-inch increments.

Outlet Structure

The outlet structure is designed for both near-term and future discharge conditions. For near-term conditions, it is desirable to allow outlet discharge flows to spread across the apron, returning to the natural wash as sheet flow. This will be accomplished by allowing outlet discharge onto the spillway apron, and by using a splash wall as shown in the attached figures.

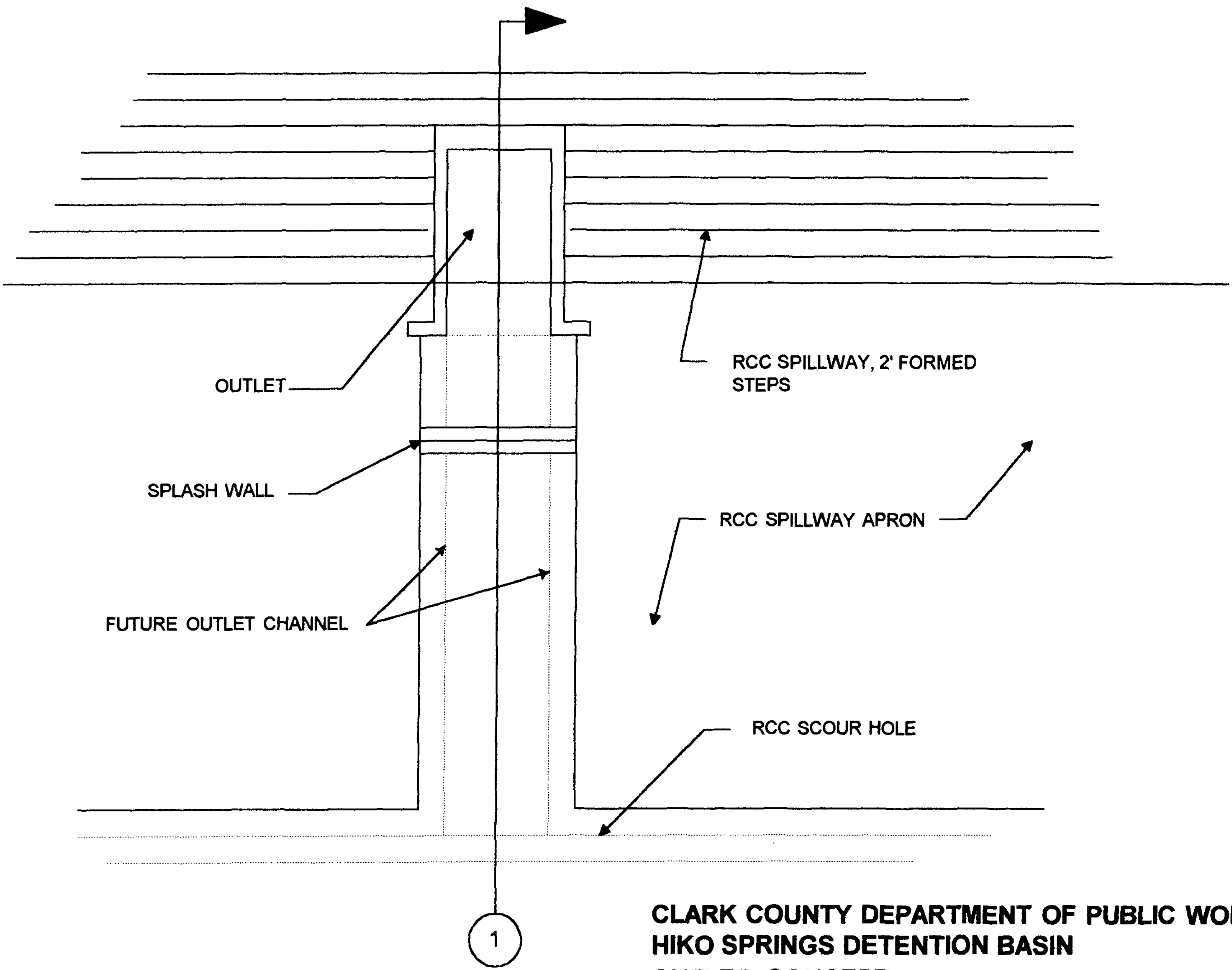
In consideration of downstream planning efforts, it is likely that detention basin outflow will eventually be channelized through the lower portion of the watershed. To accommodate this, the outlet works was positioned near the western side of the wash since this is the more desirable location for future channelization. In addition, a depressed channel section will be provided in the spillway apron from the outlet to the end of the apron (see figures). The detention basin can be modified for channel discharge by removing the splash block and excavating to the depressed invert slab.

References

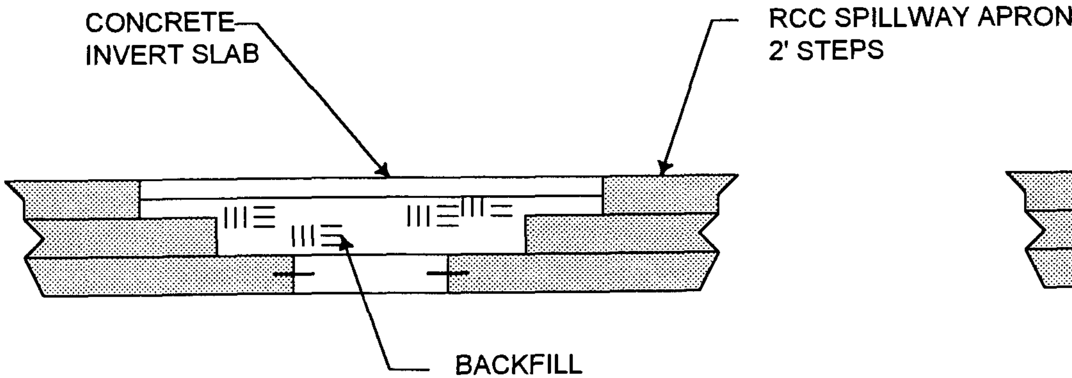
1. "Design Memorandum for Hiko Springs Wash in Laughlin, Clark County, Nevada; Boyle Engineering Corporation; April 1991.

2. Fluid Mechanics with Engineering Applications, Eighth Edition; R.L. Daugherty, J. B. Franzini, and E.J. Finnemore; McGraw-Hill Book Company; 1985.

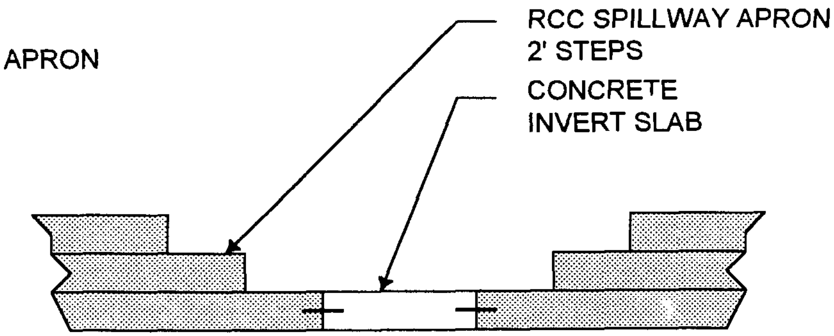
3. Design of Small Dams; USDI Bureau of Reclamation; 1987.



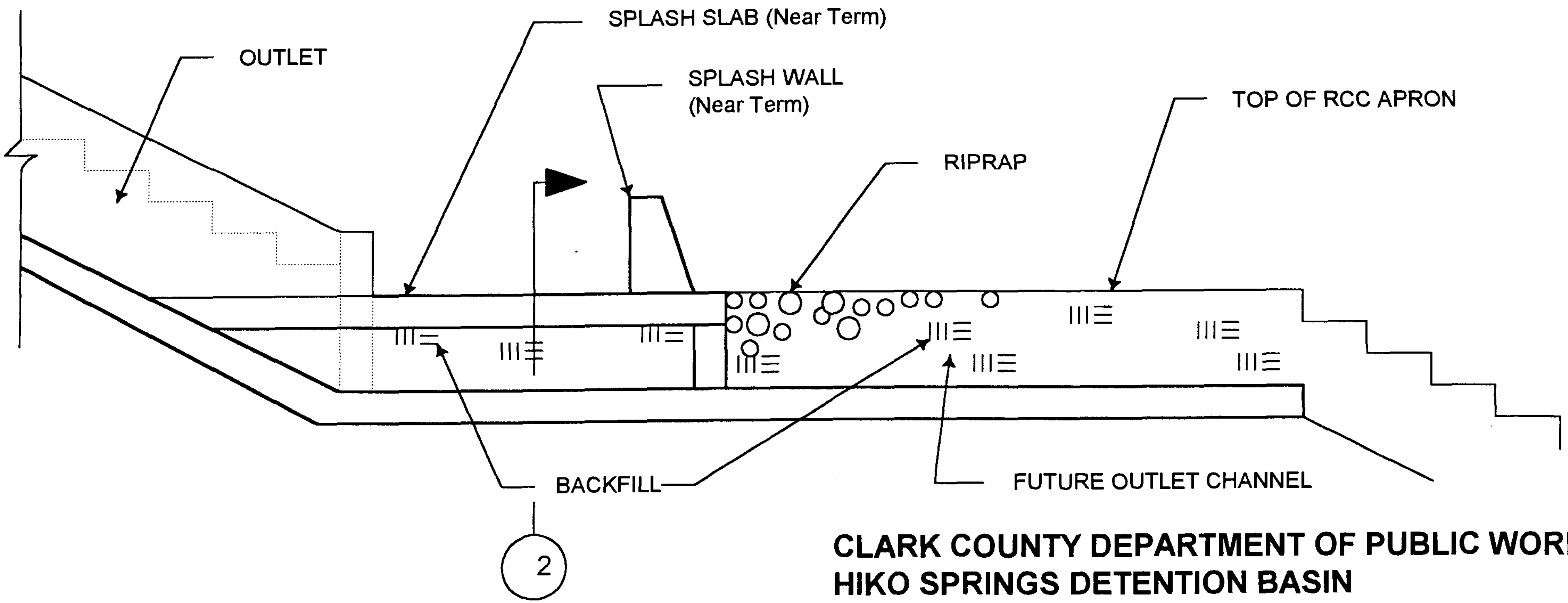
CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS DETENTION BASIN
OUTLET CONCEPT



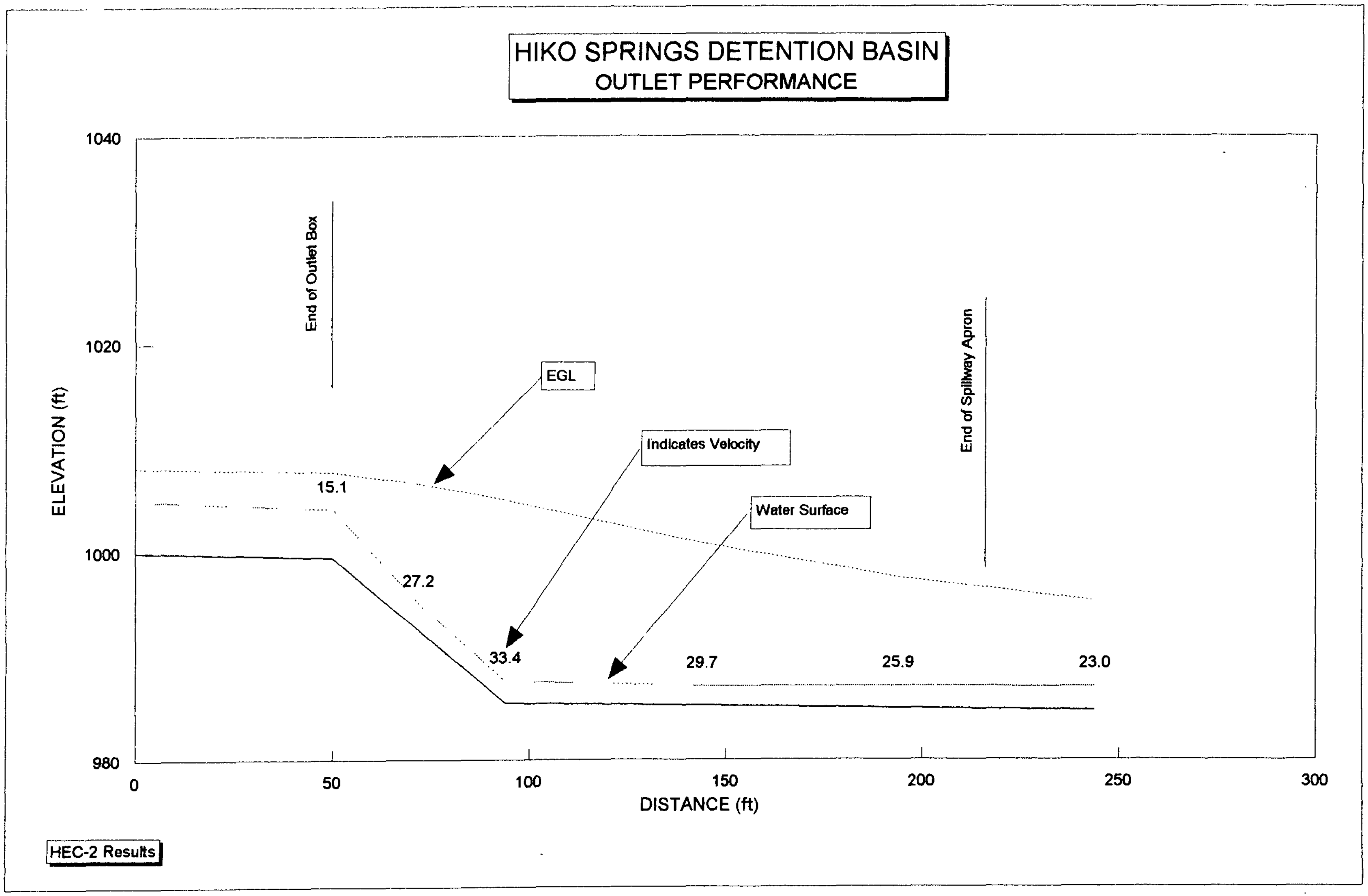
SECTION 2 - NEAR TERM CONDITION



SECTION 2 - FUTURE CONDITION



CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
HIKO SPRINGS DETENTION BASIN
OUTLET CONCEPT


HIKO SPRINGS DETENTION BASIN
OUTLET PERFORMANCE
ELEVATION (ft)
DISTANCE (ft)
1040
1020
1000
980
0
50
100
150
200
250
300
End of Outlet Box
End of Spillway Apron
EGL
Indicates Velocity
Water Surface
15.1
27.2
33.4
29.7
25.9
23.0
HEC-2 Results

Untitled

CLOMR

Federal Emergency Management Agency

Washington, D.C. 20472

MAY 16 1996

RECEIVED
MAY 20 1996
BLACK & VEATCH
LAS VEGAS

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 96-09-357R

The Honorable Yvonne Atkinson Gates
Chairperson, Clark County
Board of Commissioners
225 Bridger Avenue
Las Vegas, Nevada 89155

Community: Clark County, Nevada
Community No.: 320003

104

Dear Ms. Atkinson Gates:

This is in response to a letter dated January 8, 1996, from Mr. Craig S. Swengle, Black & Veatch, to the Federal Emergency Management Agency (FEMA) regarding the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Clark County, Nevada and Incorporated Areas. Mr. Swengle requested that FEMA evaluate the effects that the proposed construction of the Hiko Springs Wash Detention Basin (HSWDB) would have on the discharge value of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) downstream of the basin.

All data required by FEMA to evaluate this request were submitted with Mr. Swengle's January 8 letter. On Application/Certification Form 1, entitled "Revision Requester and Community Official Form," dated December 21, 1995, Mr. Steven D. Canney, Project Manager, Black & Veatch, certified that the project is a flood-control project that is sponsored by a Federal, State, or local government, is for public benefit, and is primarily intended for flood loss reduction to insurable structures in identified flood hazard areas that were in existence prior to commencement of the flood-control project. Therefore, in accordance with Section 72.5 of the National Flood Insurance Program (NFIP) regulations, the fees associated with our review of this Conditional Letter of Map Revision (CLOMR) have been waived.

We have reviewed the data submitted and the flood data used to prepare the effective FIRM and FIS report for Clark County, Nevada and Incorporated Areas. Hiko Springs Wash is identified as being subject to alluvial fan flooding on the effective FIRM dated August 16, 1995. The base flood discharge values calculated in the submitted HEC-1 hydrologic analysis upstream and downstream of the proposed HSWDB are 8,282 and 850 cubic feet per second (cfs), respectively. The downstream discharge value is based on flow through the outlet works (a 62-inch orifice plate with an 8-foot by 6-foot box culvert) and no flow over the spillway during the base flood event. If the operation of the outlet works is not jeopardized during the base flood event and the proposed project is constructed as shown on the plans entitled "Hiko Springs Wash Detention Basin," prepared by Black and Veatch, dated December 15, 1994, we agree the discharge value downstream of the basin would be 850 cfs.

Because the proposed project is in an area subject to alluvial fan flooding, the items described in Section 65.13 of the enclosed NFIP regulations must be addressed before the structure can be credited with providing protection from the base flood. We are concerned that local deposition of sediment during the base flood event could jeopardize the safe operation of the outlet works and that the accumulation of sediment over time could affect the storage capacity of the basin. An engineering analysis must be provided that quantifies the volumes of debris flow and sediment movement associated with the base flood. The assessment should consider the characteristics and availability of sediment in the drainage basin and on the alluvial fan. The effect of sediment deposition over time on the storage capacity of the basin is usually addressed in the maintenance and operation plan, which must be submitted along with as-built plans before a final determination can be made on crediting the structure.

The extent of the area downstream of the HSWDB that would be subject to base flooding depends on the outflow-frequency relationship at the basin outlet. Because the flow paths downstream of the basin are not predictable from flood to flood or during any given flood, the entire flood frequency curve, not just the base flood value, must be defined at the outlet before a revision to the FIRM can be made. Depths and velocities for the flooding downstream of the basin must also be defined before the FIRM can be revised. We would anticipate that areas downstream of the basin will be subject to more scour than they are currently experiencing because the basin will remove sediment associated with the base flood. The release of clear water downstream of the basin may lead to scour, head cutting, and new channels being formed.

This response to Mr. Swengle's request is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all proposed floodplain development, including this request, and for assuring that the necessary permits required by Federal or State law have been received. State and community officials, based on knowledge of local conditions and in the interest of human safety, may set higher standards for construction or may limit development in floodplain areas. If the State of Nevada or your community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by contacting the Director, Mitigation Division of FEMA in San Francisco, California, at (415) 923-7177. If you have any technical questions regarding this CLOMR, please contact Mr. Karl Mohr of our staff in Washington, DC, either by telephone at (202) 646-2770 or by facsimile at (202) 646-4596.

Sincerely,

Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate

Enclosure

cc: Mr. Robert B. Thompson, P.E.
Civil Engineer III
Clark County Department of Public Works

Mr. Kevin L. Eubanks, P.E.
Assistant General Manager
Clark County Regional Flood Control District

Mr. Craig S. Swengle
Black & Veatch

Federal Emergency Management Agency

Washington, D.C. 20472

RECEIVED

FEB 0 5 1996

BLACK & VEATCH
LAS VEGAS

January 31, 1996

Mr. Craig S. Swengle
Black & Veatch
1900 East Flamingo Road, Suite 295
Las Vegas, Nevada 89119

IN REPLY REFER TO:
Case No.: 96-09-357R
Community: Clark County, Nevada
Community No.: 320003

316-ACK

Dear Mr. Swengle:

This is in response to your request dated January 8, 1996, for a conditional revision to the Flood Insurance Rate Map (FIRM) for the above-referenced community. Pertinent information about the request is listed below.

Identifier:	Hiko Springs Wash Detention Basin
Flooding Source:	Hiko Springs Fan
FIRM Panel Affected:	32003C3995 D

As you may know, the Federal Emergency Management Agency (FEMA) has implemented a procedure to recover costs associated with reviewing and processing requests for conditional modifications to published flood information and maps. However, because your request is intended to show the effects of a publicly sponsored flood-control project that reduces flooding to existing development, no fees will be assessed for our review.

We have completed an inventory of the items that you submitted. We have received all of the data we require to begin a detailed technical review of your request. If additional data are required, we will inform you within 30 days of the date of this letter.

Please direct all questions concerning your request to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Attention: Mr. Thomas W. Smith, P.E.
(703) 317-6267

When you write us about your request, you must include the case number referenced above in your letter.

If you have any questions concerning FEMA policy, or the National Flood Insurance Program in general, please contact Mr. John Magnotti of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-4596.

Sincerely,

Michael Buckley

Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate

cc: Mr. Robert B. Thompson, P.E.
Civil Engineer III
Clark County Department of Public Works

Mr. Kevin L. Eubanks, P.E.
Assistant General Manager
Clark County Regional Flood Control District

CLARK COUNTY NEVADA

"Progress as Promised"

DEPARTMENT OF PUBLIC WORKS

CLOMR SUBMITTAL FOR HIKO SPRINGS WASH DETENTION BASIN, LAUGHLIN, NEVADA

BLACK & VEATCH

BLACK & VEATCH

1900 East Flamingo Road, Suite 295, Las Vegas, Nevada 89119 (702) 732-0448, Fax (702) 732-7578

Clark County Public Works
Hiko Springs Wash Detention
Basin

B&V Project 25574.400
B&V File AC
January 8, 1996

Shirley Mattingly, Regional Director
FEMA - Region IX
Presidio of San Francisco
Building 105
San Francisco, California 94129-1250

Subject: Request for a Conditional Letter of Map Revision (CLOMR)

Dear Ms. Mattingly:

Black & Veatch has completed a Conditional Letter of Map Revision (CLOMR) for the Hiko Springs Wash Detention Basin in Laughlin, Nevada. We are submitting this CLOMR on behalf of Clark County, Department of Public Works.

The Detention Basin is currently under construction. The dam was topped out in mid-December and the project is anticipated to be completed by March 1996, ahead of schedule.

This project reduces the Hiko Springs Wash inflow from 8,282 cfs to an outflow of 850 cfs below the new dam. This CLOMR seeks to reduce the flow downstream of the dam. The CLOMR **does not** seek to redefine flood boundaries below the dam since the wash remains uncontrolled downstream of the basin.

The CLOMR is bound in a three-ring binder and includes the Revision Requestor and Community Official Form (Form 1), Certifications by Registered Professional Engineer (Form 2), Hydrologic Analysis Form (Form 3), and Dam Form (Form 11). Supporting documentation includes the Project Construction Documents (Plans and Specifications), Kleinfelder's Geotechnical Report, Clark County Ordinances creating and adopting Improvement District No. 74 (supports Form 1), computer diskette with the HEC-1 computer model (supports Form 3), Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual Sections 502.4 and 504.2 (supports Form 3), and portions of Boyle Engineering Corporation's Facilities Plan for Hiko Springs and Unnamed Wash (supports Form 3).

Should you have any questions or if you need additional information, please do not hesitate to call me at (702) 732-0448.

Very truly yours,

BLACK & VEATCH

Craig S. Swengle

Craig S. Swengle

cc: William C. Brandt, CCPW
Steve Canney, B&V
File

femaltr.wp/drh/CCDPW

Revision Requestor

and

Community Official Form

(Form 1)

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTOR AND COMMUNITY OFFICIAL FORM**	O.M.B. Burden No. 3067-0148 Expires July 31, 1997	FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden, to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

1. OVERVIEW

1. The basis for this revision request is (are): *(check all that apply)*
   - ☒ Physical change
     - ☐ Existing
     - ☒ Proposed
   - ☐ Improved methodology
   - ☐ Improved data
   - ☐ Floodway revision
   - ☒ Other Ongoing construction of detention basin, embankment, and outlet works.

     Explain Dam embankment elevation at maximum height.
2. Flooding Source: Hiko Springs Wash
3. Project Name/Identifier: Hiko Springs Wash Detention Basin
4. FEMA zone designations affected: Zone AO
   (example: A, AH, AO, A1-A30, A99, AE, V, V1-30, VE, B, C, D, X)
5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	County	State	Map No.	Panel No.	Effective Date
EX: 480301	Katy,City	Harris, Fort Bend	TX	480301	0005D	02/08/83
480287	Harris County	Harris	TX	48201C	0220G	09/28/90
320003	Clark County Unincorporated Areas	Clark	NV	32003C	3995D	08/16/95

6. The area of revision encompasses the following types of flooding, structures, and associated disciplines: *(check all that apply)*

Types of Flooding
- ☐ Riverine
- ☐ Coastal
- ☒ Alluvial Fan
- ☐ Shallow Flooding *(e.g. Zones AO and AH)*
- ☐ Lakes

Affected by wind/wave action
- ☐ Yes
- ☒ No

Structures
- ☐ Channelization
- ☐ Levee/Floodwall
- ☐ Bridge/Culvert
- ☒ Dam
- ☐ Coastal
- ☐ Fill
- ☐ Pump Station
- ☐ None
- ☐ Channel Relocation
- ☐ Excavation
- ☐ Other *(describe)*

Disciplines*
- ☒ Water Resources
  - ☒ Hydrology
  - ☒ Hydraulics
  - ☒ Sediment Transport
  - ☐ Interior Drainage
- ☒ Structural
- ☒ Geotechnical
- ☐ Land Surveying
- ☐ Other *(describe)*

☐ Other(describe)______

* **Attach completed "Certification by Registered Professional Engineer and/or Land Surveyor" Form for each discipline checked. (Form 2)**

2. FLOODWAY INFORMATION

7. Does the affected flooding source have a floodway designated on the effective FIRM or FBFM? ☒ Yes ☐ No
8. Does the revised floodway delineation differ from that shown on the effective FIRM or FBFM ☐ Yes ☒ No

   If yes, give reason: ______

Attach copy of either a public notice distributed by the community stating the community's intent to revise the floodway or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.

9. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP? ☐ Yes ☒ No

If yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

3. PROPOSED ENCROACHMENTS

10. With floodways:

1A. Does the revision request involve fill, new construction, substantial improvement, or other development in the floodway? ☒ Yes ☐ No

1B. If yes, does the development cause the 100-year water surface elevation to increase at any location by more than 0.000 feet? ☒ Yes ☐ No Water surface elevation is only increased within limits of detention basin impoundment area, therefore, documentation required under 65.12 has not been provided.

11. Without floodways:

2A. Does the revision request involve fill, new construction, substantial improvement, or other development in the 100-year floodplain? ☐ Yes ☐ No

2B. If yes, does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the 100-year water surface elevation to increase at any location by more than one foot (*or other surcharge limit if community or state has adopted more stringent criteria*)? ☐ Yes ☐ No

If the answer to either Items 1B or 2B is yes, please provide documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

4. REVISION REQUESTOR ACKNOWLEDGMENT

12. Having read NFIP Regulations, 44 CFR Ch. I, parts 59, 60, 61, and 72, I believe that the proposed revision ☒ is ☐ is not in compliance with the requirements of the aforementioned NFIP Regulations.

5. COMMUNITY OFFICIAL ACKNOWLEDGMENT

13. Was this revision request reviewed by the community for compliance with the community's adopted floodplain management ordinances? ☒ Yes ☐ No

14. Does this revision request have the endorsement of the community? ☒ Yes ☐ No

If no to either of the above questions, please explain: ____________________

Please note that community acknowledgment and /or notification is required for all requests as outlined in Section 65.4 (b) of the NFIP Regulations.

6. OPERATION AND MAINTENANCE

15. Does the physical change involve a flood control structure (e.g., levees, floodwalls, channelization, basins, dams)? ☒ Yes ☐ No

If yes, please provide the following information for each of the new flood control structures:

A. Inspection of the flood control project will be conducted periodically by Clark County Department of Public Works (entity) with a maximum interval of 12 months between inspections.

B. Based on the results of scheduled periodic inspections, appropriate maintenance of the flood control facilities will be conducted by Clark County Department of Public Works (entity) to ensure the integrity and degree of flood protection of the structure.

C. A formal plan of operation, including documentation of the flood warning system, specific actions and assignments of responsibility by individual name or title, and provisions for testing the plan at intervals not less than one year, ☐ has ☒ has not been prepared for the flood control structure.

D. The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the ______________________________ (Name)

flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Attach operation and maintenance plans

7. REQUESTED RESPONSE FROM FEMA

16. After examining the pertinent NFIP regulations and reviewing the document entitled "Appeals, Revisions, and Amendments to Flood Insurance Maps: A guide for Community Officials," dated January 1990, this request is for a:

_X_ a.	CLOMR	A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision *(LOMR or PMR)*, or proposed hydrology changes *(see 44 CFR Ch. I, Parts 60, 65, and 72)*.
____ b.	LOMR	A letter from FEMA officially revising the current NFIP map to show changes to floodplains, floodways, or flood elevations. LOMRs typically depict decreased flood hazards. *(See 44 CFR Ch. I Parts 60 and 65.)*
____ c.	PMR	A reprinted NFIP map incorporating changes to floodplains, floodways, or flood elevations. Because of the time and cost involved to change, reprint, and redistribute an NFIP map, a PMR is usually processed when a revision reflects increased flood hazards or large-scope changes. *(See 44 CFR Ch. I, Parts 60 and 65.)*
____ d.	Other:	Describe ______________________________

8. FORMS INCLUDED

17. Form 2 entitled, "Certification By Registered Professional Engineer and/or Land Surveyor" must be submitted.

The following forms should be included with this request if (check the included forms):

• Hydrologic analysis for flooding source differs from that used to develop FIRM	☒ Hydrologic Analysis Form (Form 3)
• Hydraulic analysis for riverine flooding differs from that used to develop FIRM	☐ Riverine Hydraulic Analysis Form (Form 4)
• The request is based on updated topographic information or a revised floodplain or floodway delineation is requested	☐ Riverine /Coastal Mapping Form (Form 5)
• The request involves any type of channel modification	☐ Channelization Form (Form 6)
• The request involves new bridge or culvert or revised analysis of an existing bridge or culvert	☐ Bridge/Culvert Form (Form 7)
• The request involves a new revised levee/floodwall system	☐ Levee/Floodwall System Analysis Form (Form 8)
• The request involves analysis of coastal flooding	☐ Coastal Analysis Form (Form 9)
• The request involves coastal structures credited as providing protection from the 100-year flood	☐ Coastal Structures (Form 10)
• The request involves an existing, proposed, or modified dam	☒ Dam Form (Form 11)
• The request involves structures credited as providing protection from the 100-year flood on an alluvial fan	☐ Alluvial Fan Flooding Form (Form 12)

9. INITIAL REVIEW FEE

18. The minimum initial review fee for the appropriate request category has been included. ☐ Yes ☒ No

Initial fee amount: $ ______

Check or money order only. Make check or money order payable to : **National Flood Insurance Program.** If paying by Visa or Mastercard please refer to the credit card information form which follows this form.

or

19. This request is for a project that is for public benefit and is primarily intended for flood loss reduction to insurable structures in identified flood hazard areas which were in existence prior to the commencement of construction of the flood control project. ☒ Yes ☐ No

or

20. This request is to correct map errors, to include the effects of natural changes within the areas of special flood hazard, or solely to provide more detailed data. ☐ Yes ☒ No

Note: I understand that my signature indicates that all information submitted in support of this request is correct.

Signature of Revision Requester

Steven D. Canney, Project Manager

Printed Name and Title of Revision Requester

Black & Veatch

Company Name

(702) 732-0448 12/21/95

Telephone No. Date

Note: Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.

Signature of Community Official

William C. Brandt, Senior Engineer

Printed Name and Title of Community Official

Clark County

Community Name

12/21/95

Date

Does this request impact any other communities? ☐ Yes ☒ No

If yes, attach letters from all affected jurisdictions acknowledging revision request and approving changes to floodway, if applicable.

Note: Although a photograph of physical changes is not required, it may be helpful for FEMA's review.

Project under construction.

Clark County

Progress As Promised

Department of Public Works

M. J. MANNING
DIRECTOR

CLARK COUNTY GOVERNMENT CENTER
500 S GRAND CENTRAL PKY
PO BOX 554000
LAS VEGAS NV 89155-4000
(702) 455-6000

URBAN C. LIVENGOOD, JR.
Deputy Director
455-6000

RONALD L. NORRIS
Deputy Director
455-6000

NALLIAH T. RAJAH
Manager
Administration & Programs
455-6000

DENIS CEDERBURG
Manager
Design Engineering
455-6050

LESLIE R. HENLEY
Manager
Construction Management
455-6050

BRETT N. LANE
County Surveyor
455-6150

CARLA J. PEARSON
Manager
Community Development
455-4600

RICHARD T. ROMER
Manager
Traffic Management
455-6100

OTHER OFFICES

JOHN N. MURDOCH
Manager
Maintenance Management
5825 E Flamingo Rd
Las Vegas NV 89122
455-7540

CHARLES R. JENNER
Manager
Environmental Control
4800 W Dewey Dr
Las Vegas NV 89118
455-7712

December 20, 1995

Craig Swengle
Black & Veatch
1771 East Flamingo Road, Suite 104A
Las Vegas, NV 89119

HIKO SPRINGS WASH DETENTION BASIN - SID 74
ENABLING LEGISLATION DOCUMENTS

Dear Mr. Swengle:

As requested, please find enclosed one copy each of the following documents:

- Ordinances creating Special Improvement District No. 74 (SID 74) and setting a public hearing.
- Ordinance adopting SID 74

Should there be questions, please call the undersigned at (702) 455-6070.

M. J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: William C. Brandt
WILLIAM C. BRANDT, P.E.
Senior Engineer

WCB:dfe

Enclosure

cc: Denis Cederburg, w/o enclosure
Maureen D'Ambra, w/o enclosure

901217e\059.d

COMMISSIONERS
Yvonne Atkinson Gates, Chair • Paul J. Christensen, Vice-Chairman
Jay Bingham, Lorraine Hunt, Erin Kenny, Myrna Williams, Bruce L. Woodbury
Donald L. "Pat" Shalmy, County Manager

Summary - An ordinance creating Clark County, Nevada, Improvement District No. 74 (Hiko Springs Wash, Laughlin) and providing other matters related thereto.

BILL NO. 12-6-94-4

ORDINANCE NO. ______

(of Clark County, Nevada)

AN ORDINANCE CREATING CLARK COUNTY, NEVADA, IMPROVEMENT DISTRICT NO. 74 (HIKO SPRINGS WASH, LAUGHLIN); PRESCRIBING DETAILS IN CONNECTION THEREWITH AND OTHER MATTERS RELATING THERETO.

WHEREAS, the Board of County Commissioners of the County of Clark in the State of Nevada (the "Board," "County" and "State," respectively), has determined and does hereby declare that the public convenience and necessity and the best interests of the County require, and the Board deems it necessary to create Clark County, Nevada, Improvement District No. 74 (Hiko Springs Wash, Laughlin) (the "District"), for the purpose of a Drainage Project and a Storm Sewer Project as defined in Chapter 271, Nevada Revised Statutes (the "Project"), and to defray a portion of the entire cost and expense of such improvements by special assessments, according to benefits, against the benefited lots, tracts and parcels of land in said District; and

WHEREAS, by resolution heretofore passed and approved (the "provisional order resolution"), the Board declared its determination to create the District for the purpose of making said improvements, stating therein the character and location of improvements, what portion of the entire expense thereof shall be paid by special assessments, and that the assessment is to be made according to benefits, by apt description designating the District, including the lands to be so assessed and definitely locating the improvements to be made; and

WHEREAS, the Board has heretofore determined that a portion of the cost and expense of the Project is to be paid by special assessments levied against the benefited lots, tracts and parcels of land in said District which the Board has determined will receive special benefits (and corresponding market value increases) from the improvements in the Project; and

WHEREAS, among other documents, the County Engineer and the County Engineering Department made out a preliminary assessment roll (Tabulation of Parcels) and an assessment plat for said District which contains, among other things, the names and addresses of the last-known owners of the property to be assessed, or if not known, stating that the name is "unknown"; a description of each lot, tract, or parcel of land to be assessed; the market value of each lot; the amount of the estimated assessment to be levied thereon; and the amount of maximum special benefits (and corresponding market value increases); and said Engineer has reported to the Board said tabulation of parcels and assessment plat to the Board, and has prepared and reported the "Engineers' Report to the Board of County Commissioners on Benefits," and has filed the assessment plat, tabulation of parcels and the Engineer's Report with the County Clerk; and

WHEREAS, pursuant to the provisional order resolution, the Board gave notice (in the manner specified by NRS 271.305) of the filing of the preliminary plans, assessment plat, preliminary assessment roll, typical section of the contemplated improvements, preliminary estimate of cost, and estimate of maximum benefits (and corresponding market value increases), and of the time and place of hearing thereon; and

WHEREAS, the manner of giving such notice by mail, publication and posting was reasonably calculated to inform the parties of the proceedings concerning the District which might directly and adversely affect their legally protected interest; and

WHEREAS, all owners of property to be assessed and interested persons so desiring were permitted to file a written protest or objection and to appear before said Board on Tuesday, October 4, 1994, and be heard as to the propriety and advisability of acquiring the

Project provisionally ordered, as to the cost thereof, and manner of payment therefor, and as to the amount thereof to be assessed against said property; and

WHEREAS, the written and oral objections and protests received were duly considered, and the Board, by resolution heretofore adopted, has determined that it is in the best interests of owners of property in the District, the County, and the inhabitants thereof to create the District as theretofore proposed; and

WHEREAS, certain property owners within the District have signed affidavits stating that the maximum special benefits to be received by each of their individual parcels from the construction of the improvements in the District are in stated amounts, which amounts are at least equal to the amounts of the assessments in the Preliminary Assessment Roll; and

WHEREAS, the owners of lots, tracts or parcels of land in the District representing less than one-half of the amount to be assessed in the District for the Project against all lots, tracts or parcels of land in the District filed written protests or made oral objections thereto; and

WHEREAS, every written protest and other objection presented was considered and found to be without sufficient merit and was overruled by said Board by the Improvement District 74 Protest Disposal Resolution except as otherwise provided therein; and

WHEREAS, any person filing a written complaint, protest or objection shall have the right, within 30 days after the Board has finally passed on such complaint, protest or objection to commence an action or suit in any court of competent jurisdiction to correct or set aside such determination; and

WHEREAS, the Board and officers of said County have done all things necessary and preliminary to the creation of the District, the filing with the County Clerk of an accurate estimate of cost, full and detailed revised and final plans and specifications, revised assessment plat, revised and final map, and a report on benefits by the County Engineer (the "Engineer"), and the County Engineering Department and said Board desires now to authorize such improvements and work by this ordinance.

NOW, THEREFORE, THE BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF CLARK, IN THE STATE OF NEVADA, DO ORDAIN:

Section 1. That this ordinance shall be known as, and may be cited by, the short title "Improvement District No. 74 Creation Ordinance" (the "ordinance").

Section 2. Assessor parcel numbers 264-21-101-001, 264-21-102-001, 264-21-404-001, and 264-28-103-001 are and were deleted by the Board from the District in the Improvement District 74 Protest Disposal Resolution. That said Board has heretofore determined and does hereby determine that each and every other protest and objection made in connection with the District is without sufficient merit and the same be, and the same heretofore has been by the Improvement District 74 Protest Disposal Resolution, overruled, and finally passed upon by said Board.

Section 3. That the Board has also determined and does hereby declare as follows:

(a) The public convenience and necessity require the creation of District No. 74 (Hiko Springs Wash, Laughlin) and the construction of the Project.

(b) The creation of the District is economically sound and feasible.

(c) The market value of each of the benefited lots, tracts and parcels of land in the District will be increased by an amount directly attributable to the Project for which the assessment is to be made.

Section 4. That there shall be, and hereby is, created in the County an improvement district designated the "Clark County, Nevada, Improvement District No. 74 (Hiko Springs Wash, Laughlin)" for the purpose of acquiring a Project as more particularly described below. The boundary of the District, which includes the lots, tracts and parcels of land to be assessed, shall be the exterior boundaries of the legal description and the parcels that follow:

Legal Description

(Hiko Springs Detention Basin)

A portion of land lying within Sections 16 and 17, Township 32 South, Range 66 East, M.D.M., Clark County, Nevada, more particularly described as follows:

> Commence at the south 1/4 corner of Section 16, being a point on the east right-of-way (ROW) line of Davis Dam - Needles Turnoff Road, thence North 89°50'28" West along the south section line of Section 16 a distance of 169.81 feet to the POINT OF BEGINNING, being a point on the West ROW line of said road; thence North 89°50'28" West along the South section line of Section 16 a distance of 2479.16 feet to the Southwest corner of Section 16; thence North 89°50'28" West, a distance of 500.00 feet; thence North 13°30'25" West, a distance of 600.00 feet; thence North 40°23'27" West, a distance of 861.73 feet; thence North 30°04'25" East, a distance of 1530.00 feet; thence South 46°16'26" East, a distance of 3575.00 feet; thence South 89°50'28" East, a distance of 341.59 feet to a point of intersection with a non-tangent curve along the west ROW line of Davis Dam - Needles Turnoff Road; said curve having a local tangent at the beginning point which bears South 10°44'59" West, a radius of 1075.00 feet, a central angle of 05°22'58", and a long chord which bears South 08°03'30" West a distance of 100.96 feet; thence Southerly along the arc of said curve to the left, being the West ROW line of Davis Dam - Needles Turnoff Road, a distance of 101.00 feet to the curve's end, and the POINT OF BEGINNING; Containing 100.62 acres of land, more or less.

and the following parcels described by Clark County Assessor's Parcel Numbers:

264-21-101-002,	264-21-101-003,	264-21-102-002,
264-21-202-001,	264-21-203-001,	264-21-303-001,
264-21-403-003,	264-21-701-001,	264-21-801-001,
264-21-801-002,	264-28-501-001,	264-28-601-001,
264-28-602-007,	264-28-602-008,	264-28-701-003,
264-28-801-001,	264-28-801-004,	264-33-101-007,
264-33-101-008,	264-33-501-001,	264-33-501-002,
264-33-501-003,	264-33-501-004,	264-33-501-005,
264-33-501-006.		

Section 5. That the Project, which is hereby ordered to be acquired, shall be located in Sections 16 and 17, Township 32 South, Range 66 East in Laughlin, Nevada, encompassing approximately 100 acres of land upon which Clark County will be granted a right-of-way by the Bureau of Land Management. The Project shall be as shown in the final plans and specifications heretofore filed in the County Clerk's office, without minor details being described, and the character of the improvements shall be described more particularly as a more or less 1,600 acre-foot detention basin on the Hiko Spring Wash, designed to reduce the 100-year peak flow from approximately 8,280 to approximately 850 cfs. The detention basin will be more or less 2,300 feet long along the top of an earthfill embankment with an 80-foot maximum height and a 550-foot roller-compacted concrete spillway designed to pass the probable maximum flood. Soil cement will protect the upstream face of the detention basin. A sediment berm will be provided to minimize downstream transport of suspended solids and redistribute the outflow from the basin to a wide shallow flow. The Project will not include improvements downstream from the detention basin.

The Board of County Commissioners has determined that the cost of the Project is of special benefit and shall be paid by special assessments against the lots, tracts and parcels of land benefited. The Project is to be constructed by the County.

Section 6. That the total cost of the Project shall be apportioned and the amount to be assessed shall be as follows:

Total Cost	Estimated Amount of Special Assessment	Amount Available From Other Sources
$9,290,000.00	$8,090,000.00	$1,200,000.00

The amounts to be assessed for the improvements in the District will be levied upon all tracts in the District, i.e., upon all abutting tracts in proportion to the special benefits derived (as shown by the estimated benefits and corresponding market value increases); provided, however, that an equitable adjustment will be made for assessments to be levied against wedge or V or other irregularly shaped lots or lands, if any, and for any lot, tract or parcel not specially benefited by the improvements so that assessments according to benefits are to be equal and uniform.

The assessments will be levied on an "area" or "square footage" basis.

Such basis of assessments has been designated by the Board in the Improvement District 74 Provisional Order Resolution.

Section 7. That the portion of the costs to be assessed against, and the maximum amount of benefits estimated (and corresponding market value increases) to be conferred upon, each piece or parcel of property in the District is stated in the assessment plat and addendum thereto designated "Tabulation of Parcels" or preliminary assessment roll.

Section 8. That the Engineer is hereby authorized to advertise for the doing of the work and making the improvements in the Las Vegas Review Journal, a daily newspaper published in Las Vegas, Nevada, and of general circulation in the County. Such notice shall be published at least once not less than seven days before the opening of bids. The notice shall be in substantially the form provided by the plans, specifications, and contract documents.

Section 9. That after the award of the contract, said Board shall determine the total cost of such work, including incidentals, and assessments shall be levied in accordance with the laws of the State, and said Board shall provide that the assessments may be payable without interest or demand, at the election of the owner, or in forty (40) substantially equal semi-annual installments of principal and interest. The Board shall provide the time and terms of payment of such assessments and shall fix penalties (not to exceed 2% per month) to be collected upon delinquent payments. The Board shall also provide the rate of interest on unpaid installments of assessments which will not exceed the current maximum rate of interest permitted under the statutes of the State; and if assessment bonds are issued, such rate will not exceed by more than one percent (1%) the highest rate of interest on any of the assessment bonds for the District. The effective interest rate on the assessment bonds of the District will not exceed the statutory maximum rate, i.e., will not exceed by more than three percent (3%) the "Index of Twenty Bonds" which shall have been most recently published at the time bids for the bonds are received, or at the time a negotiated offer for the sale of such bonds is accepted. If bonds are not issued for the District, the Board shall by resolution establish the rate of interest on unpaid and deferred installments of assessments.

Section 10. That all action, proceedings, matters and things heretofore taken, had and done by the County, and the officers thereof (not inconsistent with the provisions of this ordinance), concerning the District, including, but not limited to, the performing of all prerequisites to the creation of said District, the acquisition of the improvements, the specially benefited property therein, the determination that the lots, tracts and parcels of land in the District will receive special benefits and market value increases, and the levy of assessments for that purpose be, and the same hereby are, ratified, approved and confirmed.

Section 11. That the officers of the County be, and they hereby are, authorized and directed to take all action necessary or appropriate to effectuate the provisions of this ordinance, including without limiting the generality of the foregoing, the preparation of all necessary documents, legal proceedings, construction contracts, engineering specifications, contract addenda, and other items necessary or desirable for the completion of the levying of the assessments for the District and the issuance of the bonds therefor.

Section 12. That in accordance with Subsection 6 of NRS 271.325, upon the final adoption of this Ordinance the County Clerk is hereby authorized and directed to immediately file in the office of the County Recorder a certified copy of the preliminary assessment roll (the list of the tracts to be assessed). The County Recorder is to record such assessment roll for the purpose of establishing of record the lien or liens against the lots, tracts, and parcels of land and the amounts of maximum benefits estimated to be assessed against each tract in the assessment area as set forth in this Ordinance.

Section 13. Except for any ordinance or resolution which waives or amends the County's Developer Special Improvement District Guidelines, all ordinances or resolutions or parts thereof, in conflict with the provisions of this ordinance, are hereby repealed to the extent only of such inconsistency. This repealer shall not be construed to revive any ordinance or resolution, or part thereof, heretofore repealed.

Section 14. That in accordance with NRS 244.100, this ordinance when first proposed is to be read by title to the Board, immediately after which several copies of the proposed ordinance are to be filed with the office of the County Clerk for public examination; thereafter, the County Clerk is authorized and directed to give notice of the filing together with the title of the ordinance and an adequate summary of the ordinance, and the date upon which a public hearing will be held on such ordinance by publication at least once in the Las Vegas Review Journal, i.e., a newspaper published and having general circulation in the County, at least ten (10) days before the date set for such hearing, i.e., at least ten (10) days before December 20, 1994, such publication to be in substantially the following form:

(Form of Publication of Notice of Filing of Bill for an Ordinance)

Bill No. _______

Ordinance No. _______

(of Clark County, Nevada)

Notice of Public Hearing Before
The Clark County Board of County Commissioners

NOTICE IS HEREBY GIVEN that the Board of County Commissioners of Clark County, Nevada, will hold a public hearing at the Clark County Commission Chambers, in the Bridger Building, 225 East Bridger Avenue, in Las Vegas, Nevada, at 10:00 o'clock a.m., on Tuesday, December 20, 1994, for the purpose of hearing objections to the adoption of a proposed ordinance. At such hearing, interested persons may present their views. The ordinance is entitled:

AN ORDINANCE CREATING CLARK COUNTY, NEVADA, IMPROVEMENT DISTRICT NO. 74 (HIKO SPRINGS WASH, LAUGHLIN); PRESCRIBING DETAILS IN CONNECTION THEREWITH AND OTHER MATTERS RELATING THERETO.

An adequate summary of the ordinance is as follows:

The preambles of the Ordinance recite that the Board of County Commissioners deems it necessary to create Clark County, Nevada Improvement District No. 74 (Hiko Springs Wash, Laughlin) for the purpose of acquiring certain local improvements; recite that the Board declared its determination to create the District by resolution heretofore adopted; recite that the Board has reviewed the Engineer's Report on Benefits, and market value increases and other documents; recite that the Board fixed a time and place for a hearing on the creation of the

District and provided for the giving of mailed, posted and published notice of such hearing; recite that the requisite Notice was given and that such Notice was reasonably calculated to inform the parties of the proceedings concerning the District; recite that the hearing was held, that the written and oral objections were duly considered and were found to be without sufficient merit and were overruled by resolution adopted on December 6, 1994; recite that the owners of tracts representing less than one-half of the amount to be assessed filed such written or oral objections; recite that any person filing a written protest has the right within thirty (30) days to commence an action in any Court of competent jurisdiction to set aside the Board's determination; recite that the Board declared its determination to create the District by resolution heretofore adopted; and recite that the Board and the officers of the County have done all things necessary and preliminary to the creation of the District. The ordaining clause is then set forth.

Section 1. Provides that the ordinance shall be designated "Improvement District No. 74 Creation Ordinance."

Section 2. Deletes certain parcels from the District and dispenses with protests and objections made at the hearing.

Section 3. Determines that the public convenience and necessity require the creation of the District which is economically sound and feasible, and that the market value of each tract will be increased by an amount attributable to the Project.

Section 4. Creates Clark County, Nevada, Improvement District No. 74 (Hiko Springs Wash, Laughlin). Describes the boundaries of the Improvement District.

Section 5. Provides that the Project shall be as shown on the final plans and specifications on file in the Office of the County Clerk and more particularly describes the construction of the improvements.

Section 6. Provides for the total cost of $9,290,000.00, provides for the levy of special assessments in the amount of $8,090,000.00; provides for the basis of assessments to be levied.

Section 7. Provides that the portion of the cost to be assessed against, and the maximum amount of benefits estimated to be conferred upon each parcel of property is stated in the assessment plat in an addendum thereto designated "Tabulation of Parcels" or "Preliminary Assessment Roll."

Section 8. Provides that the Engineer of the County of Clark is authorized to advertise for the construction contract.

Section 9. Provides that after the award of the construction contract, the Board shall levy the assessments, which may be payable without interest or demand immediately upon the levy of the assessments, or in forty (40) substantially equal semi-annual installments of principal and interest, with interest at a rate which will not exceed by more than one percent (1%) the highest rate of interest on the special assessment bonds to be issued for Improvement District No. 74.

Section 10. Ratifies, approves, and confirms all consistent prior action taken in connection with Improvement District No. 74 and the levying of special assessments against the property in the District.

Section 11. Authorizes the County officials to take any action necessary to effectuate this ordinance.

Section 12. Authorizes and requires the recording of the preliminary assessment roll.

Section 13. Provides a repealer clause for conflicting provisions.

Section 14. Provides for notice by publication of the December 20, 1994, hearing on the ordinance and provides for this summary of provisions.

Section 15. Provides that this ordinance shall be in effect from and after its publication for two weeks following its final adoption on December 20, 1994; and provides the form for such publication which includes the names of the Commissioners voting for and against the adoption of the ordinance.

Section 16. Provides a severability clause.

Copies of Bill No. ________ are on file in the office of the Clark County Clerk on the fifth floor of the Bridger Building, 225 East Bridger Avenue, in Las Vegas, Nevada, for public examination. The Board shall adopt or reject the ordinance (or the ordinance as amended) within 35 days after the date of the final public hearing.

IN WITNESS WHEREOF, the Board of County Commissioners of Clark County, Nevada, has caused this notice to be published this December 6, 1994.

(SEAL)

/S/ Loretta Bowman
Loretta Bowman, County Clerk

(End of form for publication)

Section 15. That this ordinance shall be in effect from and after its publication as hereinafter provided, and after this ordinance is signed by the Chairman of the Board and attested and sealed by the County Clerk, this ordinance shall be published by title only, together with the names of the Commissioners voting for or against its passage, and with a statement that typewritten copies of said ordinance are available for inspection by all interested parties at the office of the County Clerk, such publication to be made in the Las Vegas Review Journal, a newspaper published and having general circulation in the County, at least once a week for a period of two (2) weeks by two (2) insertions, pursuant to NRS 244.100 and all laws thereunto enabling, such publication is to be in substantially the following form:

(Form for Publication after final adoption of Ordinance)

BILL NO. ________

ORDINANCE NO. _______

(of Clark County, Nevada)

AN ORDINANCE CREATING CLARK COUNTY, NEVADA, IMPROVEMENT DISTRICT NO. 74 (HIKO SPRINGS WASH, LAUGHLIN); AND PRESCRIBING DETAILS IN CONNECTION THEREWITH AND OTHER MATTERS RELATING THERETO.

PUBLIC NOTICE IS HEREBY GIVEN that typewritten copies of the above-numbered and entitled ordinance are available for inspection by the interested parties at the office of the County Clerk of Clark County, Nevada, at her office on the fifth floor of the Bridger Building, 225 East Bridger Avenue, Las Vegas, Nevada; and that said ordinance was proposed by Commissioner ________________ on December 6, 1994, and following a public hearing passed and adopted without amendment at a regular meeting held not more than 35 days after the close of the hearing, i.e., at the regular meeting on December 20, 1994, by the following vote of the Board of County Commissioners:

Those Voting Aye: ______________________________

____

____

____

____

____

____

Those Voting Nay: ______________________________

____

____

Those Absent and Not
Voting: ____________________

Those Abstaining: ____________________

This ordinance shall be in full force and effect from and after January 3, 1995, i.e., the date of the second publication of such ordinance by its title only.

IN WITNESS WHEREOF, the Board of County Commissioners of Clark County, Nevada, has caused this ordinance to be published by title only.

DATED this December 20, 1994.

/s/ Jay Bingham
Chairman
Board of County Commissioners
Clark County, Nevada

(SEAL)

Attest:

/s/ Loretta Bowman
County Clerk

(End of Form of Publication)

Section 16. That if any section, paragraph, clause or other provision of this ordinance shall for any reason be held to be invalid or unenforceable, the invalidity or unenforceability of such section, paragraph, clause or other provision shall not affect any of the remaining provisions of this ordinance.

Proposed on December 6, 1994.

Proposed by Commissioner __________.

Passed on December 20, 1994.

Ayes: Jay Bingham
Paul J. Christensen
Thalia M. Dondero
Yvonne Atkinson Gates
Karen Hayes
Don Schlesinger
Bruce Woodbury

Nays: __________

Absent: __________

Abstaining: __________

Chairman
Board of County Commissioners
Clark County, Nevada

(SEAL)

Attest:

Loretta Bowman
County Clerk

This ordinance shall be in force and effect from and after January 3, 1995, i.e., the date of the second publication of such ordinance by its title only.

REVIEWED BY DEPUTY DISTRICT ATTORNEY

The presiding officer thereupon declared that in accordance with the provisions of NRS 244.100, final decision upon the Bill for the proposed ordinance would be deferred until a hearing could be held at the regular meeting of the Board, on December 20, 1994, and that upon the filing of an adequate number of copies of the proposed ordinance with the office of the County Clerk, she shall give notice of such filing by publication, in the Las Vegas Review Journal, at least ten (10) days prior to the hearing on the adoption of said ordinance; and that said proposed ordinance will be read by title for a second and final time and considered for passage and adoption at the next regular meeting of the Board, (held within 35 days after the public hearing) to be held on December 20, 1994.

STATE OF NEVADA)
) SS.
COUNTY OF CLARK)

I, Loretta Bowman, the duly elected, qualified and acting County Clerk of Clark County (herein "County"), Nevada, and ex officio Clerk of its Board of County Commissioners (herein "Board"), do hereby certify:

1. The foregoing pages numbered -1- to -28-, inclusive are a full and correct copy of the record of proceedings of the Board of said County taken at a regular meeting thereof held on December 6, 1994, so far as such minutes relate to a resolution and an ordinance, copies of which are therein set forth; and the copies of such contained in such minutes is a true, correct, compared copy of the original proposed at such meeting.

2. All members of the Board were given due and proper notice of such meeting.

3. Public notice of such meeting was given and such meeting was held and conducted in full compliance with the provisions of NRS § 241.020. A copy of the notice of meeting and excerpts from the agenda for the meeting relating to the resolution, as posted at least 3 working days in advance of the meeting at:

(i) Principal Office
Bridger Building
225 Bridger Avenue
Las Vegas, Nevada

(ii) Winchester Park and Center
3130 South McLeod
Las Vegas, Nevada

(iii) Paradise Park, Pool and Center
4770 Harrison Avenue
Las Vegas, Nevada

(iv) Spring Valley Library
4280 South Jones Boulevard
Las Vegas, Nevada

is attached as Exhibit "A."

4. At least 3 working days before such meeting, such notice was delivered to each member of the Board and to each person, if any, who has requested notice of meetings of the Board in the same manner in which notice is required to be mailed to a member of the Board. Such notice, if mailed, was delivered to the postal service no later than 9:00 a.m. on the third working day prior to the meeting.

5. Upon request, the Board provides at no charge, at least one copy of the agenda for its public meetings, any proposed ordinance or regulation which will be discussed at the public meeting, and any other supporting materials provided to the Board for an item on the agenda, except for certain confidential materials and materials pertaining to closed meetings, as provided by law.

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of Clark County, Nevada, this December 6, 1994.

Loretta Bowman
County Clerk

(SEAL)

EXHIBIT "A"

(Attach copy of notice of meeting)

Item Number

BUSINESS ITEMS

SEC. 10. PARKS AND RECREATION

1. Approve and authorize the Chairman to sign a Community Access Agreement between Clark County and Clark County School District for use of selected school sites as recreational facilities. **80**

2. Approve the reallocation of $586.820 of County capital project monies (Fund 437) to the Open Schools - Open Doors program; authorize the creation of fifteen (15) permanent full time positions and nine (9) part time positions; and authorize transfer of $360.526 from the County Capital Projects Fund (Fund 437) to the Clark County General Fund (Fund 101). **81**

3. Receive the Community Cultural Plan for the Las Vegas Metropolitan Area. **82**

SEC. 11. AIRPORT

1. Approve and authorize the creation of five additional positions in the Department of Aviation for support of Geographic Information and Computer Services at the Airport. **83**

SEC. 12. PUBLIC WORKS

1. Review the decision of the newsrack hearing officer regarding Strip advertising, adult entertainers, Star Entertainment, Eddie Munoz, Ken Kolojay, and Angel R. Santana and sustain or reverse the decision based on the evidence provided or take other action deemed appropriate. **84**

2. Approve, adopt, and authorize the Chairman to sign the resolution disposing of protests; and introduce the ordinance creating the district; and set a public hearing for Tuesday, December 20, 1994, at 10 a.m., for Special Improvement District No. 74, Hiko Springs, Laughlin. **85**
PROCEEDINGS

(Attach Affidavit of Publication of Notice of Hearing
on the Creation Ordinance)

Item Number

SEC. 7. PUBLIC HEARINGS - **10 A.M.**

1. Conduct a public hearing; adopt and authorize the Chairman to sign an ordinance to amend Title 6, Chapter 6.160 of the Clark County Code, as to Erotic Dance Licensing, Sections 6.160.010, 6.160.040, 6.160.060, 6.160.065, 6.160.070, 6.160.080, 6.160.090, 6.160.110, 6.160.160, 6.160.170 and 6.160.190, as to findings, Prima Facie Evidence, License Application, License Issuance or Denial, License Renewal, Work Identification Cards, Regulations, Revocation or Suspension, Exemptions and Penalty; and providing for other matters properly relating thereto. **81**

2. Conduct a public hearing; adopt and authorize the Chairman to sign an ordinance to amend Title 6, as to Adult Nightclub Establishments, Chapter 6.170 of the Clark County Code by amending Sections 6.170.050 - Adult Nightclub License application, 6.170.060 - Issuance or denial of license and appeal, 6.170.080 - Attendant and Server Work Card, 6.170.085 - as to Work Identification Card required, and 6.170.090 - Adult Nightclub regulations and providing for other matters properly relating thereto. **82**

3. Conduct a public hearing; adopt and authorize the Chairman to sign an ordinance to amend Title 6, Chapter 6.95 of the Clark County Code as to Theater Licensing, Sections 6.95.010 (Definitions), 6.95.045 (Theater Manager - Work Identification Card), 6.95.070 (Picture Arcade Facility Regulations), and 6.95.080 (Penalty), and changing 6.95.090 to 6.95.100 (License Fee) and providing for other matters properly relating thereto. **83**

4. Conduct a public hearing to review proposed amendments to the Spring Valley Land Use and Development Guide and not close but continue the public hearing to a later date in order to allow the Planning Commission time to hold a public hearing pursuant to Clark County Code, Chapter 29.70.50. **84**

5. Approve, adopt and authorize the Chairman to sign the resolution declaring public convenience and necessity; conduct a public hearing and adopt the ordinance creating the district, for Special Improvement District No. 74, Hiko Springs, Laughlin. **85**
   PROCEEDINGS

END OF PUBLIC HEARINGS

STATE OF NEVADA)
) SS.
COUNTY OF CLARK)

The Board of County Commissioners of Clark County met in regular session in full conformity with law and the bylaws and rules of such Board at the regular place of meeting in the Clark County Commission Chambers in the Bridger Building, 225 East Bridger Avenue in Las Vegas, Clark County, Nevada, on Tuesday, December 20, 1994, at 9:00 a.m.

The meeting was called to order by the Chairman, and on roll call the following members were found to be present, constituting a quorum:

Present:	
Chairman:	Jay Bingham
Other Commissioners:	Paul J. Christensen
	Thalia M. Dondero
	Yvonne Atkinson Gates
	~~Karen Hayes~~
	~~Don Schlesinger~~
	Bruce Woodbury
Absent:	Karen Hayes*
	Don Schlesinger*

constituting all the members thereof.

There were also present:	
County Clerk:	Loretta Bowman
County Manager:	Donald L. Shalmy
County Counsel:	S. Mahlon Edwards

*Commissioners Hayes and Schlesinger entered the meeting.

CERTIFIED COPY
DOCUMENT ATTACHED IS A TRUE AND CORRECT COPY OF THE ORIGINAL ON FILE
DEC 27 '94
CLERK

The County Clerk announced that in accordance with NRS 244.100, that notice of filing of Bill No. 12-6-94-4 together with the title and an adequate summary of the ordinance and the date upon which a public hearing would be held, was published once on December 9, 1994, in the Las Vegas Review Journal, a newspaper published in Clark County and having a general circulation therein, which publication was at least ten (10) days before the date set for this hearing on December 20, 1994.

The Chairman thereupon declared the hearing on the foregoing designated Bill open and asked if interested persons wanted to present their views.

(The public hearing was thereupon held in connection with this meeting as provided for in subsection (4) of NRS 244.100.)

(insert minutes of hearing if anyone asked to be heard)

Commissioner Woodbury then moved that the
Bill for an ordinance entitled:

AN ORDINANCE CREATING CLARK COUNTY, NEVADA, IMPROVEMENT DISTRICT NO. 74 (HIKO SPRINGS WASH, LAUGHLIN); AND PRESCRIBING DETAILS IN CONNECTION THEREWITH AND OTHER MATTERS RELATING THERETO.

and introduced and read by title at the regular meeting of the Board on December 6, 1994, be now finally passed and adopted as read, without amendment, as an ordinance. The question being upon the final passage and adoption of such bill as an ordinance, the roll was called with the following result:

Ayes: Jay Bingham
Paul J. Christensen
Thalia M. Dondero
~~Yvonne Atkinson Gates~~
Karen Hayes
Don Schlesinger
Bruce Woodbury

Nays: Yvonne Atkinson

Absent: None

Abstaining: None

The presiding officer thereupon declared that a majority of the members of the Board of County Commissioners of Clark County, Nevada, having voted in favor thereof, such motion was carried and the Bill was duly passed and adopted as an ordinance.

The presiding officer thereupon declared that such ordinance, be duly numbered and the Clerk was directed to have the Ordinance published twice by title as therein provided. The ordinance is to be approved and authenticated by the signature of the Chairman of such Board of County Commissioners, sealed with the seal of Clark County, attested by the County Clerk and recorded in the minute book of such Board, such record to be signed by such officers and properly sealed.

Thereupon, after considering other matters not concerning District No. 74 (Hiko Springs Wash, Laughlin), upon motion duly made, and adopted, such meeting was adjourned.

Chairman
Board of County Commissioners
Clark County, Nevada

(SEAL)

Attest:

Loretta Bowman
County Clerk

STATE OF NEVADA)
) SS.
COUNTY OF CLARK)

I, Loretta Bowman, the duly elected, qualified and acting County Clerk of Clark County (herein "County"), Nevada, and ex-officio Clerk of its Board of County Commissioners (herein "Board"), do hereby certify:

1. The foregoing pages numbered -33- to -37-, inclusive, excerpts from the minutes of a meeting of the Board held on December 20, 1994, constitute a true, correct and compared copy of the proceedings of such Board so far as said minutes relate to an ordinance, a copy of which is set forth in full in the minutes of the meeting at which the ordinance was introduced and held on December 6, 1994; the copy of the ordinance contained in such minutes is a true, correct and compared copy of the original passed and adopted, following a public hearing thereon, without amendment by the Board at the designated meeting which was held within 35 days after the close of the public hearing on such ordinance; and the original of such ordinance has been approved and authenticated by the signature of the Chairman of the Board and myself as County Clerk, and sealed with the seal of the County, and has been recorded in the minute book of the Board kept for that purpose in my office, which record has been duly signed by such officers and properly sealed.

2. Notice of the hearing on the ordinance was published in the Las Vegas Review Journal, a newspaper published and of general circulation in the County, on December 9, 1994, which was at least ten (10) days before the December 20, 1994 hearing.

3. Members of the Board voted on the passage of the ordinance as set forth in such minutes of both of the above-designated meetings.

4. The ordinance was scheduled to be published by title only and collateral statement in the Las Vegas Review Journal, a newspaper published and of general circulation in the County, on Tuesday, December 27, 1994, and on Tuesday, January 3, 1995.

5. All members of the Board were given due and proper notice of each of such meetings held on December 6, 1994, and on December 20, 1994, respectively.

6. Public notice of such meeting was given and such meeting was held and conducted in full compliance with the provisions of NRS § 241.020. A copy of the notice of meeting and excerpts from the agenda for the meeting relating to the resolution, as posted at least 3 working days in advance of the meeting at:

(i) Principal Office
Bridger Building
225 Bridger Avenue
Las Vegas, Nevada

(ii) Winchester Park and Center
3130 South McLeod
Las Vegas, Nevada

(iii) Paradise Park, Pool and Center
4770 Harrison Avenue
Las Vegas, Nevada

(iv) Spring Valley Library
4280 South Jones Boulevard
Las Vegas, Nevada

is attached as Exhibit "A."

7. At least 3 working days before such meeting, such notice was delivered to each member of the Board and to each person, if any, who has requested notice of meetings of the Board in the same manner in which notice is required to be mailed to a member of the Board. Such notice, if mailed, was delivered to the postal service no later than 9:00 a.m. on the third working day prior to the meeting.

8. Upon request, the Board provides at no charge, at least one copy of the agenda for its public meetings, any proposed ordinance or regulation which will be discussed at the public meeting, and any other supporting materials provided to the Board for an item on the agenda, except for certain confidential materials and materials pertaining to closed meetings, as provided by law.

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of Clark County, Nevada, this December 20, 199__.

(SEAL)

Loretta Bowman
County Clerk

EXHIBIT "A"

(Attach Copy of Notice of Meeting)

Certification by

Registered Professional Engineer

(Form 2)

FEDERAL EMERGENCY MANAGEMENT AGENCY
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM

O.M.B. Burden No. 3067-0148
Expires July 31, 1997

FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average . 23 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden, to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067- 0148), Washington, DC 20503.

1. This certification is in accordance with 44 CFR Ch. I, Section 65.2
2. I am licensed with an expertise in Water resources (hydrology, hydraulics & sediment transport)
[example: water resources *(hydrology, hydraulics, sediment transport, interior drainage)** structural, geotechnical, land surveying.]
3. I have 8 years experience in the expertise listed above.
4. I have ☒ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☒ have ☐ have not visited and physically viewed the project.
6. In my opinion, the following analyses and /or designs, is/are being certified:
Engineering analysis, design & construction of the Hiko Springs Wash Detention Basin.
7. Base upon the following review, the modifications in place have been constructed in general accordance with plans and specifications.

Basis for above statement: (check all that apply)

a. ☐ Viewed all phases of actual construction.
b. ☐ Compared plans and specifications with as-built survey information.
c. ☐ Examined plans and specifications and compared with completed projects.
d. ☒ Other Prepared & supervised design & supporting analyses and currently participating in quality control of project construction.

8. All information submitted in support of this request is correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Steven D. Canney
(please print or type)

Title: Project Manager
(please print or type)

Registration No. 9801

Expiration Date: 12-31-96

State Nevada

Type of License Civil

[signature]
Signature

12-21-95
Date

PROFESSIONAL ENGINEER : STATE OF NEVADA
STEVEN D. CANNEY
CIVIL
09801

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) when statement does not apply.

FEDERAL EMERGENCY MANAGEMENT AGENCY

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM

O.M.B. Burden No. 3067-0148
Expires July 31, 1997

FEMA USE ONLY

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1. This certification is in accordance with 44 CFR Ch. I, Section 65.2
2. I am licensed with an expertise in Structural Engineering
   [example: water resources *(hydrology, hydraulics, sediment transport, interior drainage)** structural, geotechnical, land surveying.]
3. I have 8 years experience in the expertise listed above.
4. I have ☒ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☒ have ☐ have not visited and physically viewed the project.
6. In my opinion, the following analyses and /or designs, is/are being certified:
   Engineering analysis, design & construction of the Hiko Springs Wash Detention Basin
7. Base upon the following review, the modifications in place have been constructed in general accordance with plans and specifications.

   Basis for above statement: (check all that apply)

   a. ☐ Viewed all phases of actual construction.
   b. ☐ Compared plans and specifications with as-built survey information.
   c. ☐ Examined plans and specifications and compared with completed projects.
   d. ☒ Other Prepared & supervised design & supporting analyses and currently participating in quality control of project construction.
8. All information submitted in support of this request is correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Steven D. Canney
(please print or type)

Title: Project Manager
(please print or type)

Registration No. 9801

Expiration Date: 12-31-96

State Nevada

Type of License Civil

Steven D. Canney
Signature

12-21-95
Date

PROFESSIONAL ENGINEER : STATE OF NEVADA
STEVEN D. CANNEY
CIVIL
09801

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) when statement does not apply.

FEDERAL EMERGENCY MANAGEMENT AGENCY

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM

O.M.B. Burden No. 3067-0148
Expires July 31, 1997

FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average . 23 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden, to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

1. This certification is in accordance with 44 CFR Ch. I, Section 65.2
2. I am licensed with an expertise in Geotechnical Engineering
   [example: water resources *(hydrology, hydraulics, sediment transport, interior drainage)** structural, geotechnical, land surveying.]
3. I have 8 years experience in the expertise listed above.
4. I have ☒ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☒ have ☐ have not visited and physically viewed the project.
6. In my opinion, the following analyses and /or designs, is/are being certified:
   Engineering analysis, design & construction of the Hiko Springs Wash Detention Basin
7. Base upon the following review, the modifications in place have been constructed in general accordance with plans and specifications.

   Basis for above statement: (check all that apply)

   a. ☐ Viewed all phases of actual construction.

   b. ☐ Compared plans and specifications with as-built survey information.

   c. ☐ Examined plans and specifications and compared with completed projects.

   d. ☒ Other Prepared & supervised design & supporting analyses and currently participating in quality control of project construction.
8. All information submitted in support of this request is correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Steven Canney
(please print or type)

Title: Project Manager
(please print or type)

Registration No. 9801 Expiration Date: 12-31-96

State Nevada

Type of License Civil

[signature]
Signature

12-21-95
Date

PROFESSIONAL ENGINEER : STATE OF NEVADA
STEVEN D. CANNEY
CIVIL
09801

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) when statement does not apply.

Hydrologic Analysis Form

(Form 3)

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	*FEMA USE ONLY*

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.67 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden, to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

Community Name: Clark County, Nevada

Flooding Source: Hiko Springs Wash
(One form for each flooding source)

Project Name/Identifier: Hiko Springs Wash Detention Basin (HSWDB)

1. HYDROLOGIC ANALYSIS IN FIS

- ☐ Approximate study stream (Zone A)
- ☒ Detailed study stream (briefly explain methodology) HEC-1 Computer Model (100HIKO.DAT)

2. REASON FOR NEW HYDROLOGIC ANALYSIS

- ☒ No existing analysis
- ☐ Improved data *(see data revision on page 3)*
- ☐ Changed physical conditions of watershed *(explain)*
- ☐ Alternative methodology *(justify why the revised model is better than model used in the effective FIS)*
- ☒ Evaluation of proposed conditions (CLOMRs only) (explain) Construction of the Hiko Springs Wash Detention Basin has reached maximum elevation.
- ☐ Other

If a computer program/model was used in revising the hydrologic analysis, please provide a diskette with the input files for the 10-, 50-, 100 - and 500-year recurrence intervals.

Only the 100-year recurrence interval need be included for SFHAs designated as Zone A.

3. APPROVAL OF ANALYSIS

- ☒ Approval of hydrologic analysis, including the resulting peak discharge value (s) has been provided by the appropriate local, state, or Federal Agency. (i.e., Clark County Regional Flood Control District.)
  Attach evidence of approval.
- ☐ Approval of the hydrologic analysis is not required by any local, State, or Federal Agency.

4. REVIEW OF RESULTS

Stream: Hiko Springs Wash

Comparison of 100-year Discharges

Location:	Drainage area (Sq mi.)	FIS (cfs):	Revised (cfs):
HSWDB Inflow	19.2	8400	8282
HSWDB Outflow			850

Note: When revised discharges are not significantly different than FIS discharges, FEMA may require a confidence limits analysis on attachment D at a later date to complete the review.

As is often the case with revision requests, only a portion of a stream may actually be revised or be affected by a revision. Therefore, transition to the unrevised portion is important to maintain the continuity of the study. NFIP regulations stipulate that such a transition must be assured. What is the transition from the proposed discharges to the effective discharges? Please explain how the transition was made *(attach separate sheet if necessary)*

ATTACH A COMPLETED REVIEW OF RESULTS PAGE FOR EACH FLOODING SOURCE.

Is the new hydrologic analysis being developed solely to revise the flow values presented in the FIS *(i.e. no changed hydraulic conditions)*? ☐ Yes ☒ No

If yes, does the 100-year water surface elevation change by 1.0 foot or more? ☐ Yes ☐ No

FEMA does not normally revise NFIP maps solely due to insignificant flow changes where changes in 100-year wat surface elevation are less than 1.0 foot.

5. HISTORICAL FLOODING INFORMATION

Is historical data available for the flooding source? ☐ Yes ☒ No

If yes, provide the following:

Location along flooding source: ____________________

Maximum peak discharge: ____________________ cfs

Second highest peak discharge: ____________________ cfs

Source of information: ____________________

6. GAGE RECORD INFORMATION N/A

Location of nearest gage to project site *(along flooding source or similar watershed; specify)*

None

Gaging Station: ____________________

Drainage area at gage: ____________________ mi^2

Number of years of data: ____________________

7. DATA REVISION

Please use the following table to list all the data and/or parameters affected by this request and identify them as new data (*New*) or as revising existing data (*Revised*). *(If necessary, attach a separate sheet.)*

Data Parameter	New	Revised	Data Source
Rainfall Adjustment Factor	☒	☐	CCRFCD Manual
6-hour Storm Distribution	☐	☒	CCRFCD Manual
SCS Curve Numbers	☐	☒	Boyle Engineerimg
	☐	☐	
	☐	☐	

- Data source can be from a Federal, State, or local government agency, or from a private source. Some State and local governments may have less strict data requirements than Federal agencies, in which case the hydrologic data may not be accepted by FEMA unless it is demonstrated that the data give a better estimate of the flood discharge.
- Attach documentation corroborating each data source *(i.e., certified statement, report, bibliographical reference to a published document)*. In the case of a published document or a government report, providing copies of the cover and pertinent pages may be helpful.

8. METHODOLOGY FOR NEW ANALYSIS

☐ Statistical Analysis of Gage Records *(use Attachment A)*

☐ Regional Regression Equations *(use Attachment B)*

☒ Precipitation/Runoff Model *(use Attachment C)*

☐ Other *(specify; attach backup computations and supporting data)* ____________________

ATTACHMENT A: STATISTICAL ANALYSIS OF GAGE RECORDS

Gaging Station: N/A

Gage Location (latitude and longitude): ______

	FIS:		Revised:	
1. Number of years of data	______		______	
Systematic	______		______	
Historical	______		______	
2. Homogeneous data	☐ Yes	☐ No	☐ Yes	☐ No
3. Data adjustments	☐ Yes	☐ No	☐ Yes	☐ No
4. Number of high outliers	______		______	
Low outliers	______		______	
Zero events	______		______	
5. Generalized skew	______		______	
6. Station skew	______		______	
7. Adopted skew	______		______	
8. Probability distribution used (justify if log-Pearson III was not used)	______		______	

9. Transfer equations to ungaged sites ☐ Yes ☐ No

If yes, specify method

______

______

______

10. Expected probability* ☐ Yes ☐ No

11. Comparison of results with other analyses ☐ Yes ☐ No

If yes, describe comparison

______

______

______

*FEMA does not accept expected probability analyses for the purpose of reflecting flood hazard information in a FIS.

If any data is not available, indicate by N/A.

Attach analysis including plot of flood frequency curve.

1. Bibliographical Reference:

N/A

(Attach a copy of title page, table of contents, and pertinent pages including equations.)

2. Gaged or ungaged stream:

3. Hydrologic region(s):
Attach backup map.

4. Provide parameters, values, and source of data used to define parameters.

		FIS:		Revised:	
5.	Urbanized conditions calculations	☐ Yes	☐ No	☐ Yes	☐ No
6	Percent of watershed urbanization				
7.	Is the watershed controlled?	☐ Yes	☐ No	☐ Yes	☐ No
8.	Comparison with other analyses	☐ Yes	☐ No	☐ Yes	☐ No

If the answer to 5, 7, or 8 is yes, explain methodology in Comments.

If data is not available, indicate by N/A.

Comments

Attach computation and supporting maps, delineating the watershed boundary and drainage area divides.

ATTACHMENT C: PRECIPITATION/RUNOFF MODEL

		FIS:	Revised
1.	Method or model used:		HEC-1
	Version:		4.0
	Date:		1990
2.	Source of rainfall depth:	NDAA Atlas 2	Boyle Model
3.	Source of rainfall distribution:		CCRFCD Manual
4.	Rainfall duration:	3-hours	6-hours
5.	Areal adjustment to precipitation (%):		79%
6.	Maximum overland flow length		Boyle Model
7.	Hydrograph development method:		Boyle Model
8.	Loss rate method:	SCS Curve No.	Boyle Model
	Source of soils information:		Boyle Model
	Source of land use information		Boyle Model
9.	Channel routing method:		Kinematic Wave
10.	Reservoir routing:	☐ Yes ☐ No	☒ Yes ☐ No
11.	Baseflow considerations:	☐ Yes ☒ No	☐ Yes ☒ No

If yes, explain how baseflow was determined:

		FIS:	Revised
12.	Snowmelt considerations:	☐ Yes ☒ No	☐ Yes ☒ No
13.	Model calibration:	☐ Yes ☐ No	☐ Yes ☒ No

If yes, explain how calibration was performed

14. Future land use condition: ☐ Yes ☒ No

If yes, explain why

NOTE: FEMA policy is to base flooding on existing conditions.
If data is not available, indicate by N/A.

Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.

ATTACHMENT D: CONFIDENCE LIMITS EVALUATION

Stream: N/A

Select one location for Confidence Limits Evaluation (*describe location*): ______

Discharges for selected location:

Exceedance Probability		FIS	Revised
10%	(10-year)	______ cfs	______ cfs
2%	(50-year)	______ cfs	______ cfs
1%	(100-year)	______ cfs	______ cfs
0.2%	(500-year)	______ cfs	______ cfs

1% (100-year) Flood Confidence Intervals

90% Confidence Interval:	5% limit	______	cfs
	95% limit	______	cfs
50% Confidence Interval:	25% limit	______	cfs
	75% limit	______	cfs

If the value of the 100-year frequency flood in the FIS is beyond the 50% confidence interval but within the 90% confidence interval, does the 100-year water surface elevation change by 1.0 foot or more? ☐ Yes ☐ No

An example of confidence limits analysis can be found in Appendix 9 of Bulletin 17B.

Attach Confidence Limits Analysis.

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

Prepared by:
WRC ENGINEERING, INC.

Where:

2-hr = 2-hr 'x'-yr estimated value (inches)
3-hr = 3-hr 'x'-yr estimated value (inches)
1-hr = 1-hr 'x'-yr previously determined (inches)
6-hr = 6-hr 'x'-yr previously determined (inches)

These point rainfall values shall be modified as stated in the following Section 502.4.

502.4 ADJUSTMENTS TO NOAA ATLAS 2

Recent analysis of rainfall data in the Clark County area (WRC, 1989 and USACE, 1988) indicates that the NOAA Atlas 2 values do not necessarily reflect the trend of observed and recorded rainfall values which have occurred following publication of the Atlas in 1973. Therefore, the rainfall values in Sections 502.2 and 502.3 are to be adjusted to reflect the current trend of rainfall values based on the latest available information for the Clark County area. This adjustment consists of increasing the rainfall depths for durations of 6-hours or less by multiplying the values previously obtained by the appropriate factors presented in Table 501.

The said adjustment shall not be used when developing the design rainfall for use with SCS TR-55. The 24-hour design rainfall for TR-55 shall be used directly as developed in Section 502.2.

503 DEPTH - AREA REDUCTION FACTORS

The NOAA Atlas 2 precipitation depths are related to rainfall frequency at an isolated point. Storms, however, cause rainfall to occur over extensive areas simultaneously, with more intense rainfall typically occurring near the center of the storm. Standard precipitation analysis methods require adjusting point precipitation depths downward in order to estimate the average depth of rainfall over the entire storm area. This is normally performed using depth-area reduction curves relating to a point precipitation reduction factor to storm area and duration.

In previous hydrologic studies in Southern Nevada, three methods have been used for adjusting point-precipitation depths to areally averaged depths. All early studies used the depth-area reduction curves presented in the NOAA Atlas 2 (NOAA, 1973). These curves were developed through investigations of storms throughout the Western United States. In fact, the NOAA Atlas 2 for each state in the West contains the same family of depth area reduction curves. Most of the recent studies have adopted depth-area reduction factors from a relatively new publication known as "Hydro 40" (NOAA, 1984), which developed factors applicable specifically to Arizona and New Mexico.

The Corps of Engineers (USACE, 1988) used slightly different depth-area reduction factors than those presented in "Hydro 40" for areas greater than 30 square miles. These factors were based on analysis of thunderstorms in the greater Las Vegas area. For areas up to 30 square miles the depth-area reduction factors are almost the same as those in "Hydro 40".

The six-hour Corps of Engineers (USACE, 1988) depth-area reduction factors are to be used for all rainfall analysis in the Clark County area. The Corps of Engineers depth-area reduction curve is shown in Figure 514. The depth-area reduction factors for the six-hour storm are also tabulated in Table 502.

For areas greater than 200 square miles, the ability of the thunderstorm generating mechanisms (i.e. available moisture, strong convective currents, etc.) to sustain a thunderstorm much greater than 200 square miles in diameter is greatly reduced. Therefore, only a portion of an entire drainage basin could be subject to precipitation from the thunderstorm event. Analysis of this effect on runoff peaks and volumes is complicated by the necessity to determine the "storm centering" which produces the greatest peak flow and/or volume at the selected design point. In order to obtain a consistent method of analysis for these areas, the designer shall consult the local entity (and/or the CCRFCD if suggested by the local entity) to determine the appropriate method of analysis and design rainfall area reduction factors for the specific location and basin under consideration.

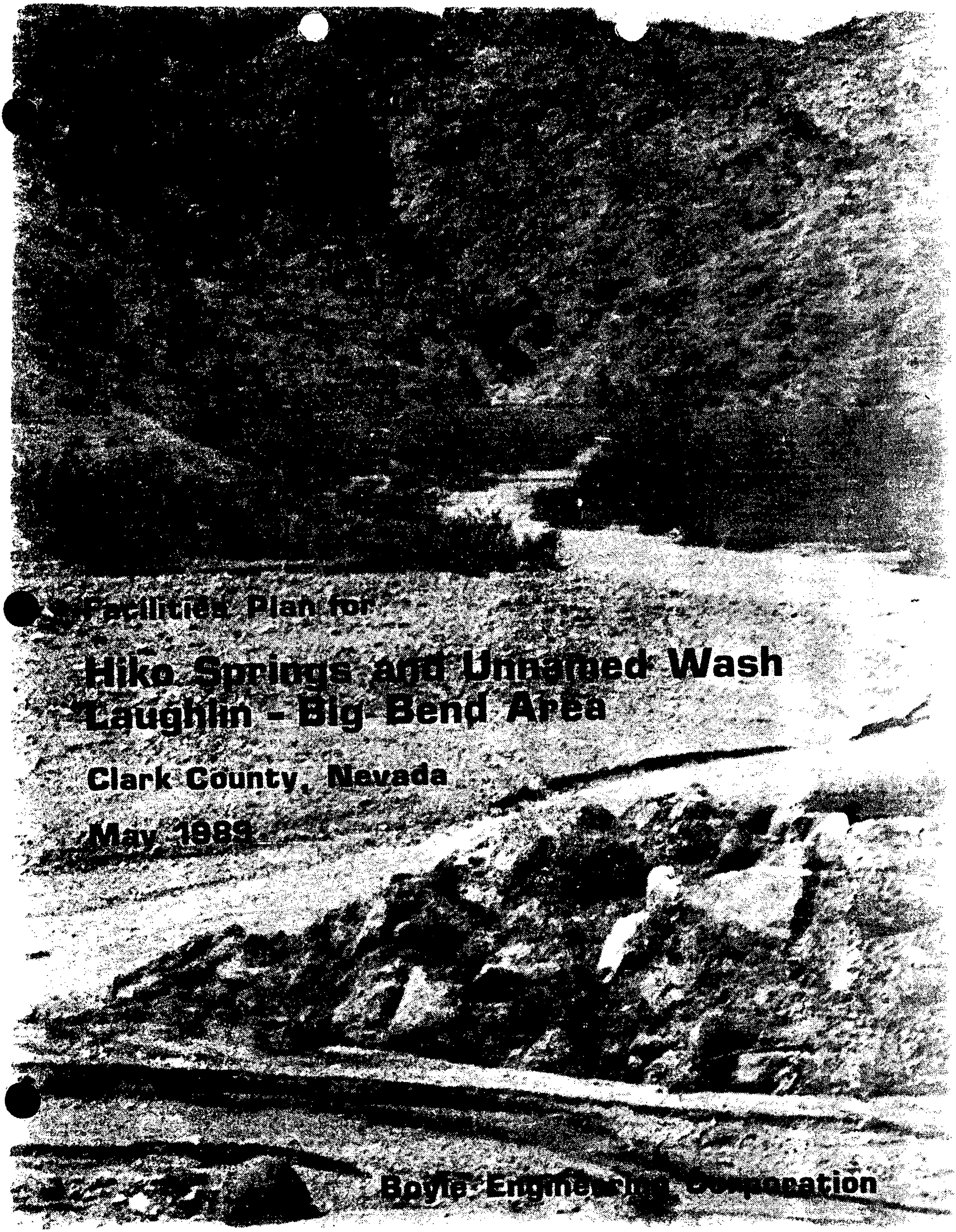
504 DESIGN STORMS

504.1 GENERAL

The design storm within the jurisdiction of the MANUAL shall be a 6-hour duration storm. The 6-hour duration storm is to be used for all HEC-1 runoff modeling in the Clark County area. The exception to the 6-hour design storm duration is when the SCS TR-55 method is used to compute runoff values. For SCS TR-55, a Type II rainfall distribution shall be used in conjunction with the 24-hour rainfall depth as described in TR-55.

504.2 SIX-HOUR DESIGN STORM DISTRIBUTION

Two different six-hour storm distributions are to be used as design storms in the Clark County area. The two design storm distributions, labeled SDN 3 and SDN 5, are graphically presented in Figure 515 and tabularized in Table 503. For drainage areas less than 10 square miles in size, use SDN 3. For drainage areas equal to or greater than 10 square miles in size, use SDN 5.



Facilities Plan for

Hiko Springs and Unnamed Wash Laughlin - Big Bend Area

Clark County, Nevada

May 1989

Boyle Engineering Corporation

CHAPTER 3

HYDROLOGY

INTRODUCTION

This chapter presents the results of the hydrologic analyses of the Hiko Springs Wash and the Unnamed Wash. Included is a presentation of the methodologies and assumptions used in the study.

METHODOLOGY

Hydrologic Model

The hydrologic model utilized for this study is the HEC-1 Flood Hydrograph Package developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center.

HEC-1 is a rainfall-runoff event simulation model utilizing an interconnected system of hydrologic and hydraulic components to simulate the surface runoff response of a drainage area to precipitation.

Precipitation

Precipitation values and parameters were utilized in accordance with the guidelines of the manual Rainfall For The Clark County Regional Flood Control District Area (CCRFCD Rainfall Manual). This manual is presently in draft format. The draft utilized was received by Boyle April 20, 1988.

Loss Rate

Precipitation excess over each sub-basin was generated using the United States Department of Agriculture Soil Conservation Service (SCS) curve number option built into HEC-1. In this method, runoff curve numbers are used to determine rainfall abstractions and are a function of soil group, antecedent moisture conditions, soil cover, and land-use type.

Hydrograph Development

The SCS Dimensionless Unit Hydrograph option in HEC-1 was used, in conjunction with excess precipitation, to develop flood hydrographs for each sub-basin.

Flood Routing

Routing of hydrographs was performed using the Kinematic Wave method. This method assumes that the energy grade line is parallel to the channel bottom. This method of routing was selected based upon the observation that slopes are generally steep within the basin and that backwater effects on flood flows are negligible.

PARAMETERS

Basin and Sub-basin Delineation

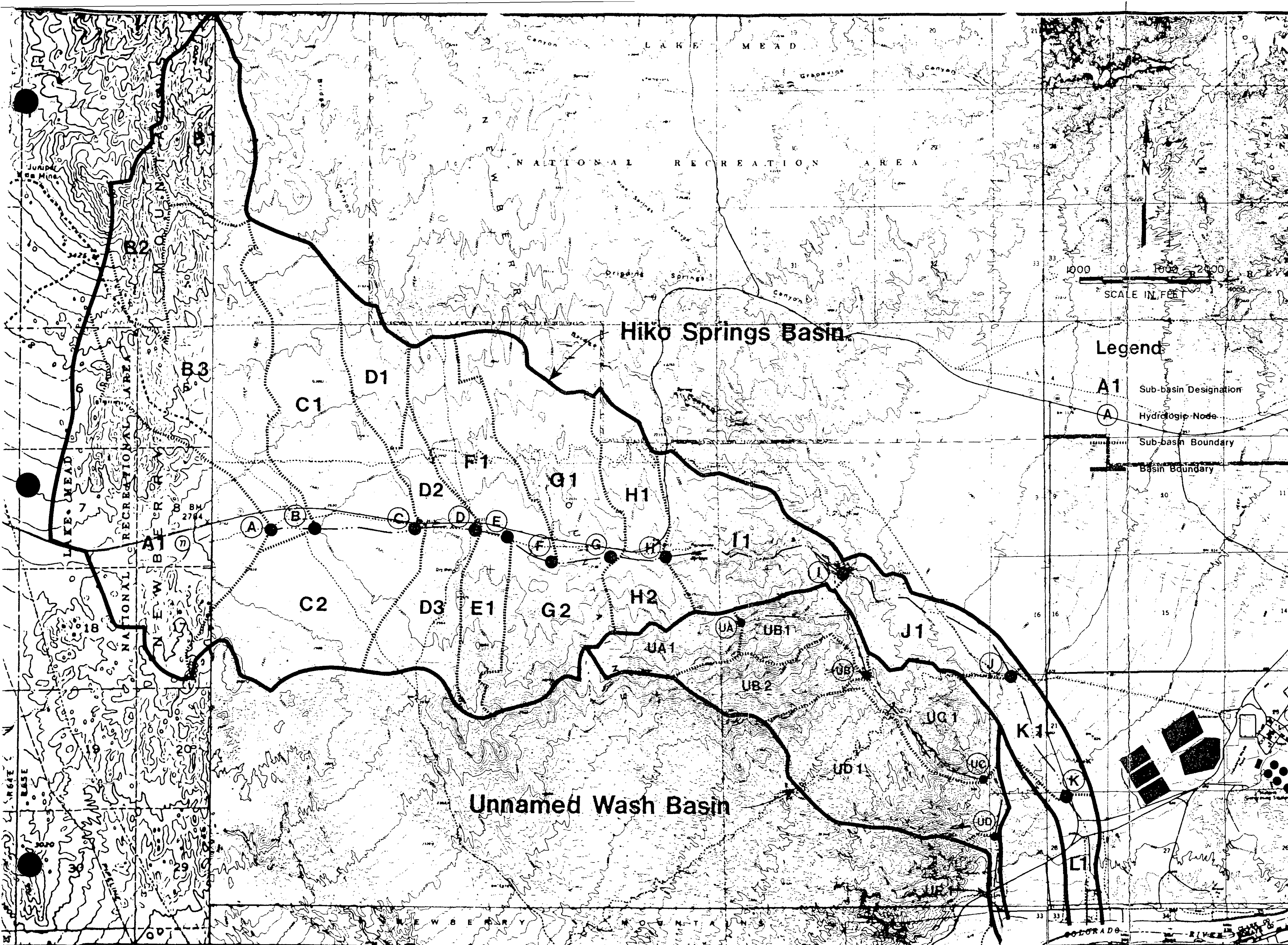
For hydrological modeling purposes the Hiko Springs Wash basin and the Unnamed Wash basin were divided into 19 and 6 sub-basins respectively. The basins and sub-basins are delineated in Figure 3.1. Sub-basin and basin boundaries were delineated based upon topography, flow concentration points, and design points of interest. The majority of the sub-basins were determined by utilizing the United State Geological Survey (USGS) 7.5 minute quadrangle maps for this area. A USGS 15 minute quadrangle map was utilized for the westerly portion of the Hiko Springs Wash Basin. For portions of each basin on the alluvial apron, 1-inch = 400-feet scale maps with 4-foot contour intervals prepared for the FEMA Flood Insurance Study were utilized.

Precipitation

A single event storm of 100-year recurrence interval was utilized for this study.

Point precipitation values were obtained using the NOAA Atlas 2, Precipitation - Frequency Atlas of the Western United States, Volume VII - Nevada, published by the U.S. Department of Commerce, National Weather Service in 1973. These point precipitation values were multiplied by a 1.43 adjustment factor to reflect the best available information in accordance with the CCRFCD Rainfall Manual.

Design storm durations of 3-hours and 6-hours were initially modeled. Based on initial modeling, the 6-hour design storm produced a greater peak discharge and greater runoff volume; therefore, only the 6-hour design storm was considered. The results of the 3-hour simulation for the entire watershed are presented along with the results of the 6-hour simulation in Table 3.3. The total rainfall utilized was 4.58 inches in the



Clark County Regional Flood Control District

Hiko Springs and Unnamed Wash Facilities Plan

DRAINAGE BASINS AND SUB-BASINS

Figure 3.1

Boyle Engineering Corporation.

model for the 6-hour design storm, and was 4.10 inches for the 3-hour design storm.

For the 6-hour design storm, five different storm distributions, each assigned a Storm Distribution Number (SDN), have been developed by the Los Angeles District of the Corps of Engineers. The appropriate SDN was utilized based on the size of the contributing drainage area. SDN 4 was used for the total area of the Hiko Springs Basin. Table 3.1 includes the SDN utilized at each hydrological node.

Depth Area Reduction Factors (DARF) were obtained from NOAA Technical Memorandum NWS HYDRO-40, Depth-Area Ratios in the Semi-Arid Southwest United States, published by the U.S. Department of Commerce, National Weather Service, in August of 1984. The appropriate DARF were obtained directly from the published table and curves, or interpolated for intermediate areas.

Table 3.1 shows the DARF utilized at each hydrological node.

Curve Numbers

Runoff curve numbers were developed based on vegetation, soils group information, land use, and antecedent soil moisture condition in accordance with the standard methods of the SCS.

Curve numbers for undeveloped area were based on a condition of desert shrub in poor hydrologic condition (less than 30 percent ground cover).

TABLE 3.1

PRECIPITATION PARAMETERS

NODE	CUMULATIVE AREA (SQ.MI)	DEPTH-AREA REDUCTION FACTOR	STORM DISTRIBUTION NUMBER
HIKO SPRINGS WASH			
A	2.7	.92	2
B	6.9	.89	3
C	10.5	.86	4
D	12.1	.84	4
E	12.6	.84	4
F	13.7	.83	4
G	16.0	.81	4
H	17.0	.80	4
I	18.3	.79	4
J	19.2	.79	4
K	19.7	.78	4
L	20.0	.78	4
UNNAMED WASH			
UA	.5	.99	1
UB	1.6	.96	*
UC	2.4	.95	*
UD	3.8	.91	*
UE	3.9	.91	3

* NOT APPLICABLE - PEAK DISCHARGES AND VOLUMES DETERMINED BY INTERPOLATION BETWEEN SIMULATIONS WITH SDN OF 1 AND 3.

Soils information was obtained from the SCS Soil Survey for the southern Clark County area. This survey delineates families of soil types and percentages of each hydrologic soil group in each family. Figure 3.2 delineates the boundaries of each family of soil types.

More than 90 percent of both basins is assumed to remain as undeveloped land. Estimates of future land use were made based on the available planning and zoning information. Future land use was lumped into three general categories: rural, residential, and resort hotel. Rural was assumed to be 30% impervious, residential - 60% impervious and resort hotel - 80% impervious.

An average antecedent soil moisture condition (Condition II) was used. Curve numbers used were based on desert shrub curve numbers published by the SCS in Technical Release 55, Second Edition, June 1986.

Based on the above factors, composite curve numbers for each sub-basin were developed. Table 3.2 shows the curve numbers for each sub-basin.

Basin Lags

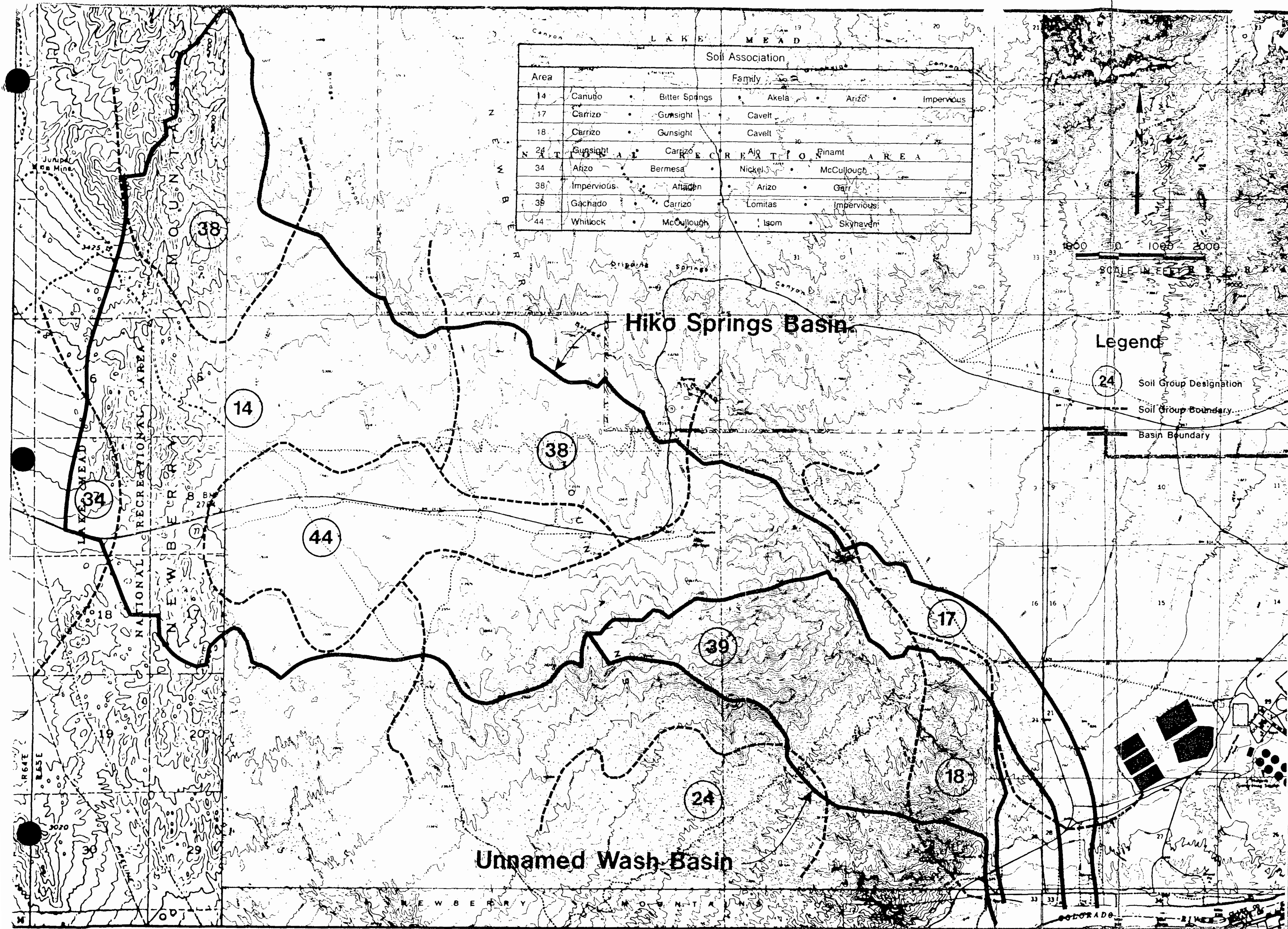
Basin lags were estimated for each sub-basin. These values were used in the calculation of a unit hydrograph for each sub-basin. The following equations were used to calculate sub-basin lag times:

$$Lag_{COE} = 24n\ (L\ Lc/\ S^{1/2})^{0.38}$$

$$Lag_{SCS} = .78\ Lag_{COE}$$

where

n	=	Roughness coefficient for overland flow,
L	=	Length of the main stream in miles.
Lc	=	Distance from the basin outlet to the centroid of the basin, in miles.
S	=	Average slope of the main water course, in feet/mile.
Lag_{COE}	=	Corps of Engineers lag time in hours.
Lag_{SCS}	=	Soil Conservation Service lag time, in hours.



Soil Association	
Area	Family
14	Canutio • Bitter Springs • Akela • Arizo • Impervious
17	Carrizo • Gunsight • Cavelt
18	Carrizo • Gunsight • Cavelt
24	Gunsight • Carrizo • Ajo • Pinamt
34	Arizo • Bermesa • Nickel • McCullough
38	Impervious • Aftaden • Arizo • Garr
39	Gachado • Carrizo • Lomitas • Impervious
44	Whitlock • McCullough • Isom • Skyhaven

Clark County Regional Flood Control District

Hiko Springs and Unnamed Wash Facilities Plan

SOIL ASSOCIATION MAP

Figure 3.2

Boyle Engineering Corporation.

TABLE 3.2

SUB-BASIN LAG AND BASIN PARAMETERS

SUB-BASIN NUMBER	AREA (sq.mi)	CN	L (mi.)	Lc (mi.)	n	SLOPE (ft/mi.)	LAG SCS
HIKO SPRINGS WASH							
A1	2.730	78	3.428	1.212	.06	162	.73
B1	1.080	83	2.121	1.080	.05	521	.39
B2	.610	82	1.761	.814	.05	330	.36
B3	2.500	81	3.240	1.890	.06	251	.78
C1	1.910	80	3.068	1.818	.06	298	.73
C2	1.680	79	2.652	1.155	.08	241	.79
D1	.524	80	1.610	.795	.05	293	.35
D2	.301	80	1.023	.644	.05	313	.27
D3	.753	85	1.591	.985	.05	289	.38
E1	.495	87	1.856	.758	.05	323	.36
F1	1.080	82	2.481	1.383	.05	391	.48
G1	1.360	83	2.765	1.477	.05	293	.53
G2	1.020	88	1.913	1.023	.05	364	.39
H1	.560	83	1.742	.871	.05	416	.35
H2	.373	90	.890	.455	.05	1056	.18
I1	1.350	89	2.614	1.098	.05	321	.47
J1	.847	75	1.894	1.023	.04	232	.34
KI	.517	68	1.136	.606	.04	216	.23
L1	.308	69	1.136	.511	.04	189	.22
UNNAMED WASH							
UA1	.481	90	1.288	.682	.05	517	.27
UB1	.495	90	1.553	.947	.05	386	.35
UB2	.631	90	1.629	1.061	.05	587	.34
UC1	.775	77	1.402	.663	.05	549	.27
UD1	1.435	84	2.159	1.383	.05	454	.44
UE1	.100	70	.841	.341	.04	166	.18

When using the SCS dimensionless unit hydrograph method, the U.S. Soil Conservation Service definition of lag is required. The relationship between the SCS Lag and the Corps of Engineers (COE) Lag is derived from the San Diego County Hydrology Manual and the SCS National Engineering Handbook.

The COE Lag is defined as the elapsed time in hours from the beginning of unit effective rainfall to the instant that the hydrograph for the concentration point of an area reaches 50 percent of the ultimate discharge volume. This time can be related to the time to peak.

From the San Diego County Hydrology Manual the following relationship applies for the SCS typical dimensionless unit hydrograph.

$$Lag_{COE} = 1.16\ T_p$$

or

$$T_p = .862\ Lag_{COE} \qquad (A)$$

Where T_p = time to peak in hours, defined as the time from the beginning of effective rainfall to the time of the maximum discharge.

The U.S. Soil Conservation Service definition of lag is the time from the center of mass of excessive rainfall to the time of maximum discharge. The SCS National Engineering Handbook provides the following relationships.

$$Lag_{SCS} \sim .6\ Tc$$

or

$$Tc \sim 1.67\ Lag_{SCS} \qquad (B)$$

and

$$D = 0.133\ Tc \qquad (C)$$

Where Tc = time of concentration, defined as the time it takes for runoff to travel from the hydrologically most distant part of the storm area to the watershed outlet.

D = time of duration of the excessive rainfall.

In hydrograph analysis, Tc is the time from the end of excessive rainfall to the point on the falling limb of the hydrograph (point of inflection) where the recession curve begins.

Both lag definitions may be related to the time to peak

$$T_p = Lag_{SCS} + D/2$$

substituting in relationship (C)

$$T_p = Lag_{SCS} + 0.133/2\ T_C$$

substituting in relationship (B)

$$T_p = Lag_{SCS} + 0.133/2\ (1.67\ Lag_{SCS})$$

reducing to

$$T_p = 1.11\ Lag_{SCS}$$

substituting in relationship (A)

$$.862\ Lag_{COE} = 1.11\ Lag_{SCS}$$

solving for Lag_{SCS}

$$Lag_{SCS} = .78\ Lag_{COE}$$

The "n" values selected for the basin range from .04 to .08. The higher "n" values are representative of the mountainous areas where significant channelization does not occur. The "n" values were selected based on field observations, guidelines from the San Bernardino County Hydrology Manual, comparison to lag relationships for numerous basins complied by the U.S.Army Corps of Engineers Los Angeles District, and noting that the smaller the sub-basin the greater percentage will be shallow overland flow, with higher "n" values than channelized flow.

Values of L, Lc, and S were measured from best available mapping, primarily USGS 7.5 minute quadrangle maps, also 15 minute USGS maps and the 1-inch = 400-feet FEMA Maps.

Hydrograph Routing

The Kinematic Wave approach to channel routing requires the estimation of channel lengths, slopes, average bottom widths, side slopes, and Manning's "n" values. Channel lengths and slopes were estimated from the available mapping. Average bottom widths, side slopes, and "n" values were estimated from mapping, aerial photographs and field observations.

TABLE 3.3

100-YEAR HYDROLOGIC ANALYSIS RESULTS

NODE	CUMULATIVE AREA (sq.mi.)	PEAK DISCHARGE (cfs)		TOTAL VOLUME (Ac-Ft)	
		Storm Duration		Storm Duration	
HIKO SPRINGS WASH		6-Hour	3-Hour	6-Hour	3-Hour
A	2.7	2500		300	
B	6.9	5700		790	
C	10.5	6900		1110	
D	12.1	7500		1260	
E	12.6	7600		1320	
F	13.7	8000		1410	
G	16.0	9100		1640	
H	17.0	9200		1730	
I	18.3	9700		1870	
J	19.2	9600		1900	
K	19.7	9500		1910	
L	20.0	9500	9000	1910	1600
UNNAMED WASH					
UA	.5	1400		88	
UB	1.6	3700		280	
UC	2.4	4400		360	
UD	3.8	5600		540	
UE	3.9	5200	4700	550	465

RESULTS

Simulations were performed using several total basin depth area reduction factors and appropriate storm distribution numbers. From these simulations, peak flows and volumes were directly calculated or interpolated for each hydrologic node. Table 3 presents the tributary area, and the resulting peak flows and volumes for each hydrological node.

VERIFICATION

The Hiko Spring Wash and the Unnamed Wash are both ungaged washes, making it difficult to calibrate the model to historic floods. There is also little information available regarding historic flooding for the region in general.

Two previous studies have developed 100-year peak discharges for the Hiko Springs Wash and the Unnamed Wash. Table 3.4 compares the discharges developed by Boyle to those developed for the CCRFCD Master Plan and for the FEMA Flood Insurance Study.

TABLE 3.4

100-YEAR PEAK DISCHARGES

	Hiko Springs Wash	Unnamed Wash
CCRFCD Master Plan	12,000	5,000
FEMA FIS	8,400	1,800
Boyle	9,500	5,200

The different studies have produced differing results. Each study used different rainfall parameters. The FEMA study used less rainfall because the 1.43 adjustment factor recently adopted by the District was not utilized. The FEMA FIS and the CCRFCD Master Plan utilized a 3-hour storm distribution. The Boyle study utilized a 6-hour SDN 4 storm distribution. Another factor was that the Boyle study used lower curve numbers in accordance with updated soils information.

Since the hydrological model was not calibrated, care was taken in selecting parameters which would be representative of the basin. Curve numbers were determined based on the most recent soils information and recently published estimates of curve numbers for desert shrub cover.

Estimates of lag times using the COE methodology were checked through comparison with other methods, particularly the upland or velocity method. Parameters used to compute lag were representative of values used in similar studies.

Results were compared to regional relationships including a 100-year peak discharge versus drainage area curve developed by The Los Angeles District of the Corps of Engineers. The higher discharge per drainage area developed for the Laughlin Area can be attributed to steep slopes and higher rainfall depths 4.58 inches compared to 2.86 inches for the Las Vegas area during the 100 year six hour storm.

Dam Form

(Form 11)

FEDERAL EMERGENCY MANAGEMENT AGENCY **DAM FORM**	O.M.B. Burden No. 3067-0148 Expires July 31, 1997	FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 0.5 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden, to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

Community Name: Clark County, Nevada

Flooding Source: Hiko Springs Wash

Project Name/Identifier: Hiko Springs Wash Detention Basin (HSWDB)

IDENTIFIER

Name of Dam: Hiko Springs Wash Detention Basin Embankment

Location of dam along flood source (in terms of stream distance or cross section identifier):

The HSWDB is located approximately 2.5 mi upstream from the Colorado River on the Hiko Springs Wash. The embankment is located in the SW corner of Section 16 and SE corner of Section 17, in Township 32 South, Range 66 East.

Check one of the following:

- ☐ Existing dam
- ☒ New dam under construction
- ☐ Modifications of existing dam (describe modifications)

Was the dam designed by ____Federal agency ____State agency X Local government agency ____Private organization?

BACKGROUND

Does the dam have dedicated flood control storage? ☒ Yes ☐ No

Does the project involve revised hydrology? ☒ Yes ☐ No

If yes, complete Hydrologic Analysis Form and include calculations of the 100-year inflow flood hydrograph routed through the dam with the beginning pool at the normal pool elevation (spillway crest elevation for ungated spillway). Include any inflow hydrograph bulking by watershed sediment yield and provide necessary debris and sediment yield analysis.

Does the revised hydrology affect the 100-year water-surface elevation behind the dam or downstream of the dam? ☒ Yes ☐ No

If yes, complete the Riverine Hydraulic Analysis Form and complete the table shown on the following page. Riverine Hydraulic Analysis form not completed. A hydraulic analysis of the downstream wash was not performed and is not intended to be a part of this CLOMR. Upstream of the embankment, the 100-year water surface elevation increases within the impoundment area of the HSWDB.

RESULTS

Stillwater Elevation Behind the Dam

	FIS	Revised
10-year		N/A
50-year		N/A
100-year		1076.12
500-year		N/A
Normal Pool Elevation (empty/dry)		1005.0

Was long term sediment accumulation taken into consideration in determining the normal pool elevation? ☒ Yes ☐ No

Was the dam designed to withstand the hydrostatic and hydrodynamic forces associated with floods greater than the 100-year flood? ☒ Yes ☐ No

If no, and the dam has a reasonable probability of failure during the 100-year flood, please attach dam break analysis.

Provide the following data on the dam:

Dimensional Height: 0 ft to 80 ft

Crest Elevation of top of dam: 1086

100-year flood storage capacity: 1580 ac-ft

Freeboard (measured from 100-year water surface elevation): 9.88 ft.

Spillway(s):

Type: ☐ gated ☒ ungated

Dimensional Width: 59 ft.

Dimensional Height: 70.12 ft.

Crest Elevation of top of spillway: 1076.12 ft.

Outlet(s):

Type: ☐ gated ☒ ungated

Width: 8 ft.

Height 6 ft.

Diameter: N/A

Invert Elevation: 994.20

Explain flow regulation plan: Upstream control using 62-in diameter orifice plate at opening of outlet. Outlet discharge is a function of the reservoir stage.

Are the project features, including the emergency spillway, designed to accommodate the 100-year flood discharge without overtopping the dam? ☒ Yes ☐ No

Was the dam designed in accordance with all currently applicable local, State, and Federal regulations? ☒ Yes ☐ No

If no, please provide explanation. ______

FEMA may request a list of regulations that have been complied with and supporting documentation demonstrating compliance with these regulations.

Attach copy of formal operation and maintenance plan N/A for CLOMR

Answer N/A to any questions which are not applicable

Permits

BLACK & VEATCH

1900 East Flamingo Road, Suite 295, Las Vegas, Nevada 89119, (702) 732-0448, Fax: (702) 732-7578

Clark County Dept. of Public Works
Hiko Springs Wash Detention Basin

B&V Project 25574.400
B&V File G-1.1
July 2, 1996

Mr. Jason King
Chief, Engineering and Dam Safety
Division of Water Resources
Dept. of Conservation & Natural Resources
Capitol Complex
123 W. Nye Lane
Carson City, Nevada 89710

Subject: Permit No. J-426

Dear Mr. King:

In accordance with the conditions of Permit No. J-426, Black & Veatch is submitting to you a set of as-built plans and a QA/QC report for the Hiko Springs Wash Detention Basin. Construction of this project was completed on March 22, 1996. The owner for the flood control facility is Clark County Department of Public Works; Black & Veatch served as the design engineer; Griener, Inc. served as construction manager; and American Asphalt and Grading constructed the project. The project was funded by the Clark County Regional Flood Control District in conjunction with Clark County Special Improvement District No. 74, and administered by Clark County Department of Public Works.

The QA/QC report is divided into two volumes: Volume 1 includes the soil tests and Volume 2 includes the roller-compacted concrete (RCC) soil cement, and conventional concrete tests. Also included in Volume 1 is Griener's Project Summary which summarizes the tests and procedures followed to mitigate results which were in noncompliance with the specifications.

The RCC for the spillway met the project specifications with a few exceptions. The RCC mix design was predetermined and proven on the scour hole test section before production began on the spillway. The onsite plant proportions were consistent and checked daily at 10-minute intervals. Given the constant supervision of RCC production, both Black & Veatch and Griener are confident that the RCC spillway is structurally adequate. This work was subsequently accepted by the Owner.

Black & Veatch has enclosed a signed statement certifying the detention basin was constructed in accordance with the approved plans and specifications.

Mr. Jason King

B&V Project 25574.400
July 2, 1996

If there are any questions regarding this submittal please contact me at 732-0448.

Very truly yours,

BLACK & VEATCH

Craig S. Swengle

Craig S. Swengle, P.E.

drh
Enclosure

cc: William C. Brandt, CCDPW, w/o enclosures

BLACK & VEATCH

1900 East Flamingo Road, Suite 295, Las Vegas, Nevada 89119, (702) 732-0448, Fax: (702) 732-7578

Clark County Dept. of Public Works
Hiko Springs Wash Detention Basin

B&V Project 25574.400
B&V File G-1.1
July 2, 1996

Mr. Jason King
Chief, Engineering and Dam Safety
Division of Water Resources
Department of Conservation & Natural Resources
Capitol Complex
123 W. Nye Lane
Carson City, Nevada 89710

Subject: Proof of Completion of Work

Dear Mr. King:

I, Jill A. Reilly, Nevada P.E. No. 11903, certify that the Hiko Springs Wash Detention Basin was constructed in accordance with the approved plans and specifications, or was modified as represented on the as-built drawings with full approval of Black & Veatch.

Very truly yours,

BLACK & VEATCH

Jill A Reilly

Jill A. Reilly, P.E.

drh

cc: William C. Brandt, P.E., CCDPW

proof.wp5/drh/CCDPW1

BOB MILLER
Governor

STATE OF NEVADA

PETER G. MORROS
Director

R. MICHAEL TURNIPSEED, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
Capitol Complex
123 W. Nye Lane
Carson City, Nevada 89710
(702) 687-4380

RECEIVED
JAN 06 1995
BLACK & VEATCH
LAS VEGAS

January 4, 1995

Mr. Bill Brandt, P.E.
Clark County Public Works
6655 W. Sahara Ave., Bldg. C-204
Las Vegas, NV 89102

Re: Hiko Springs Detention Basin; J-426

Dear Bill:

Please find enclosed the approved permit, plans and specifications for the referenced structure.

The owner is responsible for complying with the terms of the permit as stipulated in the original Exhibit "A".

Should you have any questions, please contact this office.

Sincerely,

Jason King, P.E.
Engineering Branch Manager

Enclosure

cc: Steve Canney, Black & Veatch
Stephen Roberts, Clark County Regional Flood Control District
NATDAM File

ORIGINAL

FILE IN TRIPLICATE

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES

Application No. J-426 Filed September 6, 1994

APPLICANT MUST NOT FILL IN ABOVE BLANKS

APPLICATION FOR APPROVAL OF THE PLANS AND SPECIFICATIONS FOR THE CONSTRUCTION, RECONSTRUCTION OR ALTERATION OF A DAM

This Application Involves in No Way the Right to Appropriate Water

To secure the right to appropriate water, application should be made to the State Engineer on forms which will be furnished upon request.

I, Denis L. Cederburg (Name of applicant) of 6655 West Sahara Avenue, Las Vegas, NV 89102 (Address), hereby make application for the approval of the plans and specifications for the construction (Construction, reconstruction, alteration) of Hiko Springs Detention Basin (Name of dam) dam.

The owner of the proposed dam is Clark County Department of Public Works (Name of owner)

of 6655 West Sahara Avenue, Las Vegas (Address) State of Nevada

If the owner is a corporation, give name and address of president and secretary—

Public Entity

The applicant is acting for the owner in the legal capacity of Agent (Agent, Lessee, Trustee, etc.)

Location of Dam

1. The source of water to be stored is Hiko Springs Wash (Name of stream or underground) which is a tributary of Colorado River (Stream),

and the proposed dam to be located within the - ¼, - ¼, Sec. 16 & 17

T. 32S, R. 66 E., M.D.B. & M. in Clark County, Nevada.

Description and Dimensions of Dam

(If for an alteration, the data given below is for the altered dam)

2. Type of dam earthfill (Concrete arch or gravity, earth, rockfill, etc.) 3. Length of crest 2300 ft.

4. Height stream bed to spillway crest 72 ft. 5. Height foundation to spillway crest 78 ft.

6. Freeboard 8.5 (Spillway crest to top) ft. 7. Thickness at top 38 ft. 8. Thickness at bottom 550 ft.

9. Slope upstream* 3:1 10. Slope downstream* 2.5:1/5:1 11. Upstream facing* soil cement (Concrete or rock paving, etc.)

*This information to be supplied for earth or rockfill dams.

12. Amount of material in dam 840,000 (Approximate) cu. yds. 13. Estimated cost $ 7,000,000

14. Spillway data 550' Trapezoidal Broad crested weir-32,140 cfs capacity; Roller Compacted concrete construction over embankment section (Type, capacity, etc.)

15. Outlet data 8' wide x 6' tall concrete box section w/inlet oriface plate - 850 cfs capaci (Type, capacity, etc.)

16. Elevation of crest of dam 1086.0 (Approximate elevation to be given if true elevation not available) above U.S.C.G. Vertical datum

17. Area of reservoir at spillway level 41.4 acres. 18. Capacity of reservoir 1,580 ac. ft.

General Information

19. State the **purpose** of the dam .... stormwater detention & sediment storage ....
Diversion only; storage only; storage and diversion; debris storage, etc.

20. State the **use** that is to be made of water .... not applicable ....
Municipal, domestic, irrigation, power, mining and milling, recreation, or stockwatering

21. Engineers .... Black & Veatch ....
Name and address of Engineers preparing plans

.... 1900 East Flamingo Rd. ....

.... Suite 295 ....

.... Las Vegas, NV 89119 ....

....

22. If the proposed dam is to be built under Federal supervision, state what department has jurisdiction

.... not applicable ....

23. The maps, plans and specifications accompanying this application are a part thereof.

[SIGNED] .... [signature] ....
Applicant

this ...11th... day of ...August..., 1994

APPROVAL OF APPLICATION NO. ...J-426..., **INCLUDING THE PLANS AND SPECIFICATIONS**

THIS IS TO CERTIFY That Application No. ...J-426..., including the plans and specifications for the ...Hiko Springs Detention Basin... dam has been examined and the same is hereby ...approved, subject to the following conditions:

.... See Exhibit 'A' ....

Witness my hand and seal this ...4... *day of* ...January..., 19 95

[signature]
State Engineer

J-426

CLARK COUNTY PUBLIC WORKS
HIKO SPRINGS DETENTION BASIN

EXHIBIT "A"

1. A registered Engineer shall make periodic inspections during construction to ensure that the dam is constructed to conform with the approved plans and specifications.

2. Upon completion of construction of the dam, the designing engineer shall submit to the State Engineer a signed statement certifying that the structure was constructed according to approved plans and specifications. The certification shall be accompanied by a set of "as-built" plans.

3. When the State Engineer has reviewed and approved the certification, he will notify the engineer in writing that water can be impounded by the dam. Water cannot be impounded until the State Engineer's written notification has been received.

4. If actual construction of the dam has not commenced within one year after the date of this approval, the approval becomes void and a new application is required to be submitted and approved before construction of the dam can begin.

5. The Engineer's report of Completion of Work shall be filed in the office of the State Engineer on or before January 1, 1996.

6. A summary of the results of all compaction, concrete, soil cement and roller compacted concrete tests shall be included in the report of completion. Actions taken regarding those tests failing to meet the minimum compaction requirements stated in the plans and specifications shall be described in the report of completion.

7. The basin shall be inspected periodically to monitor silt and debris accumulations. The basin shall be periodically cleaned to maintain the designed storage and flow capacities.

8. No long-term storage shall be allowed behind this dam and no gates, valves or other water control appliances shall be allowed on the outlet works. Water shall be released from storage as soon as practicable after filling.

9. This approval does not waive the requirement that the permit holder obtain other required permits from any and all other Federal, state and local agencies.

Clark County

Department of Public Works

M. J. MANNING
DIRECTOR

6855 WEST SAHARA AVENUE
BUILDING C-204
LAS VEGAS, NEVADA 89102
(702) 455-7760
FAX: (702) 455-7764

Progress As Promised

RECEIVED

FEB 07 1995

BLACK & VEATCH
LAS VEGAS

February 1, 1995

URBAN C. LIVENGOOD, JR.
Deputy Director
455-7755

NALLIAH T. RAJAH
Manager
Administration & Programs
455-7760

DENIS CEDERBURG
Manager
Design Engineering
455-7759

LESLIE R. HENLEY
Manager
Construction Management
455-7768

BRETT N. LANE
County Surveyor
455-7726

RICHARD T. ROMER
Manager
Traffic Management
455-7760

OTHER OFFICES

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Maintenance Management
5825 East Flamingo Road
Las Vegas, Nevada 89122
455-7640

CHARLES R. JENNER
Manager
Environmental Control
4800 West Dewey Drive
Las Vegas, Nevada 89118
455-7712

CARLA J. PEARSON
Manager
Community Development
401 South Fourth Street, 2nd Flr.
P. O. Box 554130
Las Vegas, Nevada 89155-4130
455-4600

Steve D. Canney, P.E.
Black & Veatch
1900 East Flamingo Road, Suite 295
Las Vegas, NV 89119

HIKO SPRINGS WASH DETENTION BASIN
NATIONWIDE PERMIT NOS. NW 14 AND NW 26

Dear Mr. Canney:

In accordance with your earlier request, we are enclosing for your perusal and file one copy of the Corps of Engineers Nationwide Permit Number NW 14 and NW 26 relating to subject project. This document was received today.

Should there be questions, please call me at 455-7707.

M. J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: William C Brandt

WILLIAM C. BRANDT, P.E.
Senior Engineer

WCB:dfe

Attachment

cc: Dana Reel, Black & Veatch, w/o enclosure
M. J. Manning, w/o enclosure
Bob Bilbray, w/o enclosure
William Trent, w/o enclosure
Carla Pearson, w/o enclosure
Gil Suckow, w/o enclosure
Denis Cederburg, w/o enclosure
Maureen D'Ambra, w/o enclosure

COMMISSIONERS
Yvonne Atkinson Gates, Chairman • Paul J. Christensen, Vice-Chairman
Jay Bingham, Lorraine Hunt, Erin Kenny, Myrna Williams, Bruce L. Woodbury
Donald L. "Pat" Shalmy, County Manager

901217e\035.D

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAM
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2[redacted]

REPLY TO
ATTENTION OF

January 19, 1995

Regulatory Section (199400917)(NW26)(NW14)

Yours

M. J. Manning
Director of Public Works
Clark County Dept. Of Public Works
6655 West Sahara Avenue
Building C-204
Las Vegas, Nevada 89102

Dear Mr. Manning:

I am responding to your request for a Department of the Army permit to place fill material in waters of the United States in conjunction with the construction of the HIKO SPRINGS WASH - DETENTION BASIN in CLARK County, south of Laughlin, Nevada.

The Chief of Engineers has issued Nationwide Permit Numbers NW14 and NW26 that allows for the placement of dredged or fill material in waters of the United States for roads crossing waters of the United States (including wetlands and other special aquatic sites) and into headwaters and isolated waters. Your project may be constructed under these authorities provided the work meets the conditions listed on the enclosed information sheets.

This verification will be valid for a period of three years from the date of this letter unless the nationwide permit authorization is modified, suspended, or revoked. You should contact this office if work will extend beyond this date.

If you have any questions, please write to Mr. Kevin Roukey, in our Reno Field Office, C. Clifton Young Federal Building, 300 Booth Street, Room 2120, Reno, Nevada 89509 or telephone (702) 784-5304.

Sincerely,

Bob Junell

Robert W. Junell, Chief
Nevada/Sierra Regulatory Office

Enclosure [redacted]

Copies: Denis
Lee
Gus
Maureen

Copies Furnished: w/o Enclosures

U.S. Fish and Wildlife Service, Nevada Ecological Services State Office, 4600 Kietzke Lane, Building C-125, Reno, Nevada 89502-5093

Nevada Department of Environmental Protection, 333 West Nye Lane, Carson City, Nevada 89710

NATIONWIDE PERMIT 14

ROAD CROSSINGS
(Sections 10 and 404)

The Corps of Engineers has issued a nationwide general permit authorizing fills for roads crossing waters of the United States (including wetlands and other special aquatic sites) provided:

a. The width of the fill is limited to the minimum necessary for the actual crossing;

b. The fill placed in waters of the United States is limited to a filled area of no more than 1/3 acre. Furthermore, no more than a total of 200 linear feet of the fill for the roadway can occur in special aquatic sites, including wetlands;

c. The crossing is culverted, bridged or otherwise designed to prevent the restriction of, and to withstand, expected high flows and tidal flows, and to prevent the restriction of low flows and the movement of aquatic organisms;

d. The crossing, including all attendant features, both temporary and permanent, is part of a single and complete project for crossing of a water of the United States; and,

e. For fills in special aquatic sites, including wetlands, the permittee notifies the District Engineer in accordance with the "Notification" general condition. The notification must also include a delineation of affected special aquatic sites, including wetlands.

Some road fills may be eligible for an exemption from the need for a Section 404 permit altogether (see 33 CFR 323.4). Also, where local circumstances indicate the need, District Engineers will define the term "expected high flows" for the purpose of establishing applicability of this nationwide permit.

A. GENERAL CONDITIONS. The following general conditions must be followed in order for any authorization by a nationwide permit to be valid:

1. No activity may cause more than a minimal adverse effect on navigation.

2. Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills must be permanently stabilized at the earliest practicable date.

4. No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water.

5. Heavy equipment working in wetlands must be placed on mats or other measures must be taken to minimize soil disturbance.

6. The activity must comply with any regional conditions which may have been added by the Division Engineer (see 33 CFR 330.4(e)) and any case specific conditions added by the Corps.

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6. The activity must comply with any regional conditions which may have been added by the Division Engineer (see 33 CFR 330.4[e]) and any case specific conditions added by the Corps.

7. No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status. Information on Wild and Scenic Rivers may be obtained from the National Park Service and the U. S. Forest Service.

8. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. In certain states, an individual state water quality certification must be obtained or waived. **IN CALIFORNIA, CERTIFICATION IS REQUIRED.** In Nevada, certification is required in **Truckee and Carson River Drainages.** In Utah and Colorado, certification is **NOT** required.

10. No activity is authorized under any nationwide permit which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species. Non federal permittees shall notify the District Engineer if any listed species or critical habitat might be affected or is in the vicinity of the project and shall not begin work on the activity until notified by the District Engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized. Information on the location of threatened and endangered species and their critical habitat can be obtained from the U.S. Fish & Wildlife Service and National Marine Fisheries Service.

b. The notification must be in writing and include the following information and any required fees:

(1) Name, address and telephone number of the prospective permittee;

(2) Location of the proposed project;

(3) Brief description of the proposed project, the project's purpose, direct and indirect adverse environmental effects the project would cause, and any other nationwide permits, regional general permits or individual permits used or intended to be used to authorize any part of the proposed project or any related activity;

(4) Where required by the terms of the nationwide permit, a delineation of affected special aquatic sites, including wetlands; and,

(5) A statement that the prospective permittee has contacted:

(i) The US Fish & Wildlife Service/National Marine Fisheries Service regarding the presence of any Federally listed (or proposed for listing) endangered or threatened species or critical habitat in the permit area that may be affected by the proposed project, and any available information provided by those agencies. (The prospective permittee may contact Corps District Offices for USFWS/NMFS agency contacts and lists of critical habitat);

(ii) The State Historic Preservation Office regarding the presence of any historic properties in the permit area that may be affected by the proposed project; and the available information, if any, provided by that agency.

c. The standard individual permit application form (Form ENG 4345) may be used as the notification but must clearly indicate that it is a PDN and must include all of the information required in b (1-5), of General Condition 12.

d. In reviewing an activity under the notification procedure, the District Engineer will first determine whether the activity will result in more than minimal individual or cumulative adverse environmental effects or will be contrary to the public interest. The prospective permittee may, at his option, submit a proposed mitigation plan with the predischarge notification to expedite the process and the District Engineer will consider any optional mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed work are minimal. The District Engineer will consider any comments from Federal and State Agencies concerning the proposed activity's compliance with the terms and conditions of the nationwide permits and the need for mitigation to reduce the project's adverse environmental effects to a minimal level. The District Engineer will, upon receipt of a notification, provide immediately (e.g., facsimile transmission, overnight mail or other expeditious manner), a copy to the appropriate offices of the Fish and Wildlife Service, State natural resource or water quality agency, EPA and, if appropriate, the National Marine Fisheries Service. With the exception of nationwide permit number 37, these agencies will then have 5 calendar days from the date the material is transmitted to telephone the District Engineer if they intend to provide substantive, site specific comments. If so contacted by an agency, the District Engineer will wait an additional 10 calendar days before making a decision on the notification. The District Engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency. The District Engineer will indicate in the administrative record associated with each notification that the resource agencies' concerns were considered. Applicants are encouraged to provide the Corps multiple copies of notifications to expedite agency notification. If the District Engineer determines that the activity complies with the terms and conditions of the nationwide permit and that the adverse effects are minimal, he will notify the permittee and include any conditions he deems necessary. If the District Engineer determines that the adverse effects of the proposed work are more than minimal, then he will notify the applicant either:

(1) That the project does not qualify for authorization under the nationwide permit and instruct the applicant on the procedures to seek authorization under an individual permit; or,

(2) That project is authorized under the nationwide permit subject to the applicant's submitting mitigation proposal that would reduce the adverse effects to the minimal level. This mitigation proposal must be approved by the District Engineer prior to commencing work. If the prospective permittee elects to submit a mitigation plan, the District Engineer will expeditiously review the proposed mitigation plan, but will not commence a second 30 day notification procedure. If the net adverse effects of the project (with the mitigation proposal) are determined by the District Engineer to be minimal, the District Engineer will provide a timely written response to the applicant informing him that the project can proceed under the terms and conditions of the nationwide permit.

e. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic site. There may be some delay if the Corps does the delineation. Furthermore, the 30 day period will not start until the wetland delineation has been completed.

f. Factors that the District Engineer will consider when determining the acceptability of appropriate and practicable mitigation include, but are not limited to:

(1) To be practicable, the mitigation must be available and capable of being done considering costs, existing technology, and logistics in light of overall project purposes; and,

(2) To the extent appropriate, permittees should consider mitigation banking and other forms of mitigation including contributions to wetland trust funds which contribute to the restoration, creation, replacement, enhancement, or preservation of wetlands.

Furthermore, examples of mitigation that may be appropriate and practicable include but are not limited to: reducing the size of the project; establishing buffer zones to protect aquatic resource values; and replacing the loss of aquatic resource values by creating, restoring, and enhancing similar functions and values. In addition, mitigation must address impacts and cannot be used to offset the acreage of wetland losses that would occur in order to meet the acreage limits of some of the nationwide permits (e.g. 5 acres of wetlands cannot be created to change a 6 acre loss of wetlands to a 1 acre loss; however, the 5 created acres can be used to reduce the impacts of the 6 acre loss).

B. SECTION 404 ONLY CONDITIONS. In addition to the General Conditions, the following conditions apply only to activities that involve the discharge of dredged or fill material and must be followed in order for authorization by the nationwide permits to be valid:

1. No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

2. No discharge of dredged or fill material may occur in areas of concentrated shellfish production, unless the discharge is directly related to a shellfish harvesting activity authorized by nationwide permit 4.

3. No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, etc.) and material discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

4. Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e., on site), unless the District Engineer has approved a compensation mitigation plan for the specific regulated activity.

5. Discharges in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

6. To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

7. If the discharge creates an impoundment of water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow shall be minimized to the maximum extent practicable.

8. Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

9. Any temporary fills must be removed in their entirety and the affected areas returned to the preexisting elevation.

C. FURTHER INFORMATION:

1. District Engineers have the authority to determine if an activity complies with the terms and conditions of a nationwide permit.

2. Nationwide permits do not obviate the need to obtain other Federal, state, or local permits, approvals, or authorizations required by law.

3. Nationwide permits do not grant any property rights or exclusive privileges.

4. Nationwide permits do not authorize any injury to the property or rights of others.

5. Nationwide permits do not authorize interference with any existing or proposed Federal project.

Clark County

Progress As Promised

Department of Public Works

M. J. MANNING
DIRECTOR

6855 WEST SAHARA AVENUE
BUILDING C-204
LAS VEGAS, NEVADA 89102
(702) 455-7760
FAX: (702) 455-7764

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LAS VEGAS

February 17, 1995

URBAN C. LIVENGOOD, JR.
Deputy Director
455-7755

NALLIAH T. RAJAH
Manager
Administration & Programs
455-7780

DENIS CEDERBURG
Manager
Design Engineering
455-7788

LESLIE R. HENLEY
Manager
Construction Management
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BRETT N. LANE
County Surveyor
455-7728

RICHARD T. ROMER
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455-7790

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455-7712

CARLA J. PEARSON
Manager
Community Development
401 South Fourth Street, 2nd Floor
P. O. Box 554130
Las Vegas, Nevada 89155-4130
455-4800

Ray Ahrns, Real Property Agent
Southern California Edison
16857 C. Street
Victorville, California 92392

HIKO SPRINGS DETENTION BASIN, LAUGHLIN, NEVADA

Dear Mr. Ahrns:

We are hereby returning, for your perusal and file, one executed copy of the "Request for Consent to Grading and Dam Construction." This matter was heard and approved by the Clark County Board of County Commissioners at their February 7, 1995 meeting.

Should there be questions, please call the undersigned at (702) 455-7707.

M. J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: William C. Brandt
WILLIAM C. BRANDT, P.E.
Senior Engineer

WCB:dfe

cc: Al Lenhart, Southern California Edison
Dana Reel, Black & Veatch
Steve Canney, Black & Veatch
Bob Bilbray
William Trent
M. J. Manning
Les Henley
Gus Cederburg
Whitey Wondra
John Murdoch
Gil Suckow
Denis Cederburg

Southern California Edison Company

16857 "C" STREET

VICTORVILLE, CALIFORNIA 92392

DESERT REGION
LAND SERVICES DIVISION
REAL PROPERTIES AND ADMINISTRATIVE SERVICES

TELEPHONE
(619) 951-3188
FACSIMILE
(619) 951-3284

William C. Brandt, P. E.
Clark County Department of Public Works
6655 West Sahara Avenue/ Building C-204
Las Vegas, Nevada 89102

January 9, 1995

Dear Mr. Brandt:

SUBJECT: Eldorado-Mohave 500 kV TL R/W (Easement)
Request for Consent to Grading and Dam Construction
Hiko Springs Wash Detention Basin
RP File No. G94D513-2-NV RA

Edison has reviewed and approved your request for Consent to Grading and Dam Construction as shown on the attached plans entitled "Hiko Springs Wash Detention Basin", bearing Edison's approval date of September 27,1994. This approval is provided only in so far as your request affects property rights held by Edison, and is subject to your obtaining the appropriate authorization and/or permission from the owners of record.

As a utility operating high voltage electric lines which serve a major portion of Southern California, Edison's approval is granted subject to the conditions listed below to provide for the safety of others, to protect the electric system from damage, and to prevent service interruptions.

1. All equipment working on the Edison right of way shall maintain a minimum clearance of twenty-seven (27) feet from all overhead conductors and twenty-five (25) feet from any Edison structures. Construction equipment shall not be parked on the Edison right of way.

2. Adequate access to all Edison structures shall be provided and at no time is there to be any interference with the free movement of Edison's equipment and materials.

3. Flammable materials shall not be stored on the Edison right of way.

4. Staging of equipment or materials shall not be permitted within the Edison right of way.

5. The construction area shall be watered down periodically to prevent dust contamination to Edison insulators. Any maintenance required by Edison on its facilities over and above normal, and resulting from this operation, shall be paid for by Clark County.

6. Any earth disturbed within the Edison right of way, and/or back-filling, shall be compacted to ninety percent (90%).

7. No additional structures or other development shall be permitted within the Edison right of way, other than those approved herein.

8. The Edison right of way shall be left in a condition reasonably satisfactory to Edison.

9. Access roads sixteen (16) feet wide inside the berms and capable of supporting forty (40) tons on a three-axle truck shall be provided at the location(s) shown on the enclosed plans.

10. The gradient of the proposed access road between shall not exceed twelve percent (12%). Any radius shall be constructed at fifty (50) feet to the inside curve.

11. Subject to the limits set forth in Nevada Revised Statutes, Chapter 41, Clark County, its officers, agents and employees, shall be responsible for all claims, demands, loss, damage, actions, causes of action, expense and/or liability arising or growing out of loss of or damage to property, including the property of Edison, or injury to or death of persons resulting in any manner, from the maintenance, use, operation, of the use approved herein caused by Clark County.

12. Final plans and any revisions thereof, including grading plans, must be submitted to Edison for review and approval at least sixty (60) days prior to commencement of any construction affecting the Edison right of way.

13. All notices required to be given to Edison herein shall be made in writing and shall be deposited in the United States mail, first class, postage prepaid, addressed as follows:

    Southern California Edison Company
    Land Services Division, Desert Region
    430 N. Vineyard Ave., Suite 210
    Ontario, CA 91764-5495

14. All costs incurred for the proposed project shall be borne by Clark County.

This letter should not be construed as a subordination of Edison's right, title and interest in and to its easements, nor should this letter be construed as a waiver of any of the provisions contained in said easements or a waiver of any costs of relocation of affected Edison facilities.

This agreement is personal to Clark County and is not transferable without Edison's prior written consent.

Please have the appropriate person sign and date the enclosed copy of this letter, thereby indicating acceptance of the above conditions, and return the signed copy to this office, using the enclosed envelope.

As previously indicated, it is necessary that the use of land within an operating high voltage transmission line right of way be closely coordinated. For this reason, it will be necessary for Edison to assume your project has been either delayed or cancelled in the event the copy of this letter has not been signed and returned within 180 days from the date of this letter. Should this occur, any consent granted or implied is voided without further notice in order to protect our rights and facilities. If the project is subsequently reactivated, please contact Edison again prior to the start of any construction, referencing our subject RP file number. We will then work together with you to ensure the project is coordinated so as to avoid interference with Edison installations and operations.

Edison appreciates the opportunity to review your plans and thanks you for your cooperation in coordinating your project with our company. If you have any questions, please contact me at (619) 951-3259.

R. J. Ahrns

R. J. AHRNS
Real Properties Agent
Land Services Division
Real Properties and
Administrative Services

ACCEPTED

BOARD OF COUNTY COMMISSIONERS
CLARK COUNTY

Date: February 7, 1995

By: Yvonne Atkinson Gates
YVONNE ATKINSON GATES
Chairman

ATTEST

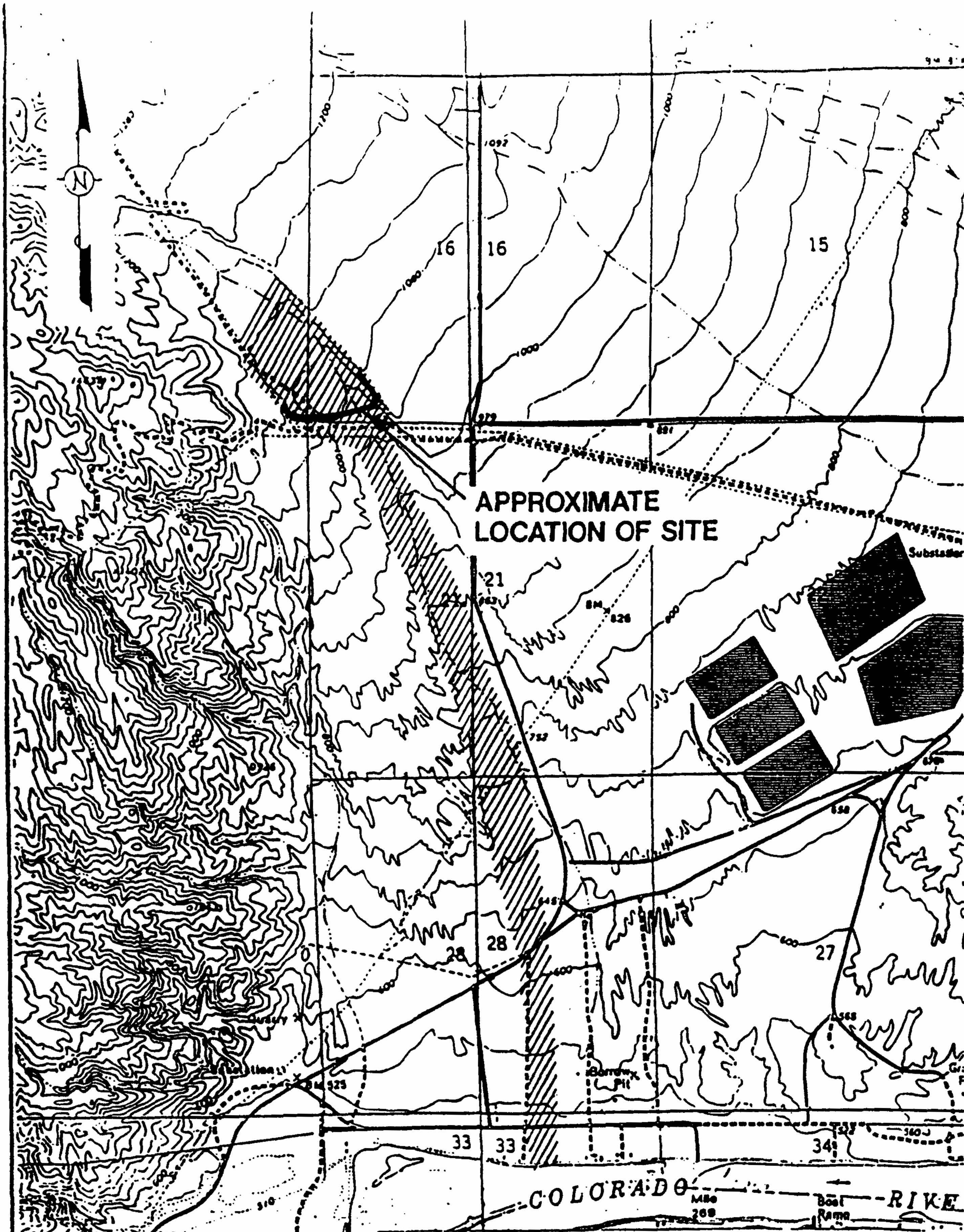
Loretta Bowman
LORETTA BOWMAN
County Clerk

APPROVED AS TO FORM

BY: CF
CHRISTOPHER FIGGINS
Deputy District Attorney

RJA/rja

cc: Steve Canney
Black & Veatch



KLEINFELDER

PROJECT NO. 31-109706

SITE VICINITY MAP

PLATE 1A

United States Department of the Interior
TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE
NEVADA ECOLOGICAL SERVICES FIELD OFFICE
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

RECEIVED
JUL 12 1993
REGIONAL
FLOOD CONTROL DISTRICT

July 9, 1993
File No. 1-5-93-F-137

Memorandum

To: District Manager, Las Vegas District, Bureau of Land Management, Las Vegas, Nevada

From: Field Supervisor, Ecological Services, Reno, Nevada

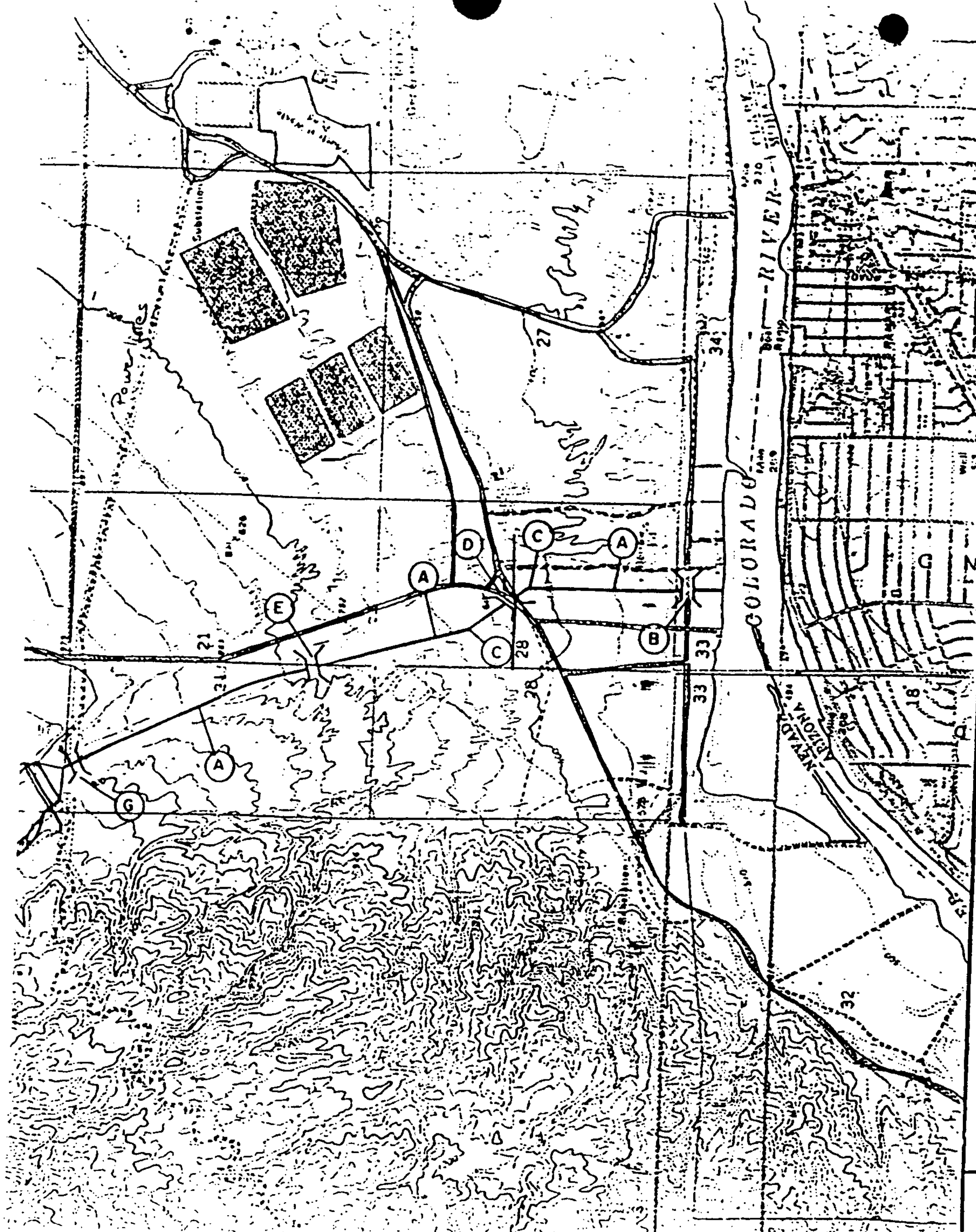
Subject: Biological Opinion for the Issuance of a Right-of-Way Permit for a Flood-Control Facility Near Laughlin, Nevada

This Biological Opinion responds to your February 19, 1993, request for formal consultation with the Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). The Service will analyze those impacts upon the desert tortoise (*Gopherus agassizii*), a species federally listed as threatened, that may result from the issuance of a right-of-way permit for a flood-control structure near Laughlin, Nevada. This consultation is conducted pursuant to 50 CFR Part 402 of our interagency regulations governing section 7 of the Act. The Service initiated formal consultation upon receipt of your request on February 24, 1993.

This Biological Opinion contains information from the section 7 biological evaluation dated January 29, 1993; Bureau of Land Management (BLM) correspondence dated February 19, 1993; Dames and Moore's environmental assessment dated March 1992; conversations with BLM staff; and information in our files.

Description of the Proposed Action

The BLM proposes to issue a right-of-way permit to Clark County Department of Public Works (CCDPW) for the construction of a 65-acre flood-control facility near Laughlin, Nevada (Figure 1). Clark County Regional Flood Control District (CCRFCD) will fund at least part of the construction with possible additional funding from a local developer. The facility will include a 50-acre detention basin with 1500 acre-feet storage capacity and a 2,200-foot access road; an earthen dam, 1200 feet long, 375 feet wide, and 70 feet above existing ground; 11,827 feet of channel and parallel road; and 10 stilling basins, 60 feet wide and



Clark County Regional Flood Control District

Hiko Springs Facilities Plan

CENTRAL ALIGNMENT PLAN

N-54984

Boyle Engineering Corporation

60 feet long. The 100-year flow would discharge through a 72-inch outlet pipe with an energy dissipation design. The 2.25 miles of channel below the dam will be fenced. The entire detention basin and access road are located on public land administered by BLM. The channel and parallel road are on private land.

The BLM proposes the following mitigation measures to minimize impacts to desert tortoises from the proposed action (BLM 1993a, Dames and Moore 1992).

1. The construction site shall be inspected for desert tortoises and their burrows before the onset of construction. The inspection shall be conducted by a qualified tortoise biologist and shall provide 100 percent coverage of the area to be impacted no more than 1 day before initiation of the construction activity.

2. If a tortoise wanders onto the site during construction, all activity will cease until the tortoise wanders out of harm's way of its own volition. If it does not move out of harm's way within 15 minutes, it will be removed by a qualified tortoise biologist and placed under the shade of a shrub 500 to 1000 feet from the project.

3. Desert tortoises encountered experiencing heat stress will be placed in a tub with 1/2 inch of water in an environment with a temperature between 76 and 95 degrees fahrenheit for several hours, until heat stress symptoms are no longer evident. The tortoise will then be moved as identified in mitigation measure 2.

4. Desert tortoises moved between November 1 and February 28 must be placed into an adequate burrow; if one is not available, one will be constructed utilizing the following restrictions: 1) The main chamber of the burrow shall be constructed of plywood and the roof placed approximately 2.5 feet below the soil surface; 2) the burrow's tunnel shall be 8 to 10 feet long with a gentle slope (e.g., about 4:1); 3) the tunnel shall be stabilized on the top with PVC pipe cut in half; 4) the pipe shall be no smaller than 15 inches in diameter and soil shall be used to adjust the tunnel to size of the tortoise; and 5) after placement of the tortoise in the burrow, the entrance shall be partially blocked with loose topsoil.

5. Tortoises and nests found on the project area shall be relocated by a qualified tortoise biologist in accordance with the Service's protocol for handling live tortoises (1990). Burrows containing tortoises or nests will be excavated by hand using hand tools to allow removal of

the tortoise or eggs. Other tortoises found where no appropriate habitat is available will be collected.

6. During construction, if trenches are to remain open overnight, they shall be checked for tortoises at least twice per day, immediately before work in the morning and at the end of the work day. All construction workers shall be instructed that their activities shall be confined to locations within the marked area.

7. The construction site shall be clearly marked or flagged at the outer boundaries before the onset of construction. All construction workers shall be instructed that their activities shall be confined to locations within the marked area.

8. All construction and maintenance vehicles shall stay within the designated area. Overnight parking and storage of equipment and materials, including stockpiling, shall be in previously disturbed areas (i.e., lacking vegetation).

9. A litter-control program shall be implemented by the applicant. It will include the use of covered, raven-proof trash containers, and removal of trash from the construction site to the containers. When the containers are nearly full, they will be properly emptied in a designated solid-waste-disposal facility.

10. A qualified desert tortoise biologist will be responsible for informing all foremen, construction workers, and other employees working on this project about the desert tortoise. This will include information provided by the BLM on the life history of the desert tortoise, its protected status, and protocols for dealing with tortoises if they are encountered. The definition of "take" will also be explained.

11. The applicant shall ensure that all supervisory and maintenance personnel received item #10 above. An acknowledgment form shall be returned to the BLM upon complete circulation to all such employees. All workers also will be instructed to check under all vehicles before moving such vehicles.

12. The BLM will be notified when construction of this proposed action begins. The Supervisory Natural Resources Specialist, Don Siebert (647-5056), will be notified before any construction begins.

13. The BLM will be notified within 30 days of completion of the project, the project proponent will submit a report to the BLM detailing all tortoise related monitoring

activity, incidental take, and effectiveness of mitigation measures.

14. The western end of the detention basin will be constructed to allow for escape of tortoises and the design shall be approved by both BLM and the Service.

15. A fee of $324 per acre for long-term disturbance to desert tortoise habitat will be paid to the Desert Tortoise Habitat Conservation Fund Number 236-8290, administered by Clark County, for the purpose of securing tortoise management areas, habitat enhancement, and tortoise research. However, none of these funds shall be used to develop the Habitat Conservation Plan (HCP). These funds are independent of any other fees collected by Clark County for desert tortoise conservation planning. The entire payment required for this proposed action is $21,060.00 This fee will be paid to the Desert Tortoise Habitat Conservation Fund prior to issuance of the right-of-way permit.

Status of the Species/Environmental Baseline

The desert tortoise, a large herbivorous reptile, is generally active when annual plants are most common (spring, early summer, autumn). Desert tortoises usually spend the remainder of the year in shelter sites, escaping the extreme weather conditions of the desert. Sheltering habits of desert tortoises vary greatly in different geographic locations. Shelter sites may be located under bushes, in the banks or beds of washes, in rock outcrops, or in caliche caves. Further information on the range, biology, and ecology of the desert tortoise can be found in Berry (1984), Berry and Burge (1984), Burge (1978), Burge and Bradley (1976), Hovik and Hardenbrook (1989), Karl (1981, 1983a, 1983b), Luckenbach (1982), and Weinstein et al. (1987).

On April 2, 1990, the Service determined the Mojave population of the desert tortoise to be threatened (Service 1990). The Mojave population includes those animals living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, and southwestern Utah and in the Colorado Desert in California (a division of the Sonoran Desert). In Nevada, the native range of this species is generally restricted to Clark County and those portions of Nye and Lincoln Counties south of 37 degrees North latitude and below approximately 1,330 meters elevation (4,000 feet). Reasons for listing the desert tortoise included loss of habitat from construction projects such as roads, housing and energy developments, and conversion of native habitat to agriculture. Grazing and off-road vehicles have degraded additional habitat. Also cited as threatening the desert tortoise's continuing existence were illegal collection, upper respiratory tract disease, and predation on juvenile desert tortoises by common ravens *(Corvus corax)*.

According to *Desert Tortoise Habitat Management on Public Lands; A Rangewide Plan* (Spang et al. 1988), BLM classified desert tortoise habitat into three categories based on: 1) Importance of the habitat to maintaining viable populations; 2) resolvability of conflicts; 3) desert tortoise density; and 4) desert tortoise population status (stable, increasing, or decreasing). The Laughlin flood-control project area is located entirely within Category III desert tortoise habitat.

The *Draft Recovery Plan for the Desert Tortoise (Mojave Population)* (Service 1993) identifies proposed desert wildlife management areas (DWMAs) where management actions should be undertaken to recover the desert tortoise. The proposed project lies adjacent to the Piute-Eldorado DWMA.

On January 19, 1993, a BLM biologist and realty specialist walked seven 30-foot interval transects across the detention basin site. On January 27 and February 1, 1993, an additional 5.5 miles of zone of influence transects were conducted by a BLM biologist in the detention basin area. No tortoise sign was observed during the surveys.

According to Dames and Moore (1992), the project area is characterized by creosotebush scrub. Dominant plant species present are creosote bush (*Larrea tridentata*) and bursage *(Ambrosia dumosa)*. The southernmost 0.75 mile of the proposed channel is within tamarisk (*Tamarix ramosissima*) vegetation.

Effects of the Proposed Action on the Listed Species

The proposed detention basin and access road will result in the long-term disturbance of 53 acres of desert tortoise habitat. Construction of the stilling basins, channel and parallel road will result in the long-term disturbance of an additional 12 acres of desert tortoise habitat.

Project vehicles or equipment may kill or injure desert tortoises that are on the site, or roads adjacent to the site, by crushing them or caving in their burrows (Nicholson 1978). Other desert tortoises may be harassed by removal from the project site or adjacent roads. Mitigation proposed by the BLM to restrict all vehicular traffic to designated areas that will be clearly flagged and marked should minimize these impacts.

Additional indirect impacts may occur from noise produced by vehicles and equipment (Bondello 1976, Bondello et al. 1979); attraction of ravens to the area if trash is not removed immediately (Berry 1985, BLM 1990); and capture of desert tortoises by employees for use as pets. The BLM proposes to lessen the adverse impacts by requiring a litter-control program and an education program for all personnel onsite.

The Service has determined that this level of impact will not reduce appreciably the likelihood of survival and recovery of the Mojave population of the desert tortoise in the wild because:

1) The project site is located in low-density desert tortoise habitat that is not recommended for recovery;

2) only 65 acres of desert tortoise habitat will be disturbed; and

3) impacts to desert tortoises within the project site represent a small impact to the Mojave population of the desert tortoise when total desert tortoise population numbers and geographical extent are considered.

Cumulative Effects

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities on endangered and threatened species or critical habitat that are reasonably certain to occur during the course of the Federal activity subject to consultation. Future Federal actions are subject to the consultation requirements established in section 7 of the Act and; therefore, are not considered cumulative to the proposed action.

The majority of the land within the project site is under public ownership and managed by BLM. The proposed flood-control project would provide protection to the city of Laughlin by eliminating or reducing the health and safety hazards associated with the potentially hazardous runoff from the Hiko Springs Wash Basin. Actions on private lands in the vicinity of Laughlin may increase due to the flood protection provided by the facility.

Clark County is proceeding with preparation of a long-term HCP for an incidental take permit, pursuant to section 10(a)(1)(B) of the Act. The application will address take of desert tortoises and their habitat from future development projects on all non-Federal lands within Clark County and will propose mitigation to minimize such impacts. The proposed channel will not be constructed for at least 10 years. If Clark County completes their long-term HCP before the proposed channel is constructed, the terms and conditions of the incidental take permit will supersede those of the Biological Opinion on private lands.

Biological Opinion

It is our Biological Opinion that issuance of a right-of-way permit for construction of a flood-control facility near Laughlin, Nevada, is not likely to jeopardize the continued existence of the threatened Mojave population of the desert tortoise. Because critical habitat has been designated for the Beaver Dam Slope subpopulation in Utah in 1980, but not for the subpopulations in Arizona, California, and Nevada, no critical habitat will be destroyed or adversely modified by issuance of this permit.

Incidental Take

Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 17.3). "Harass" is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the reasonable and prudent measures, and the terms and conditions that implement them, as set forth below.

The Service hereby incorporates by reference BLM's 15 mitigation measures from the *Description of the Proposed Action* into this incidental take statement as part of these terms and conditions. The following terms and conditions either specify additional measures considered necessary by the Service or modify measures proposed by BLM. Where these terms and conditions vary from or contradict mitigation measures proposed under the *Description of the Proposed Action*, specifications in these terms and conditions shall apply. The measures described below are nondiscretionary and must be implemented by BLM so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply.

BLM has a continuing duty to regulate the activity that is covered by this incidental take statement. If BLM fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse.

Based on the analysis of impacts provided above, mitigation measures proposed by BLM, desert tortoise surveys conducted by BLM, and anticipated project duration, the Service anticipates that the following take could occur as a result of the proposed action:

1. No desert tortoise may be accidentally injured or killed by vehicles or equipment during construction of the flood-control facility.

2. Two (2) desert tortoises may be harassed by removal from the boundaries of the project.

3. An unknown number of desert tortoise eggs may be destroyed during construction of the flood-control structure.

4. An unknown number of desert tortoises may be taken in the form of indirect mortality through predation by ravens drawn to trash on the construction site.

5. An unknown number of desert tortoises may be taken indirectly in the form of harm through increased noise associated with operation of heavy equipment.

6. A total of 65 acres of desert tortoise habitat may be destroyed during construction of the flood-control facility.

Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take:

1. Measures shall be taken to minimize mortality or injury of desert tortoises due to construction or maintenance activities and operation of heavy equipment.

2. Measures shall be taken to reduce entrapment of desert tortoises in the detention basin and open channel.

3. Measures shall be taken to minimize predation on tortoises by ravens drawn to construction areas or by unleashed dogs brought to construction areas.

4. Measures shall be taken to minimize destruction of desert tortoise habitat, such as soil compaction, erosion, or crushed vegetation, due to construction or maintenance activities.

5. Measures shall be taken to ensure compliance with the reasonable and prudent measures, terms and conditions, reporting requirements, and reinitiation requirements contained in this Biological Opinion.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, BLM must comply with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. To implement Reasonable and Prudent Measure number 1, BLM shall fully implement mitigation measures 1, 2, 3, 4, 5, and 7 from the *Description of the Proposed Action*.

   In addition to BLM's mitigation measure 1, the following shall be added to their measure:

   > All desert tortoise burrows located will be conspicuously flagged or marked. All desert tortoise burrows, and other species' burrows which may be used by desert tortoises, will be examined with a fiber-optic scope, if necessary, to determine occupancy of each burrow by tortoises.

   In addition to BLM's mitigation measure 2, the following shall be added to their measure:

   > Desert tortoises shall not be placed on lands outside the administration of the Federal government without the written permission of their landowner.

   In addition to BLM's mitigation measure 5, the following shall be added to their measure:

   > If a suitable location is not found, desert tortoises shall be provided to a Service-approved transfer facility. The transfer facility must be provided with a 10-day notice that tortoises may be delivered. The project proponent will bear all costs associated with delivery of desert tortoises to the transfer facility. Each tortoise shall be delivered in an individual cardboard box which is marked with the date and location of collection, Biological Opinion number, and "BLM" to distinguish these desert tortoises from those collected on private lands.

2. To implement Reasonable and Prudent Measure number 2, BLM shall fully implement mitigation measures 6 and 14 from the *Description of the Proposed Action*.

3. To implement Reasonable and Prudent Measure number 3, BLM shall fully implement mitigation measure 3 from the *Description of the Proposed Action*.

4. To implement Reasonable and Prudent Measure number 4, BLM shall fully implement mitigation measures 8 and 15 from the *Description of the Proposed Action*.

In addition to BLM's mitigation measure 15, the following shall be added to their measure:

> Prior to issuance of right-of-way permit, BLM shall transfer $21,060.00 into an interest-bearing escrow account administered by Clark County, as mitigation for the destruction of desert tortoise habitat within the project boundaries. The mitigation rate is based on $324 per acre for long-term destruction of 65 acres of desert tortoise habitat, but will be indexed for inflation based on the Bureau of Labor and Statistics Consumer Price Index beginning January 1, 1994. These funds shall be directly deposited into Desert Tortoise Habitat Conservation Fund Number 236-8290 administered by Clark County for the purpose of securing tortoise management areas, habitat enhancement, and tortoise research. None of these funds shall be used to develop a HCP. These funds are independent of any other fees collected by the county for desert tortoise conservation planning. These funds shall be held in an interest-bearing account, and the accrued interest also shall be expended on desert tortoise conservation measures. Proposed expenditures shall be with the concurrence of the Service.

Total payment must be made prior to issuance of BLM right-of-way permit for BLM and CCDPW to be in compliance with the provisions of the Act. Payment, if made directly, shall be by certified check or money order payable to Clark County, and delivered to:

Clark County
Department of Administrative Services
225 Bridger Avenue, 6th Floor
Las Vegas, Nevada 89155
(702) 455-3530

The payment, whether made directly or transferred under an interlocal agreement, shall be accompanied by a cover letter from the project proponent that identifies the project and biological opinion that is requiring the payment, the amount of payment enclosed, and the number of the check or money order. The cover letter shall also identify the name and address of the project proponent, the name and address of the Federal agency responsible for authorizing the project, and the address of the Service office issuing the biological opinion. This information will be used to notify the project proponent, the authorizing Federal agency, and the Service that the payment has been received.

If development of the surrounding lands has made the area surrounding the channel unsuitable for tortoises prior to the construction of the channel, the terms and conditions shall no longer apply to the 11 acres designated for the channel and a refund of mitigation fees will issued to the CCRFCD. Such a determination will be made only with the concurrence of the Service. Any refunds to CCRFCD or the developer shall include principle and interest.

5. To implement Reasonable and Prudent Measure number 5, BLM shall fully implement mitigation measures 10, 11, 12, and 13.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the anticipated incidental take that may result from the proposed action. With implementation of these measures, the Service believes that no more than 2 desert tortoises may be incidentally taken (0 killed or injured and 2 harassed) and 65 acres of desert tortoise habitat may be destroyed. If, during the course of the action, the level of incidental take identified is exceeded, reinitiation of consultation will be required. BLM must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Reporting Requirements

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be made to the Service's Division of Law Enforcement, Special Agent Edward Dominguez, in Las Vegas, Nevada, at telephone number (702) 388-6380. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Law Enforcement Division to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

Sick or injured desert tortoises shall be delivered to a Service-approved transfer facility in Las Vegas, Nevada, or any qualified veterinarian for appropriate treatment or disposal. Dead desert tortoises suitable for preparation as museum specimens shall be frozen immediately and provided to an institution holding appropriate Federal and State permits per their instructions. Should no institutions want the desert tortoise specimens, or if it is determined that the specimen is too damaged (crushed, spoiled, etc.) for preparation as a museum specimen, then the specimen may be buried away from the project site or cremated. If required, the applicant or project proponent shall bear the cost of transportation and treatment of injured desert tortoises, euthanasia of sick desert tortoises, or cremation of dead desert tortoises. Should sick or injured desert tortoises be treated by a veterinarian and survive, they may be transferred as directed by the Service.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The term "conservation recommendations" has been defined as Service suggestions regarding discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information.

The BLM should begin implementation of the Draft Recovery Plan for the Desert Tortoise (Mojave Population) on lands under their administration.

In order for the Service to be kept informed of actions that either minimize or avoid adverse effects or that benefit listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

Reinitiation Requirement

This concludes formal consultation on the actions outlined in the February 19, 1993, request. As required by 50 CFR § 402.16, reinitiation of formal consultation is required if: 1) The amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations that are causing such take must be stopped in the interim period between the initiation and completion of the new consultation if any additional taking is likely to occur.

We appreciate the assistance and cooperation of your staff throughout this consultation process. If we can be of any further assistance, please contact me or Michael Burroughs at (702) 784-5227.

David L. Harlow

David L. Harlow

Attachment

cc:
General Manager, Clark County Regional Flood Control District, Las Vegas, Nevada
(w/atch.)
Operations Services Coordinator, Administrative Services, Clark County, Las Vegas, Nevada
Desert Tortoise HCP Coordinator, The Nature Conservancy, Las Vegas, Nevada
Director, Nevada Department of Wildlife, Reno, Nevada
Regional Manager, Nevada Department of Wildlife, Las Vegas, Nevada
Assistant Regional Director, Ecological Services, Fish and Wildlife Service, Portland, Oregon (AES) Attn: Richard Hill
Chief, Division of Endangered Species, Fish and Wildlife Service, Arlington, Virginia
Senior Resident Agent, Division of Law Enforcement, Fish and Wildlife Service, Reno, Nevada
Special Agent, Division of Law Enforcement, Fish and Wildlife Service, Las Vegas, Nevada
(all w/o atch.)

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ATTACHMENT A

DESERT TORTOISE HANDLING AND OVERWINTERING PROCEDURES

(Note: Much of the information contained herein was obtained from Chapter III, Protocols for Handling Live Tortoises, in the Interim Techniques Handbook for Collecting and Analyzing Data on Desert Tortoise Populations and Habitats. This handbook is a cooperative effort among federal and state agencies. Primary editor is Dr. Cecil Schwalbe of the University of Arizona, Tucson, Arizona. The information on handling tortoise eggs was developed by the Reno Field Station in consultation with Dr. Schwalbe, Betty Burge of Las Vegas, Nevada, and the Service's Ventura Field Office.)

1. All desert tortoises shall be handled in a careful manner. This includes lifting the animal slowly, fully supporting the animal in an upright position, and completing various measurements in the minimum amount of time. A tortoise can be damaged or die of intestinal torsion. If a tortoise must be turned over on its back, this should be done gently. The fieldworker shall turn the tortoise over by carefully rolling it over on its side to its back, and return the tortoise to the upright position by rolling it back in the same direction. The tortoise shall not be rolled end over end, side over side, or spun.

   Tortoises, especially females, may be fatally damaged by blows, butting, or overturning, which results in egg yolk peritonitis brought on by seepage of egg yolk or breakage of shelled eggs into the peritoneal cavity. Handling of potentially gravid females shall be done very carefully.

   To prevent hyperthermia, on warm days a tortoise must be kept in the shade (of the fieldworker, a pack, other equipment, etc.) except during photography. Tortoises shall not be weighed, measured, etc. when air temperatures exceed 90°F (32°C) at 1.5 m (4.9 ft) above ground unless measures are taken to insure the animal does not overheat. Tortoises shall be placed in shaded areas during handling, and if the animal is to be held for a longer period, it shall be individually placed in a sterile cardboard box, placed in a shaded, cool location and returned to the site of capture or relocation at sunrise on the following day. CAUTION! TEMPERATURES ARE MUCH HIGHER NEARER THE GROUND. Take extreme caution to avoid overheating a tortoise whenever surface temperatures exceed 86°F (30°C). Shield the bulb of the thermometer from direct solar radiation and wind when measuring temperatures.

2. Because of the threat of Upper Respiratory Tract Disease (URTD), all tortoises shall be handled so as to minimize the chances of spreading the disease, even if URTD has not been documented in a given locality. All personnel handling tortoises must be initially trained using protocols developed by Dr. Cecil Schwalbe of the University of Arizona. These protocols will be used to minimize the spread of URTD. All personnel handling tortoises shall wear disposable latex or plastic gloves to prevent transmission of diseases among tortoises. Not more than one tortoise shall be handled with each pair of gloves.

All equipment that comes in contact with any tortoise shall be sterilized before it is used on another tortoise. For example, triangular files for notching, calipers for measuring shell length, rules, and other equipment should be sterilized by soaking in 95% isopropyl or ethyl alcohol for at least 20 minutes before using on another tortoise. A 25% solution of chlorine bleach may also be used, but bleach is extremely corrosive and may damage many types of equipment. Wooden rules should not be used; they are difficult to sterilize because of the porosity of the wood. Use metal or plastic rules instead.

To avoid sterilizing spring scales or weighing straps prior to weighing each tortoise, use individual "T-shirt" bags, the plastic bags with two handles that are used to bag groceries. The handles of the bag can be used to suspend the tortoise during weighing.

The fieldworker's clothes shall be changed completely, including shoes, before visiting other tortoise sites. Dr. Schwalbe defines a site as follows: "As a general rule, a single valley or desert mountain range would be considered one site, unless there were special circumstances, such as URTD confirmed in one part of a valley, but not thought to occur in other parts of that valley. In such an instance, a change of clothes would be necessary before visiting other parts of that valley." Always visit the site with known occurrence of URTD last to minimize the chance of spreading the disease. Vehicle undercarriages and tires shall be washed when travelling between sites where URTD is known or suspected to occur. The fieldworker is not required to wash vehicles if there are no confirmed reports of URTD on a study site. The fieldworker shall consider that wet soil carrying microbes will adhere to vehicles, and such microbes are less likely to die before a new study area is visited. It is advisable to wash a vehicle after driving in wet soil if feasible.

When transported by vehicle or confined, each tortoise shall be contained in a newly-purchased, clean cardboard box of an appropriate size. Boxes shall be discarded after use. Tortoises shall never be placed in automobile trunks or on floorboards in an unconfined manner. Tortoises shall never be placed in the bed of a truck over the catalytic converter as this area of the metal bed may become extremely hot. Tortoises must not be left unattended in vehicles; this measure is intended to eliminate accidental mortality caused by overheating. Truck beds and floorboards must be padded and travel shall be at speeds which eliminate unnecessary vibrations.

3. Tortoises removed from the project area and released into the wild as a result of mitigation measures for this project shall not be individually marked, except for those hibernating tortoises removed temporarily as specified under Procedure number 6 below. These tortoises shall be marked per Bureau of Land Management (BLM) standards (Attachment A-1). Tagging is the current preferred method for long-term marking and is supplemented with photographs and drawings. All three methods should be used to insure that over time the tortoise can be properly identified in future years.

   Tagging: Tagging was originally used in 1977 and appears to be as effective or better than notching for a long-term marking technique. Place a small dot of white paint or a small piece of heavy white paper (card stock) on the fourth left costal scute; wait for the paint to dry. Write the identifying number for that tortoise on the dry dot or paper using permanent black ink. Wait for the ink to dry and cover the dot or paper and the ink with quick-drying clear epoxy. Note that the epoxy shall not touch the suture lines between the scutes. Numbers shall not be placed in the middle of the scute as this area may be sloughed or rubbed depending on the age of the tortoise and habitat in which it occurs.

   In addition a photograph (35mm slide) of the carapace and fourth left costal scute shall be taken. If possible dust off the tortoise with a small brush to remove mud or dust from the scutes. Remember the brush must be either sterilized or disposed of after each use. Place a small piece of white paper (16 mm x 90 mm) on the edge of the shell with information on the study site name, date, and tortoise number. The tortoise shell area and fourth costal scute shall fill the slide frame. Drawings shall be made showing any anomalies (e.g., extra or missing marginal, costal, or vertebral scutes) or injuries (e.g., punctures holes from canines, tooth scrapes).

The responsible Federal Agency shall develop its own cataloging format to enable it and others to track tortoises handled as a result of development projects.

4. A standard data sheet should be developed to record the following information:
   A. Name of person collecting the animal.
   B. Exact location and date of collection.
   C. The individual number assigned to that animal.
   D. The over-wintering location of the tortoise.
   E. The release site and date of release of the animal.
   F. Health condition of the tortoise, including measured weight and length at initial capture and release. In addition to this information complete the URTD checklist (Attachments A-2 & A-3).
   G. Photographs of carapace, plastron, and fourth left costal scute.
   H. The information specified in 4.A. through 4.G. must be supplied to the responsible Federal agency and the Fish and Wildlife Service (Service) immediately after cessation of both tortoise clearing and release activities. The information shall be provided in the form of a report accompanied by data sheets.

5. Tortoises found actively moving on the surface, and to be removed from the project site, shall be released between 150 and 1000 feet from the outer boundary of the project area nearest the capture point. Relocated tortoises shall be placed under a shrub in the shade. Tortoises shall be monitored at the release site until they are exhibiting normal behavior. Should the capture occur late in the day so the animal will not have sufficient time to find a suitable burrow for the night, the tortoise shall be placed in a clean cardboard box as described above and held in an appropriate place safe from predators and danger of hyperthermia, until release can occur in the morning.

6. If tortoises found in burrows, and to be removed from the project site and released into the wild, are removed from burrows between November 1 and March 15, they shall be transported in cardboard boxes to the approved over-wintering site. Each tortoise shall be placed in an artificial burrow within a fenced enclosure with one tortoise per enclosure. Each enclosure must be separate from adjacent pens so that one tortoise can not place its head or limbs through the fence and physically contact a tortoise in an adjacent enclosure. Fencing does not need to be buried but shall be stable enough to preclude escape.

The main chamber of the burrow shall be constructed of plywood and the roof placed approximately 2.5 feet below the soil surface. The burrow's tunnel shall be eight to 10 feet long with a gentle slope (e.g., about 4:1). The tunnel shall be stabilized on the top with PVC pipe cut in half. The pipe shall be no smaller than 15 inch in diameter and soil shall be used to adjust tunnel to tortoise size. After placement of the tortoise in the burrow, the entrance of the tunnel shall be partially blocked with loose topsoil.

If any tortoise excavated is underweight, as determined by comparison to regressions developed by Dr. Michael Weinstein for the tortoises at the Honda project, the tortoise shall be placed in a room at a temperature of 90° to 100°F and allowed to soak in fresh water for two to three hours. After rehydration and drying, the tortoise shall be cooled to hibernation temperature slowly and placed in an artificial burrow. This procedure shall be implemented only by persons instructed in this manner of treatment.

Beginning in February, activity of the tortoises within the artificial burrows shall be monitored to determine an appropriate release time. Tortoises shall be released in the morning hours when temperatures are conducive to activity. The appropriate time for release will probably occur in the third week of March.

Each tortoise shall be released between 150 and 1000 feet from the outer boundary of the project area nearest the capture point. Released tortoises shall be placed under a shrub in the shade. Releases shall occur at a temperature that is suitable for activity, with reasonable expectation that the temperature will remain within the tortoise's thermal preference long enough for the tortoise to adjust to its surroundings. Tortoises shall be monitored at the release site until they are exhibiting normal behavior. To facilitate this measure, each tortoise must be accompanied by one of the approved biologists. There shall be no mass releases of animals.

7. Tortoise eggs shall be moved to artificial nests either in the wild or at an approved facility. Biologists must receive special training in the procedures outlined below, but such training can be obtained after a nest is actually found. If this is done, the nest shall be carefully covered with soil so as not to move the eggs and protected until on site training is provided. The responsible Federal agency shall ensure that this training is made available.

Any nest that is found shall be carefully excavated by hand at a time of day when the air temperature 6 inches above the ground is approximately equal to the soil temperature at egg level. Immediately upon finding a nest, large tool use shall be discontinued and the nest excavated by the biologist using his or her hands. Before disturbance of nest contents, each egg shall be gently marked with a small dot on the top using a felt-tipped pen to establish the egg's orientation in the nest. In handling nest contents, eggs must be maintained in this orientation at all times. Because egg shells become extremely fragile in the last few weeks before hatching, special care shall be taken with eggs found from August to mid-October. Because these eggs are very fragile, some may break during handling. This will be lethal to egg contents. Such an accident can be expected to occur until techniques are developed to avoid this type of incident. Broken eggs shall be buried nearby and left in the field, or the contents preserved and provided to qualified researchers.

The biologist shall measure and record the depth of the nest below the soil surface, the location of the nest in relation to any adjacent shrub (i.e., whether on the north, south, east, or west side of the shrub), the species of shrub and its approximate foliage volume, and the soil type. Place approximately one inch of soil from the nest area in a bucket and carefully transfer the eggs to the bucket, maintaining egg orientation. Cover the eggs with soil that is free of cobbles and pebbles, to a depth equivalent to that in the original nest.

If good tortoise habitat is available in the general area, the eggs shall be relocated between 150 to 1,000 feet from outer boundary of the project site. Prepare a nest with the same depth, orientation, location in relation to a specific shrub species, and in the same soil type as the original nest. Carefully transfer the eggs, maintaining their original orientation, to the new nest. The eggs shall be replaced so that they touch one another. Gently cover with soil from which cobbles and pebbles have been removed so that all the air spaces around the eggs are filled. Relocated nests in the wild shall be monitored by a qualified biologist. The monitoring program shall be developed in consultation with the Service.

If a suitable site for a new nest is not available in the wild, the eggs shall be prepared for incubation in a suitable holding facility. Place a small amount of soil in a bucket and transfer the eggs to the bucket using the technique specified above, making sure the eggs are touching one another. Carefully fill the bucket to the depth of the original nest, but leave the top of the soil layer 3 inches below the rim of the bucket so that future hatchlings cannot escape. Bury the bucket in soil in a safe location at an approved holding facility.

The biologist shall record in detail all the procedures used in moving eggs. Personnel caring for incubating eggs at a facility shall maintain a record of where the eggs were found, method of incubation, length of time and conditions under which the eggs were incubated, observations of eggs during the incubation period, information about hatchling health and behavior, and disposition of the hatchlings.

8. Should any deviation from the procedures outlined above be necessary, the approved biologist shall contact the Fish and Wildlife Service as soon as possible.

9. A final report, containing all the information noted above and including release information, must be supplied to the Service and the responsible Federal agency within one month of the final releases or disposition of tortoises.

ATTACHMENT 1

HIKO SPRINGS WASH DETENTION BASIN PROJECT

1. PROJECT DESCRIPTION

a. Background: Hiko Springs Wash originates in the Newberry Mountains west of Laughlin and drains easterly and southerly into Laughlin Bay on the Colorado River. Upper portions of the 20-square-mile basin include rough, mountainous terrain which drains through narrow canyons onto a broad alluvial fan on the east side of the Newberry Mountains. The upper watershed is predominantly public land (NPS, BLM) whereas the lower portions (generally two miles north of the river) have considerable residential, commercial, and resort development.

The wash is subject to flash flooding and, as such, FEMA has recently established 100-year flood boundaries for the Hiko Springs Wash basin. Considerable flooding of private and public lands is indicated by the FEMA flood map (Figure 4).

The control of flooding on Hiko Springs Wash has been the subject of several investigations for Clark County by J. M. Montgomery Consulting Engineers (1986) and Boyle Engineering Corporation (1989). Based on these investigations, a flood control facilities plan was developed to include the following major features (see Figure 3):

- A 1,600 acre-foot detention basin on Hiko Springs Wash (solely on BLM land) designed to reduce the 100-year peak flow from 8,500 to 1,000 cfs. The detention basin will include a 100-year capacity outlet works and an 800-foot long emergency concrete spillway designed to pass the probable maximum flood. The embankment will consist of compacted earth fill lined with soil cement lining on both upstream and downstream faces (Figures 5 and 5a).

- o A concrete-lined channel, originating at the detention basin outlet, and extending 2.25 miles downstream. Four or five bridge structures and 10 energy-dissipating stilling basins will be incorporated into the channel design.

- o An outfall and energy dissipation structure will convey the flood waters into the Laughlin Bay area of the Colorado River.

The detention basin, which is the subject of this permit application to BLM, is described in more detail below.

b. Type, Size, and Legal Description: The proposed right-of-way for the detention basin includes approximately 100.6 acres as described in the Legal Description (below) and as shown on Figure 2. The dam embankment will be approximately 70 feet above existing ground, 375 feet wide, and 1,200 feet long. The excavated pond will encompass an area of about 50 acres. Access will be by a graded road extending north westerly from the intersection of the Davis Dam - Needles Highway and Desert Drive.

Legal Description

A portion of land lying within Sections 16 and 17, Township 32 South, Range 66 East, M.D.M., Clark County, Nevada more particularly described as follows:

Commence at the south 1/4 corner of Section 16, being a point on the east right-of-way (ROW) line of Davis Dam - Needles Turnoff Road; thence North 89°50'28" West along the south section line of Section 16 a distance of 169.81 feet to the POINT OF BEGINNING, being a point on the West ROW line of said road; thence North 89°50'28" West along the South section line of Section 16 a distance of 2479.16 feet to the Southwest corner of Section 16; thence North 89°50'28" West, a distance of 500.00 feet; thence North 13°30'25" West, a distance of 600.00 feet; thence North 40°23'27" West, a distance of 861.73 feet; thence North 30°04'25" East, a distance of 1530.00 feet; thence South 46°16'26" East, a distance of

BOYLE ENGINEERING CORPORATION

3575.00 feet; thence South 89°50'28" East, a distance of 341.59 feet; to a point of intersection with a non-tangent curve along the west ROW line of Davis Dam - Needles Turnoff Road; said curve having a local tangent at the beginning point which bears South 10°44'59" West, a radius of 1075.00 feet, a central angle of 05°22'58", and a long chord which bears South 08°03'30" West a distance of 100.96 feet; thence Southerly along the arc of said curve to the left, being the West ROW line of Davis Dam - Needles Turnoff Road, a distance of 101.00 feet to the curve's end, and the POINT OF BEGINNING; Containing 100.62 acres of land, more or less.

c. Types of Construction Equipment: Project will employ a variety of heavy equipment, including: D-7 and D-9 cat, scrapers, rollers, front-end loaders, graders, dump trucks, cement trucks, and water trucks. Basin will be excavated by ripping and scrapping with much of cut material used to construct the earthen embankment dam. The embankment will be constructed in compacted lifts and treated with soil cement to form a water-tight, stabilized facing both upstream and downstream (Figure 5). It is anticipated that cut and fill volumes will be approximately equal, thereby precluding the need for stockpile areas.

d. Surface Disturbance: Permanent surface disturbance will occur over a 70-acre ± area including the sediment basin, embankment, outlet works, channel, and access roadway. Vegetation will be entirely removed from these areas. The 600± channel below the dam will require a 100-foot-wide (±) ROW to incorporate access roads and fencing.

e. Construction Timetable: Construction schedule unknown at present, but could commence in late 1991. Anticipated duration of project is eight twelve months.

f. Interrelated Projects: Design of embankment dam (when completed) must be approved by Nevada State Engineer. Downstream flood control improvements on private land (primarily channels) are proposed for funding by a Special Assessment District which is presently (May, 1991) being formed. Basin, channel, and outfall to Colorado River will be permitted under "404 Program" administered by the Sacramento Office of the U. S. Army Corps of Engineers. The initial application to the Corps is presently being prepared.

g. Surrounding Land Use: A map showing existing and proposed land use in the project area is provided in Figure 6.

h. Standard Operating Procedures: Measures for mitigating environmental impacts include all provisions of recently-enacted regulations for preservation of the desert tortoise; and any other historic archeological, or environmental requirements resulting from studies and assessment work done by the County under the Memorandum of Agreement to be negotiated with BLM if the Special Improvement District is successfully formed.

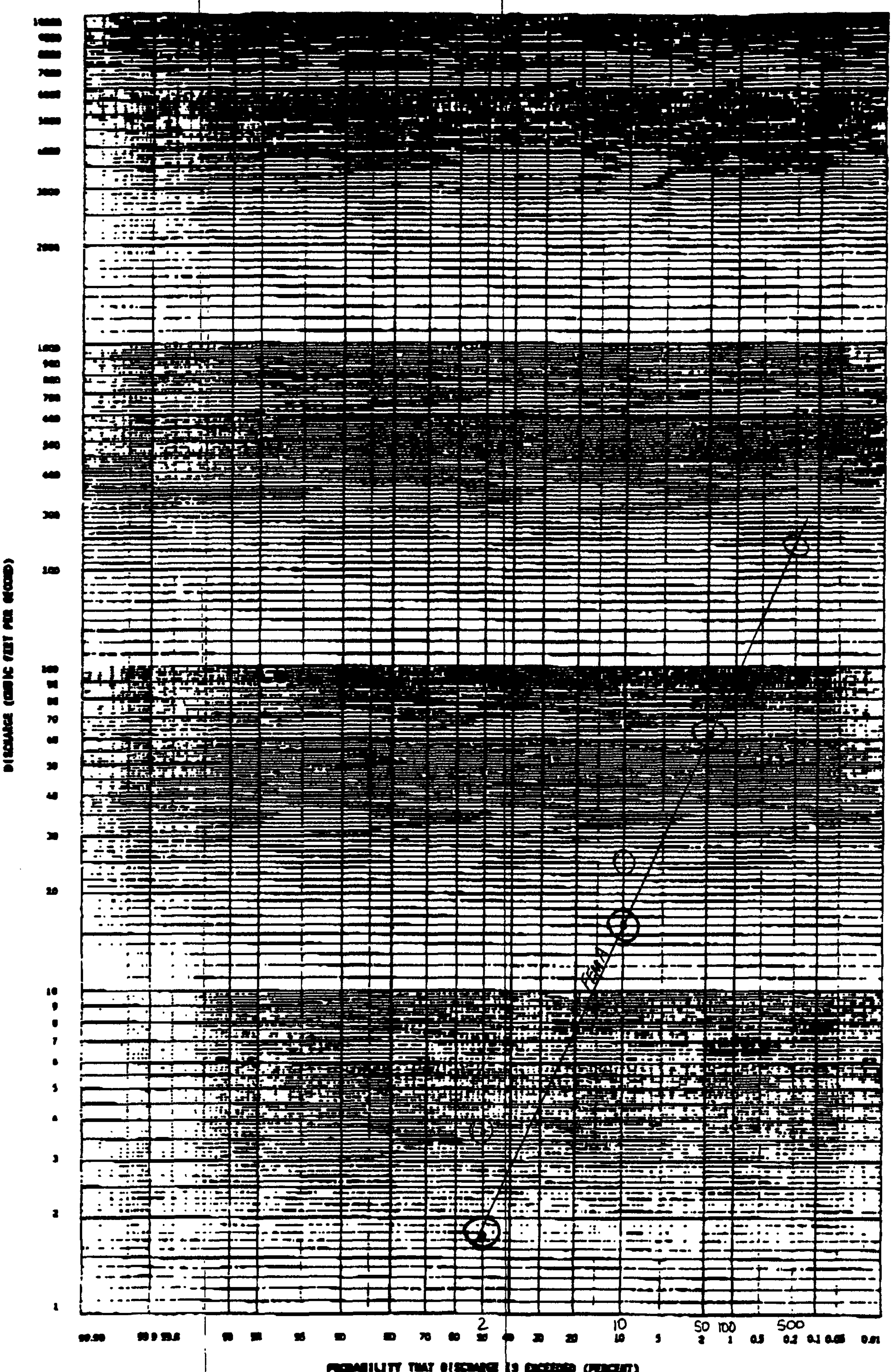
Miscellaneous

Owner:	Clark County Dept. of Public Works	**Computed By:**	JAR
Project:	Hiko Srpings Wash Detention Basin	**Date:**	07/12/96
Project No.:	25574.400 **File No.:**	**Checked By:**	
Title:	Flood Frequency Information - 2, 10, 50, and 100-year	**Date:**	
		Page No.	1/2

Frequency (yr)	Depth * (in)	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Stage (ft)	Peak Storage (ft)
2	0.96	175	123	1009.39	24
10	1.95	1628	448	1026.61	243
50	3.89	6236	778	1064.94	1173
100	4.58	8282	850	1076.12	1580

* Precipitation depths were adjusted on the 2-yr and 10-yr HEC-1 models to obtain peak inflow runoff values approximately equal to those recognized by FEMA.

2/2



Hiko Springs Wash Detention Basin Flood Frequency Curve
(Using FEMA accepted inflow values)

2-yr (Adj.)

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*****************************************                    ***************************************
*                                       *                    *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *  U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990             *                    *  HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0               *                    *        609 SECOND STREET            *
*                                       *                    *      DAVIS, CALIFORNIA 95616        *
* RUN DATE  07/11/1996  TIME  17:59:21  *                    *          (916) 756-1104             *
*                                       *                    *                                     *
*****************************************                    ***************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1       ID  NIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
  2       ID  2 YEAR FREQUENCY 6-HOUR STORM per CCRFCD HC&DDM
  3       ID  SDN 5, DARF .79
  4       ID  Originally created by Boyle Engineering for CCRFCD
  5       ID    as Niko Springs/Unnamed Wash Facilities Plan.
  6       ID  TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
  7       ID  Edited by Black & Veatch for design of Niko Springs Detention Basin.
  8       IT      5       0       0     300
  9       IN      5       0       0
 10       IO      5       0       0
 11       JR   PREC     .79

 12       KK      A1
 13       KM  RUNOFF FROM SUBBASIN A1
 14       BA    2.73
 15       PB     .96  <-- Adjusted to obtain FEMA inflow ≈ 175 cfs
 16       PC    .000    .020    .059    .080    .110    .144    .150    .160    .168    .171
 17       PC    .180    .182    .187    .190    .197    .202    .210    .220    .230    .241
 18       PC    .250    .259    .265    .280    .290    .300    .305    .309    .310    .317
 19       PC    .321    .327    .333    .346    .361    .381    .408    .430    .477    .514
 20       PC    .561    .630    .710    .720    .731    .752    .779    .790    .795    .804
 21       PC    .810    .820    .826    .840    .859    .889    .910    .938    .966    .970
 22       PC    .974    .979    .981    .983    .985    .989    .990    .992    .993    .996
 23       PC    .997    .999    1.00
 24       LS      0      78
 25       UD     .83

 26       KK      RA
 27       KM  ROUTE A1 RUNOFF
 28       RK   2200   .0364    .050            TRAP     200      25

 29       KK      B1
 30       KM  RUNOFF FROM SUBBASIN B1
 31       BA    1.08
 32       LS      0      83
 33       UD     .47

 34       KK     RB1
 35       KM  ROUTE B1 RUNOFF
 36       RK  15500   .0503    .050            TRAP     350      25

 37       KK      B2
 38       KM  RUNOFF FROM SUBBASIN B2
 39       BA     .61
 40       LS      0      82
 41       UD     .43

 42       KK     RB2
 43       KM  ROUTE B2 RUNOFF
 44       RK  11500   .0435    .050            TRAP     200      25
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 45         KK      B3
 46         KM   RUNOFF FROM SUBBASIN B3
 47         BA     2.5
 48         LS       0       81
 49         UD     .88

 50         KK       B
 51         KM   COMBINE RA, B1, B2, & B3
 52         HC       4

 53         KK      RB
 54         KM   ROUTE B
 55         RK    4500   .0389    .050            TRAP     300      25

 56         KK      C1
 57         KM   RUNOFF FROM SUBBASIN C1
 58         BA    1.91
 59         LS       0       80
 60         UD     .83

 61         KK      C2
 62         KM   RUNOFF FROM SUBBASIN C2
 63         BA    1.68
 64         LS       0       79
 65         UD     .94

 66         KK       C
 67         KM   COMBINE RB, C1, & C2
 68         HC       3

 69         KK      RC
 70         KM   ROUTE C
 71         RK    2900   .0414    .050            TRAP     300       5

 72         KK      D1
 73         KM   RUNOFF FROM SUBBASIN D1
 74         BA    .524
 75         LS       0       80
 76         UD     .42

 77         KK     RD1
 78         KM   ROUTE D1
 79         RK    5400    .061    .050            TRAP     100      50

 80         KK      D2
 81         KM   RUNOFF FROM SUBBASIN D2
 82         BA    .301
 83         LS       0       80
 84         UD     .34
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  85          KK      D3
  86          KM   RUNOFF FROM SUBBASIN D3
  87          BA    .753
  88          LS       0      85
  89          UD     .46

  90          KK       D
  91          KM   COMBINE RC, RD1, D2, & D3
  92          HC       4

  93          KK      RD
  94          KM   ROUTE D
  95          RK    1600   .0469   .050            TRAP     300      15

  96          KK      E1
  97          KM   RUNOFF FROM E1
  98          BA    .495
  99          LS       0      87
 100          UD     .43

 101          KK       E
 102          KM   COMBINE RD & E1
 103          HC       2

 104          KK      RE
 105          KM   ROUTE E
 106          RK    2560   .0364   .050            TRAP     300      50

 107          KK      F1
 108          KM   RUNOFF FROM SUBBASIN F1
 109          BA    1.08
 110          LS       0      82
 111          UD     .56

 112          KK       F
 113          KM   COMBINE RE & F1
 114          HC       2

 115          KK      RF
 116          KM   ROUTE F
 117          RK    3000   .0467   .050            TRAP     300      50

 118          KK      G1
 119          KM   RUNOFF FROM SUBBASIN G1
 120          BA    1.36
 121          LS       0      83
 122          UD     .62

 123          KK      G2
 124          KM   RUNOFF FROM SUBBASIN G2
 125          BA    1.02
 126          LS       0      88
 127          UD     .47
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LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 128       KK      G
 129       KM   COMBINE RF, G1, & G2
 130       HC      3

 131       KK     RG
 132       KM   ROUTE G
 133       RK   2600   .0346   .050           TRAP    300     5

 134       KK     H1
 135       KM   RUNOFF FROM SUBBASIN H1
 136       BA   .560
 137       LS     0       83
 138       UD    .42

 139       KK     H2
 140       KM   RUNOFF FROM SUBBASIN H2
 141       BA   .373
 142       LS     0       90
 143       UD    .24

 144       KK      H
 145       KM   COMBINE RG, H1 & H2
 146       HC      3

 147       KK     RH
 148       KM   ROUTE H
 149       RK   9400   .0585   .070           TRAP     75     5

 150       KK     I1
 151       KM   RUNOFF FROM SUBBASIN I1
 152       BA   1.35
 153       LS     0       89
 154       UD    .55

 155       KK      I
 156       KM   COMBINE RH & I1
 157       HC      2

 158       KK     RI
 159       KM   ROUTE I
 160       RK   10000  .0410   .050           TRAP    400    50

 161       KK     J1
 162       KM   RUNOFF FROM SUBBASIN J1
 163       BA   .847
 164       LS     0       75
 165       UD    .41

 166       KK      J
 167       KM   COMBINE RI & J1
 168       HC      2
 169       KO      1
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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          KK   DET B
          KM   DETENTION BASIN SITE
          KM     Spillway elevation of 1077.5 ft.; 62" dia. low-level outlet pipe;
          KM     storage capacity of 1636 ac ft.
          KO       1
          RS       1    STOR      -1
          SV       0    2.68   27.13   75.75  141.59  216.52  299.74  393.04  497.42  612.84
          SV  738.58  873.92 1018.86 1174.58 1343.32 1531.69 1746.05 1988.34
          SE    1002    1005    1010    1015    1020    1025    1030    1035    1040    1045
          SE    1050    1055    1060    1065    1070    1075    1080    1085
          SL  1007.5   20.97     .61      .5
          SS  1077.5     550   2.939     1.5
          ZZ
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****************************************                ****************************************
*                                      *                *                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                *  U.S. ARMY CORPS OF ENGINEERS         *
*           SEPTEMBER 1990             *                *  HYDROLOGIC ENGINEERING CENTER       *
*             VERSION 4.0              *                *        609 SECOND STREET             *
*                                      *                *    DAVIS, CALIFORNIA 95616           *
* RUN DATE  07/11/1996  TIME  17:59:21 *                *        (916) 756-1104                *
*                                      *                *                                      *
****************************************                ****************************************



                         HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
                         2 YEAR FREQUENCY  6-HOUR STORM per CCRFCD HC&DDM
                         SDN 5, DARF .79
                         Originally created by Boyle Engineering for CCRFCD
                           as Hiko Springs/Unnamed Wash Facilities Plan.
                         TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
                         Edited by Black & Veatch for design of Hiko Springs Detention Basin.

 10 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT           HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2    0  ENDING DATE
                    NDTIME       0055  ENDING TIME
                     ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE   24.92 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT

   JP           MULTI-PLAN OPTION
                     NPLAN          1  NUMBER OF PLANS

   JR           MULTI-RATIO OPTION
                   RATIOS OF PRECIPITATION
                   .79

       *** FDXRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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          **************
          *            *
166 KK    *        J   *
          *            *
          **************
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169 KO   OUTPUT CONTROL VARIABLES

IPRNT 1 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

168 HC   HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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HYDROGRAPH AT STATION J
SUM OF 2 HYDROGRAPHS
PLAN 1, RATIO = .79

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	172.	1		1230	151	21.	1		1845	226	4.
1		0005	2	0.	1		0620	77	167.	1		1235	152	21.	1		1850	227	4.
1		0010	3	0.	1		0625	78	162.	1		1240	153	20.	1		1855	228	4.
1		0015	4	0.	1		0630	79	156.	1		1245	154	20.	1		1900	229	4.
1		0020	5	0.	1		0635	80	150.	1		1250	155	19.	1		1905	230	4.
1		0025	6	0.	1		0640	81	145.	1		1255	156	19.	1		1910	231	4.
1		0030	7	0.	1		0645	82	141.	1		1300	157	18.	1		1915	232	4.
1		0035	8	0.	1		0650	83	136.	1		1305	158	18.	1		1920	233	4.
1		0040	9	0.	1		0655	84	132.	1		1310	159	17.	1		1925	234	3.
1		0045	10	0.	1		0700	85	127.	1		1315	160	17.	1		1930	235	3.
1		0050	11	0.	1		0705	86	121.	1		1320	161	16.	1		1935	236	3.
1		0055	12	0.	1		0710	87	116.	1		1325	162	16.	1		1940	237	3.
1		0100	13	0.	1		0715	88	110.	1		1330	163	15.	1		1945	238	3.
1		0105	14	0.	1		0720	89	104.	1		1335	164	15.	1		1950	239	3.
1		0110	15	0.	1		0725	90	99.	1		1340	165	14.	1		1955	240	3.
1		0115	16	0.	1		0730	91	95.	1		1345	166	14.	1		2000	241	3.
1		0120	17	0.	1		0735	92	91.	1		1350	167	14.	1		2005	242	3.
1		0125	18	0.	1		0740	93	88.	1		1355	168	13.	1		2010	243	3.
1		0130	19	0.	1		0745	94	85.	1		1400	169	13.	1		2015	244	3.
1		0135	20	0.	1		0750	95	84.	1		1405	170	13.	1		2020	245	3.
1		0140	21	0.	1		0755	96	83.	1		1410	171	12.	1		2025	246	3.
1		0145	22	0.	1		0800	97	82.	1		1415	172	12.	1		2030	247	3.
1		0150	23	0.	1		0805	98	82.	1		1420	173	12.	1		2035	248	3.
1		0155	24	0.	1		0810	99	81.	1		1425	174	12.	1		2040	249	3.
1		0200	25	0.	1		0815	100	80.	1		1430	175	11.	1		2045	250	3.
1		0205	26	0.	1		0820	101	79.	1		1435	176	11.	1		2050	251	3.
1		0210	27	0.	1		0825	102	77.	1		1440	177	11.	1		2055	252	3.
1		0215	28	0.	1		0830	103	75.	1		1445	178	11.	1		2100	253	3.
1		0220	29	0.	1		0835	104	73.	1		1450	179	10.	1		2105	254	3.
1		0225	30	0.	1		0840	105	70.	1		1455	180	10.	1		2110	255	3.
1		0230	31	0.	1		0845	106	67.	1		1500	181	10.	1		2115	256	2.
1		0235	32	0.	1		0850	107	65.	1		1505	182	10.	1		2120	257	2.
1		0240	33	0.	1		0855	108	62.	1		1510	183	9.	1		2125	258	2.
1		0245	34	0.	1		0900	109	59.	1		1515	184	9.	1		2130	259	2.
1		0250	35	0.	1		0905	110	57.	1		1520	185	9.	1		2135	260	2.
1		0255	36	0.	1		0910	111	55.	1		1525	186	9.	1		2140	261	2.
1		0300	37	0.	1		0915	112	52.	1		1530	187	9.	1		2145	262	2.
1		0305	38	0.	1		0920	113	50.	1		1535	188	8.	1		2150	263	2.

1	0315	40	0.	*	1	0930	115	46.	*	1	1545	190	8.	*	1	2200	265	2.
1	0320	41	0.	*	1	0935	116	44.	*	1	1550	191	8.	*	1	2205	266	2.
1	0325	42	0.	*	1	0940	117	43.	*	1	1555	192	8.	*	1	2210	267	2.
1	0330	43	0.	*	1	0945	118	41.	*	1	1600	193	8.	*	1	2215	268	2.
1	0335	44	0.	*	1	0950	119	39.	*	1	1605	194	7.	*	1	2220	269	2.
1	0340	45	0.	*	1	0955	120	38.	*	1	1610	195	7.	*	1	2225	270	2.
1	0345	46	0.	*	1	1000	121	36.	*	1	1615	196	7.	*	1	2230	271	2.
1	0350	47	0.	*	1	1005	122	35.	*	1	1620	197	7.	*	1	2235	272	2.
1	0355	48	0.	*	1	1010	123	33.	*	1	1625	198	7.	*	1	2240	273	2.
1	0400	49	0.	*	1	1015	124	32.	*	1	1630	199	7.	*	1	2245	274	2.
1	0405	50	0.	*	1	1020	125	31.	*	1	1635	200	7.	*	1	2250	275	2.
1	0410	51	0.	*	1	1025	126	30.	*	1	1640	201	6.	*	1	2255	276	2.
1	0415	52	0.	*	1	1030	127	29.	*	1	1645	202	6.	*	1	2300	277	2.
1	0420	53	0.	*	1	1035	128	28.	*	1	1650	203	6.	*	1	2305	278	2.
1	0425	54	0.	*	1	1040	129	27.	*	1	1655	204	6.	*	1	2310	279	2.
1	0430	55	0.	*	1	1045	130	27.	*	1	1700	205	6.	*	1	2315	280	2.
1	0435	56	0.	*	1	1050	131	28.	*	1	1705	206	6.	*	1	2320	281	2.
1	0440	57	0.	*	1	1055	132	28.	*	1	1710	207	6.	*	1	2325	282	2.
1	0445	58	0.	*	1	1100	133	31.	*	1	1715	208	6.	*	1	2330	283	2.
1	0450	59	0.	*	1	1105	134	32.	*	1	1720	209	5.	*	1	2335	284	2.
1	0455	60	1.	*	1	1110	135	34.	*	1	1725	210	5.	*	1	2340	285	2.
1	0500	61	5.	*	1	1115	136	34.	*	1	1730	211	5.	*	1	2345	286	2.
1	0505	62	18.	*	1	1120	137	33.	*	1	1735	212	5.	*	1	2350	287	2.
1	0510	63	36.	*	1	1125	138	32.	*	1	1740	213	5.	*	1	2355	288	2.
1	0515	64	51.	*	1	1130	139	31.	*	1	1745	214	5.	*	2	0000	289	2.
1	0520	65	62.	*	1	1135	140	30.	*	1	1750	215	5.	*	2	0005	290	2.
1	0525	66	75.	*	1	1140	141	29.	*	1	1755	216	5.	*	2	0010	291	2.
1	0530	67	91.	*	1	1145	142	28.	*	1	1800	217	5.	*	2	0015	292	2.
1	0535	68	106.	*	1	1150	143	27.	*	1	1805	218	5.	*	2	0020	293	1.
1	0540	69	117.	*	1	1155	144	26.	*	1	1810	219	5.	*	2	0025	294	1.
1	0545	70	124.	*	1	1200	145	25.	*	1	1815	220	4.	*	2	0030	295	1.
1	0550	71	133.	*	1	1205	146	25.	*	1	1820	221	4.	*	2	0035	296	1.
1	0555	72	149.	*	1	1210	147	24.	*	1	1825	222	4.	*	2	0040	297	1.
1	0600	73	166.	*	1	1215	148	23.	*	1	1830	223	4.	*	2	0045	298	1.
1	0605	74	174.	*	1	1220	149	23.	*	1	1835	224	4.	*	2	0050	299	1.
1	0610	75	175.	*	1	1225	150	22.	*	1	1840	225	4.	*	2	0055	300	1.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	24.92-HR
175.	6.17	(CFS)	82.	25.	24.	24.
		(INCHES)	.040	.049	.049	.049
		(AC-FT)	41.	50.	50.	50.

CUMULATIVE AREA = 19.17 SQ MI

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         **************
         *            *
170 KK   *    DET B   *
         *            *
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174 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          1  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL          0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA
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175 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

176 SV	STORAGE	.0	2.7	27.1	75.8	141.6	216.5	299.7	393.0	497.4	612.8
		738.6	873.9	1018.9	1174.6	1343.3	1531.7	1746.1	1988.3		
178 SE	ELEVATION	1002.00	1005.00	1010.00	1015.00	1020.00	1025.00	1030.00	1035.00	1040.00	1045.00
		1050.00	1055.00	1060.00	1065.00	1070.00	1075.00	1080.00	1085.00		

180 SL LOW-LEVEL OUTLET

ELEVL	1007.50	ELEVATION AT CENTER OF OUTLET
CAREA	20.97	CROSS-SECTIONAL AREA
COQL	.61	COEFFICIENT
EXPL	.50	EXPONENT OF HEAD

181 SS SPILLWAY

CREL	1077.50	SPILLWAY CREST ELEVATION
SPWID	550.00	SPILLWAY WIDTH
COQW	2.94	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

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COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	169.02	190.92	219.35	257.72	312.36	396.41	542.34	858.32
ELEVATION	1002.00	1007.50	1010.21	1010.96	1012.07	1013.81	1016.77	1022.43	1035.45	1077.50
OUTFLOW	892.86	1128.77	1764.60	2999.50	5031.27	8059.63	12281.89	17898.24	25106.23	34104.37
ELEVATION	1077.58	1077.80	1078.18	1078.70	1079.38	1080.20	1081.18	1082.30	1083.58	1085.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	2.68	14.90	27.13	29.21	36.50	47.27	64.19	75.75	99.07
OUTFLOW	.00	.00	.00	162.21	169.02	190.92	219.35	257.72	280.95	312.36
ELEVATION	1002.00	1005.00	1007.50	1010.00	1010.21	1010.96	1012.07	1013.81	1015.00	1016.77
STORAGE	141.59	178.02	216.52	299.74	393.04	402.38	497.42	612.84	738.58	873.92
OUTFLOW	362.71	396.41	429.16	486.62	537.98	542.34	584.85	628.23	668.80	707.05
ELEVATION	1020.00	1022.43	1025.00	1030.00	1035.00	1035.45	1040.00	1045.00	1050.00	1055.00
STORAGE	1018.86	1174.58	1343.32	1531.69	1638.87	1642.14	1651.83	1667.93	1690.46	1719.40
OUTFLOW	743.33	777.92	811.04	842.86	858.32	892.86	1128.77	1764.60	2999.50	5031.27
ELEVATION	1060.00	1065.00	1070.00	1075.00	1077.50	1077.58	1077.80	1078.18	1078.70	1079.38
STORAGE	1746.05	1755.90	1803.13	1857.61	1919.35	1988.34				
OUTFLOW	7263.10	8059.63	12281.89	17898.24	25106.23	34104.37				
ELEVATION	1080.00	1080.20	1081.18	1082.30	1083.58	1085.00				

HYDROGRAPH AT STATION DET B
PLAN 1, RATIO = .79

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	14.9	1007.5	*	1		0820	101	97.	22.2	1009.0	*	1		1640	201	8.	[illegible]	[illegible]
1		0005	2	0.	14.9	1007.5	*	1		0825	102	95.	[illegible]	[illegible]	*	[illegible]		1645	202	8.	15.5	1007.6
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	*	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	*	[illegible]		[illegible]	[illegible]	[illegible]	15.5	1007.6

[illegible]	0020	5	0.	14.9	1007.5	*	[illegible]	0840	105	[illegible]	21.7	[illegible]	*	[illegible]	1700	205	8.	15.5	[illegible]
1	0025	6	0.	14.9	1007.5	*	1	0845	106	88.	21.5	1008.9	*	1	1705	206	8.	15.5	1007.6
1	0030	7	0.	14.9	1007.5	*	1	0850	107	86.	21.4	1008.8	*	1	1710	207	7.	15.5	1007.6
1	0035	8	0.	14.9	1007.5	*	1	0855	108	84.	21.2	1008.8	*	1	1715	208	7.	15.5	1007.6
1	0040	9	0.	14.9	1007.5	*	1	0900	109	82.	21.1	1008.8	*	1	1720	209	7.	15.4	1007.6
1	0045	10	0.	14.9	1007.5	*	1	0905	110	80.	20.9	1008.7	*	1	1725	210	7.	15.4	1007.6
1	0050	11	0.	14.9	1007.5	*	1	0910	111	78.	20.8	1008.7	*	1	1730	211	7.	15.4	1007.6
1	0055	12	0.	14.9	1007.5	*	1	0915	112	76.	20.6	1008.7	*	1	1735	212	7.	15.4	1007.6
1	0100	13	0.	14.9	1007.5	*	1	0920	113	74.	20.5	1008.6	*	1	1740	213	7.	15.4	1007.6
1	0105	14	0.	14.9	1007.5	*	1	0925	114	71.	20.3	1008.6	*	1	1745	214	6.	15.4	1007.6
1	0110	15	0.	14.9	1007.5	*	1	0930	115	69.	20.1	1008.6	*	1	1750	215	6.	15.4	1007.6
1	0115	16	0.	14.9	1007.5	*	1	0935	116	67.	20.0	1008.5	*	1	1755	216	6.	15.4	1007.6
1	0120	17	0.	14.9	1007.5	*	1	0940	117	65.	19.8	1008.5	*	1	1800	217	6.	15.4	1007.6
1	0125	18	0.	14.9	1007.5	*	1	0945	118	63.	19.7	1008.5	*	1	1805	218	6.	15.4	1007.6
1	0130	19	0.	14.9	1007.5	*	1	0950	119	61.	19.5	1008.4	*	1	1810	219	6.	15.3	1007.6
1	0135	20	0.	14.9	1007.5	*	1	0955	120	59.	19.4	1008.4	*	1	1815	220	6.	15.3	1007.6
1	0140	21	0.	14.9	1007.5	*	1	1000	121	57.	19.2	1008.4	*	1	1820	221	6.	15.3	1007.6
1	0145	22	0.	14.9	1007.5	*	1	1005	122	55.	19.1	1008.4	*	1	1825	222	5.	15.3	1007.6
1	0150	23	0.	14.9	1007.5	*	1	1010	123	53.	18.9	1008.3	*	1	1830	223	5.	15.3	1007.6
1	0155	24	0.	14.9	1007.5	*	1	1015	124	52.	18.8	1008.3	*	1	1835	224	5.	15.3	1007.6
1	0200	25	0.	14.9	1007.5	*	1	1020	125	50.	18.7	1008.3	*	1	1840	225	5.	15.3	1007.6
1	0205	26	0.	14.9	1007.5	*	1	1025	126	48.	18.5	1008.2	*	1	1845	226	5.	15.3	1007.6
1	0210	27	0.	14.9	1007.5	*	1	1030	127	46.	18.4	1008.2	*	1	1850	227	5.	15.3	1007.6
1	0215	28	0.	14.9	1007.5	*	1	1035	128	45.	18.3	1008.2	*	1	1855	228	5.	15.3	1007.6
1	0220	29	0.	14.9	1007.5	*	1	1040	129	43.	18.2	1008.2	*	1	1900	229	5.	15.3	1007.6
1	0225	30	0.	14.9	1007.5	*	1	1045	130	42.	18.1	1008.1	*	1	1905	230	5.	15.3	1007.6
1	0230	31	0.	14.9	1007.5	*	1	1050	131	41.	18.0	1008.1	*	1	1910	231	5.	15.3	1007.6
1	0235	32	0.	14.9	1007.5	*	1	1055	132	40.	17.9	1008.1	*	1	1915	232	5.	15.2	1007.6
1	0240	33	0.	14.9	1007.5	*	1	1100	133	39.	17.8	1008.1	*	1	1920	233	4.	15.2	1007.6
1	0245	34	0.	14.9	1007.5	*	1	1105	134	38.	17.8	1008.1	*	1	1925	234	4.	15.2	1007.6
1	0250	35	0.	14.9	1007.5	*	1	1110	135	38.	17.7	1008.1	*	1	1930	235	4.	15.2	1007.6
1	0255	36	0.	14.9	1007.5	*	1	1115	136	37.	17.7	1008.1	*	1	1935	236	4.	15.2	1007.6
1	0300	37	0.	14.9	1007.5	*	1	1120	137	37.	17.7	1008.1	*	1	1940	237	4.	15.2	1007.6
1	0305	38	0.	14.9	1007.5	*	1	1125	138	37.	17.7	1008.1	*	1	1945	238	4.	15.2	1007.6
1	0310	39	0.	14.9	1007.5	*	1	1130	139	36.	17.6	1008.1	*	1	1950	239	4.	15.2	1007.6
1	0315	40	0.	14.9	1007.5	*	1	1135	140	36.	17.6	1008.0	*	1	1955	240	4.	15.2	1007.6
1	0320	41	0.	14.9	1007.5	*	1	1140	141	35.	17.5	1008.0	*	1	2000	241	4.	15.2	1007.6
1	0325	42	0.	14.9	1007.5	*	1	1145	142	34.	17.5	1008.0	*	1	2005	242	4.	15.2	1007.6
1	0330	43	0.	14.9	1007.5	*	1	1150	143	34.	17.5	1008.0	*	1	2010	243	4.	15.2	1007.6
1	0335	44	0.	14.9	1007.5	*	1	1155	144	33.	17.4	1008.0	*	1	2015	244	4.	15.2	1007.6
1	0340	45	0.	14.9	1007.5	*	1	1200	145	33.	17.4	1008.0	*	1	2020	245	4.	15.2	1007.6
1	0345	46	0.	14.9	1007.5	*	1	1205	146	32.	17.3	1008.0	*	1	2025	246	4.	15.2	1007.6
1	0350	47	0.	14.9	1007.5	*	1	1210	147	31.	17.3	1008.0	*	1	2030	247	3.	15.2	1007.6
1	0355	48	0.	14.9	1007.5	*	1	1215	148	31.	17.2	1008.0	*	1	2035	248	3.	15.2	1007.6
1	0400	49	0.	14.9	1007.5	*	1	1220	149	30.	17.2	1008.0	*	1	2040	249	3.	15.2	1007.6
1	0405	50	0.	14.9	1007.5	*	1	1225	150	29.	17.1	1008.0	*	1	2045	250	3.	15.2	1007.6
1	0410	51	0.	14.9	1007.5	*	1	1230	151	29.	17.1	1007.9	*	1	2050	251	3.	15.2	1007.6
1	0415	52	0.	14.9	1007.5	*	1	1235	152	28.	17.0	1007.9	*	1	2055	252	3.	15.1	1007.5
1	0420	53	0.	14.9	1007.5	*	1	1240	153	27.	17.0	1007.9	*	1	2100	253	3.	15.1	1007.5
1	0425	54	0.	14.9	1007.5	*	1	1245	154	27.	16.9	1007.9	*	1	2105	254	3.	15.1	1007.5
1	0430	55	0.	14.9	1007.5	*	1	1250	155	26.	16.9	1007.9	*	1	2110	255	3.	15.1	1007.5
1	0435	56	0.	14.9	1007.5	*	1	1255	156	25.	16.8	1007.9	*	1	2115	256	3.	15.1	1007.5
1	0440	57	0.	14.9	1007.5	*	1	1300	157	25.	16.8	1007.9	*	1	2120	257	3.	15.1	1007.5
1	0445	58	0.	14.9	1007.5	*	1	1305	158	24.	16.7	1007.9	*	1	2125	258	3.	15.1	1007.5
1	0450	59	0.	14.9	1007.5	*	1	1310	159	24.	16.7	1007.9	*	1	2130	259	3.	15.1	1007.5
1	0455	60	0.	14.9	1007.5	*	1	1315	160	23.	16.6	1007.9	*	1	2135	260	3.	15.1	1007.5
1	0500	61	0.	14.9	1007.5	*	1	1320	161	22.	16.6	1007.8	*	1	2140	261	3.	15.1	1007.5
1	0505	62	1.	15.0	1007.5	*	1	1325	162	22.	16.5	1007.8	*	1	2145	262	3.	15.1	1007.5
1	0510	63	3.	15.2	1007.6	*	1	1330	163	21.	16.5	1007.8	*	1	2150	263	3.	15.1	1007.5
1	0515	64	7.	15.4	1007.6	*	1	1335	164	21.	16.5	1007.8	*	1	2155	264	3.	15.1	1007.5
1	0520	65	11.	15.8	1007.7	*	1	1340	165	20.	16.4	1007.8	*	1	2200	265	3.	15.1	1007.5
1	0525	66	16.	16.1	1007.8	*	1	1345	166	20.	16.4	1007.8	*	1	2205	266	3.	15.1	1007.5
1	0530	67	22.	16.6	1007.8	*	1	1350	167	19.	16.4	1007.8	*	1	2210	267	3.	15.1	1007.5
1	0535	68	29.	17.1	1007.9	*	1	1355	168	19.	16.3	1007.8	*	1	2215	268	2.	15.1	1007.5
1	0540	69	36.	17.6	1008.1	*	1	1400	169	18.	16.3	1007.8	*	1	2220	269	2.	15.1	1007.5

1	0550	71	51.	18.7	1008.3	*	1	1410	171	17.	16.2	1007.8	*	1	2230	271	2.	[illegible]	[illegible]
1	0555	72	59.	19.3	1008.4	*	1	1415	172	17.	16.2	1007.8	*	1	2235	272	2.	15.1	1007.5
1	0600	73	67.	20.0	1008.5	*	1	1420	173	16.	16.1	1007.8	*	1	2240	273	2.	15.1	1007.5
1	0605	74	76.	20.7	1008.7	*	1	1425	174	16.	16.1	1007.7	*	1	2245	274	2.	15.1	1007.5
1	0610	75	85.	21.3	1008.8	*	1	1430	175	16.	16.1	1007.7	*	1	2250	275	2.	15.1	1007.5
1	0615	76	93.	21.9	1008.9	*	1	1435	176	15.	16.1	1007.7	*	1	2255	276	2.	15.1	1007.5
1	0620	77	99.	22.4	1009.0	*	1	1440	177	15.	16.0	1007.7	*	1	2300	277	2.	15.1	1007.5
1	0625	78	105.	22.8	1009.1	*	1	1445	178	14.	16.0	1007.7	*	1	2305	278	2.	15.1	1007.5
1	0630	79	110.	23.2	1009.2	*	1	1450	179	14.	16.0	1007.7	*	1	2310	279	2.	15.1	1007.5
1	0635	80	114.	23.5	1009.2	*	1	1455	180	14.	15.9	1007.7	*	1	2315	280	2.	15.1	1007.5
1	0640	81	117.	23.7	1009.3	*	1	1500	181	13.	15.9	1007.7	*	1	2320	281	2.	15.1	1007.5
1	0645	82	119.	23.9	1009.3	*	1	1505	182	13.	15.9	1007.7	*	1	2325	282	2.	15.1	1007.5
1	0650	83	121.	24.0	1009.4	*	1	1510	183	13.	15.9	1007.7	*	1	2330	283	2.	15.1	1007.5
1	0655	84	122.	24.1	1009.4	*	1	1515	184	12.	15.8	1007.7	*	1	2335	284	2.	15.1	1007.5
1	0700	85	122.	24.1	1009.4	*	1	1520	185	12.	15.8	1007.7	*	1	2340	285	2.	15.1	1007.5
1	0705	86	123.	24.1	1009.4	*	1	1525	186	12.	15.8	1007.7	*	1	2345	286	2.	15.0	1007.5
1	0710	87	122.	24.1	1009.4	*	1	1530	187	12.	15.8	1007.7	*	1	2350	287	2.	15.0	1007.5
1	0715	88	121.	24.1	1009.4	*	1	1535	188	11.	15.8	1007.7	*	1	2355	288	2.	15.0	1007.5
1	0720	89	120.	24.0	1009.4	*	1	1540	189	11.	15.7	1007.7	*	2	0000	289	2.	15.0	1007.5
1	0725	90	119.	23.8	1009.3	*	1	1545	190	11.	15.7	1007.7	*	2	0005	290	2.	15.0	1007.5
1	0730	91	117.	23.7	1009.3	*	1	1550	191	11.	15.7	1007.7	*	2	0010	291	2.	15.0	1007.5
1	0735	92	115.	23.5	1009.3	*	1	1555	192	10.	15.7	1007.7	*	2	0015	292	2.	15.0	1007.5
1	0740	93	112.	23.4	1009.2	*	1	1600	193	10.	15.7	1007.7	*	2	0020	293	2.	15.0	1007.5
1	0745	94	110.	23.2	1009.2	*	1	1605	194	10.	15.6	1007.7	*	2	0025	294	2.	15.0	1007.5
1	0750	95	108.	23.0	1009.2	*	1	1610	195	10.	15.6	1007.6	*	2	0030	295	2.	15.0	1007.5
1	0755	96	106.	22.9	1009.1	*	1	1615	196	9.	15.6	1007.6	*	2	0035	296	2.	15.0	1007.5
1	0800	97	104.	22.7	1009.1	*	1	1620	197	9.	15.6	1007.6	*	2	0040	297	2.	15.0	1007.5
1	0805	98	102.	22.6	1009.1	*	1	1625	198	9.	15.6	1007.6	*	2	0045	298	2.	15.0	1007.5
1	0810	99	100.	22.4	1009.0	*	1	1630	199	9.	15.6	1007.6	*	2	0050	299	2.	15.0	1007.5
1	0815	100	98.	22.3	1009.0	*	1	1635	200	9.	15.6	1007.6	*	2	0055	300	2.	15.0	1007.5
						*							*						

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	24.92-HR
123.	7.08	(CFS)	79.	25.	24.	24.
		(INCHES)	.038	.049	.049	.049
		(AC-FT)	39.	50.	50.	50.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)	6-HR	24-HR	72-HR	24.92-HR
24.	7.08	21.	17.	17.	17.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
(FEET)	(HR)	6-HR	24-HR	72-HR	24.92-HR
1009.39	7.08	1008.71	1007.89	1007.88	1007.88

CUMULATIVE AREA = 19.17 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .79
HYDROGRAPH AT	A1	2.73	1	FLOW	14.
				TIME	5.50
ROUTED TO	RA	2.73	1	FLOW	14.
				TIME	5.83
HYDROGRAPH AT	B1	1.08	1	FLOW	24.
				TIME	5.08
ROUTED TO	RB1	1.08	1	FLOW	24.
				TIME	7.33
HYDROGRAPH AT	B2	.61	1	FLOW	12.
				TIME	5.08
ROUTED TO	RB2	.61	1	FLOW	12.
				TIME	6.83
HYDROGRAPH AT	B3	2.50	1	FLOW	28.
				TIME	5.50
4 COMBINED AT	B	6.92	1	FLOW	41.
				TIME	5.67
ROUTED TO	RB	6.92	1	FLOW	41.
				TIME	6.17
HYDROGRAPH AT	C1	1.91	1	FLOW	18.
				TIME	5.50
HYDROGRAPH AT	C2	1.68	1	FLOW	11.
				TIME	5.58
3 COMBINED AT	C	10.51	1	FLOW	61.
				TIME	6.00
ROUTED TO	RC	10.51	1	FLOW	61.
				TIME	6.25
HYDROGRAPH AT	D1	.52	1	FLOW	7.
				TIME	5.08
ROUTED TO	RD1	.52	1	FLOW	7.
				TIME	5.75
HYDROGRAPH AT	D2	.30	1	FLOW	5.
				TIME	5.00
HYDROGRAPH AT	D3	.75	1	FLOW	23.
				TIME	5.08
4 COMBINED AT	D	[illegible]	1	FLOW	49.

ROUTED TO	RD	12.09	1	FLOW	69.
				TIME	6.33
HYDROGRAPH AT	E1	.50	1	FLOW	20.
				TIME	5.08
2 COMBINED AT	E	12.58	1	FLOW	71.
				TIME	6.25
ROUTED TO	RE	12.58	1	FLOW	70.
				TIME	6.50
HYDROGRAPH AT	F1	1.08	1	FLOW	19.
				TIME	5.17
2 COMBINED AT	F	13.66	1	FLOW	73.
				TIME	6.42
ROUTED TO	RF	13.66	1	FLOW	73.
				TIME	6.67
HYDROGRAPH AT	G1	1.36	1	FLOW	27.
				TIME	5.25
HYDROGRAPH AT	G2	1.02	1	FLOW	45.
				TIME	4.00
3 COMBINED AT	G	16.04	1	FLOW	111.
				TIME	5.42
ROUTED TO	RG	16.04	1	FLOW	110.
				TIME	5.50
HYDROGRAPH AT	H1	.56	1	FLOW	13.
				TIME	5.08
HYDROGRAPH AT	H2	.37	1	FLOW	33.
				TIME	3.67
3 COMBINED AT	H	16.98	1	FLOW	129.
				TIME	5.17
ROUTED TO	RH	16.98	1	FLOW	128.
				TIME	5.58
HYDROGRAPH AT	I1	1.35	1	FLOW	66.
				TIME	4.08
2 COMBINED AT	I	18.33	1	FLOW	176.
				TIME	5.33
ROUTED TO	RI	18.33	1	FLOW	174.
				TIME	6.17
HYDROGRAPH AT	J1	.85	1	FLOW	1.
				TIME	5.25
2 COMBINED AT	J	19.17	1	FLOW	175.
				TIME	6.17
ROUTED TO	DET B	19.17	1	FLOW	123.
				TIME	7.08

** PEAK STAGES IN FEET **

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT (INTERPOLATED TO COMPUTATION INTERVAL)	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .79									
RA	MANE	5.00	14.41	349.65	.01	5.00	14.39	350.00	.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1823E+01 EXCESS= .0000E+00 OUTFLOW= .1826E+01 BASIN STORAGE= .1832E-03 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .79									
RB1	MANE	5.00	24.00	439.48	.07	5.00	23.97	440.00	.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2923E+01 EXCESS= .0000E+00 OUTFLOW= .3806E+01 BASIN STORAGE= .6514E-01 PERCENT ERROR= -32.4

FOR PLAN = 1 RATIO= .79									
RB2	MANE	4.97	12.07	411.55	.05	5.00	12.01	410.00	.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1320E+01 EXCESS= .0000E+00 OUTFLOW= .1536E+01 BASIN STORAGE= .1125E-01 PERCENT ERROR= -17.3

FOR PLAN = 1 RATIO= .79									
RB	MANE	4.83	41.07	368.51	.03	5.00	40.89	370.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1140E+02 EXCESS= .0000E+00 OUTFLOW= .1134E+02 BASIN STORAGE= .5580E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .79									
RC	MANE	4.72	61.03	376.25	.03	5.00	60.91	375.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1540E+02 EXCESS= .0000E+00 OUTFLOW= .1535E+02 BASIN STORAGE= .5392E-01 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .79									
RD1	MANE	4.91	7.07	342.32	.02	5.00	7.06	345.00	.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6765E+00 EXCESS= .0000E+00 OUTFLOW= .6833E+00 BASIN STORAGE= .8818E-04 PERCENT ERROR= -1.0

FOR PLAN = 1 RATIO= .79									
RD	MANE	3.27	68.62	376.88	.03	5.00	68.52	380.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1946E+02 EXCESS= .0000E+00 OUTFLOW= .1944E+02 BASIN STORAGE= .2432E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .79									
RE	MANE	5.00	70.51	388.06	.03	5.00	70.22	390.00	.03

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        FOR PLAN = 1  RATIO=  .79
             RF  MANE         4.43     72.95    397.30      .03      5.00     72.95    400.00        .03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2460E+02 EXCESS= .0000E+00 OUTFLOW= .2455E+02 BASIN STORAGE= .4810E-01 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .79
             RG  MANE         4.73    110.46    333.20      .04      5.00    110.37    330.00        .04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3517E+02 EXCESS= .0000E+00 OUTFLOW= .3511E+02 BASIN STORAGE= .7313E-01 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .79
             RH  MANE         5.00    128.44    335.81      .04      5.00    128.38    335.00        .04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4010E+02 EXCESS= .0000E+00 OUTFLOW= .3988E+02 BASIN STORAGE= .2140E+00 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .79
             RI  MANE         5.00    175.24    368.17      .05      5.00    174.39    370.00        .05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5064E+02 EXCESS= .0000E+00 OUTFLOW= .5012E+02 BASIN STORAGE= .5172E+00 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
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10-yr. (Adj.)

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****************************************          ****************************************
*                                      *          *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *          *   U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990            *          *   HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0              *          *         609 SECOND STREET            *
*                                      *          *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE  07/11/1996  TIME  17:56:13 *         *           (916) 756-1104             *
*                                      *          *                                      *
****************************************          ****************************************
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X     X  XXXXXXX   XXXXX           X
X     X  X         X     X        XX
X     X  X         X               X
XXXXXXX  XXXX      X       XXXXX   X
X     X  X         X               X
X     X  X         X     X         X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

ID  NIKO SPRINGS WASH  FILE: 100NIKO  DATE: 7-22-94
ID  10 YEAR FREQUENCY 6-HOUR STORM per CCRFCD HC&DDM
ID  SDN 5, DARF .79
ID  Originally created by Boyle Engineering for CCRFCD
ID    as Niko Springs/Unnamed Wash Facilities Plan.
ID  TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
ID  Edited by Black & Veatch for design of Niko Springs Detention Basin.
IT       5       0       0     300
IN       5       0       0
IO       5       0       0
JR    PREC     .79

KK      A1
KM  RUNOFF FROM SUBBASIN A1
BA    2.73
PB    1.95  ← Adjusted to obtain FEMA inflow ≈ 1625 cfs
PC    .000    .020    .059    .080    .110    .144    .150    .160    .168    .171
PC    .180    .182    .187    .190    .197    .202    .210    .220    .230    .241
PC    .250    .259    .265    .280    .290    .300    .305    .309    .310    .317
PC    .321    .327    .333    .346    .361    .381    .408    .430    .477    .514
PC    .561    .630    .710    .720    .731    .752    .779    .790    .795    .804
PC    .810    .820    .826    .840    .859    .889    .910    .938    .966    .970
PC    .974    .979    .981    .983    .985    .989    .990    .992    .993    .996
PC    .997    .999    1.00
LS       0      78
UD     .83

KK      RA
KM  ROUTE A1 RUNOFF
RK    2200   .0364    .050            TRAP     200      25

KK      B1
KM  RUNOFF FROM SUBBASIN B1
BA    1.08
LS       0      83
UD     .47

KK     RB1
KM  ROUTE B1 RUNOFF
RK   15500   .0503    .050            TRAP     350      25

KK      B2
KM  RUNOFF FROM SUBBASIN B2
BA     .61
LS       0      82
UD     .43

KK     RB2
KM  ROUTE B2 RUNOFF
RK   11500   .0435    .050            TRAP     200      25
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ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

KK      B3
KM   RUNOFF FROM SUBBASIN B3
BA     2.5
LS       0      81
UD     .88

KK       B
KM   COMBINE RA, B1, B2, & B3
HC       4

KK      RB
KM   ROUTE B
RK    4500   .0389    .050            TRAP     300      25

KK      C1
KM   RUNOFF FROM SUBBASIN C1
BA    1.91
LS       0      80
UD     .83

KK      C2
KM   RUNOFF FROM SUBBASIN C2
BA    1.68
LS       0      79
UD     .94

KK       C
KM   COMBINE RB, C1, & C2
HC       3

KK      RC
KM   ROUTE C
RK    2900   .0414    .050            TRAP     300       5

KK      D1
KM   RUNOFF FROM SUBBASIN D1
BA    .524
LS       0      80
UD     .42

KK     RD1
KM   ROUTE D1
RK    5400    .061    .050            TRAP     100      50

KK      D2
KM   RUNOFF FROM SUBBASIN D2
BA    .301
LS       0      80
UD     .34
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  85          KK      D3
  86          KM   RUNOFF FROM SUBBASIN D3
  87          BA    .753
  88          LS      0       85
  89          UD     .46

  90          KK       D
  91          KM   COMBINE RC, RD1, D2, & D3
  92          HC       4

  93          KK      RD
  94          KM   ROUTE D
  95          RK    1600   .0469    .050            TRAP     300      15

  96          KK      E1
  97          KM   RUNOFF FROM E1
  98          BA    .495
  99          LS      0       87
 100          UD     .43

 101          KK       E
 102          KM   COMBINE RD & E1
 103          HC       2

 104          KK      RE
 105          KM   ROUTE E
 106          RK    2560   .0364    .050            TRAP     300      50

 107          KK      F1
 108          KM   RUNOFF FROM SUBBASIN F1
 109          BA    1.08
 110          LS      0       82
 111          UD     .56

 112          KK       F
 113          KM   COMBINE RE & F1
 114          HC       2

 115          KK      RF
 116          KM   ROUTE F
 117          RK    3000   .0467    .050            TRAP     300      50

 118          KK      G1
 119          KM   RUNOFF FROM SUBBASIN G1
 120          BA    1.36
 121          LS      0       83
 122          UD     .62

 123          KK      G2
 124          KM   RUNOFF FROM SUBBASIN G2
 125          BA    1.02
 126          LS      0       88
 127          UD     .47
```

```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 128        KK      G
 129        KM   COMBINE RF, G1, & G2
 130        HC      3

 131        KK     RG
 132        KM   ROUTE G
 133        RK    2600   .0346    .050           TRAP     300      5

 134        KK     H1
 135        KM   RUNOFF FROM SUBBASIN H1
 136        BA    .560
 137        LS      0       83
 138        UD     .42

 139        KK     H2
 140        KM   RUNOFF FROM SUBBASIN H2
 141        BA    .373
 142        LS      0       90
 143        UD     .24

 144        KK      H
 145        KM   COMBINE RG, H1 & H2
 146        HC      3

 147        KK     RH
 148        KM   ROUTE H
 149        RK    9400   .0585    .070           TRAP      75      5

 150        KK     I1
 151        KM   RUNOFF FROM SUBBASIN I1
 152        BA    1.35
 153        LS      0       89
 154        UD     .55

 155        KK      I
 156        KM   COMBINE RH & I1
 157        HC      2

 158        KK     RI
 159        KM   ROUTE I
 160        RK   10000   .0410    .050           TRAP     400     50

 161        KK     J1
 162        KM   RUNOFF FROM SUBBASIN J1
 163        BA    .847
 164        LS      0       75
 165        UD     .41

 166        KK      J
 167        KM   COMBINE RI & J1
 168        HC      2
 169        KO      1
```

```
LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                KK   DET B
                KM   DETENTION BASIN SITE
                KM     Spillway elevation of 1077.5 ft.; 62" dia. low-level outlet pipe;
                KM     storage capacity of 1636 ac ft.
                KO       1
                RS       1    STOR      -1
                SV       0    2.68   27.13   75.75  141.59  216.52  299.74  393.04  497.42  612.84
                SV  738.58  873.92 1018.86 1174.58 1343.32 1531.69 1746.05 1988.34
                SE    1002    1005    1010    1015    1020    1025    1030    1035    1040    1045
                SE    1050    1055    1060    1065    1070    1075    1080    1085
                SL  1007.5   20.97     .61      .5
                SS  1077.5     550   2.939     1.5
                ZZ
```

```
****************************************                    ****************************************
*                                      *                    *                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS       *
*           SEPTEMBER 1990             *                    *   HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0              *                    *        609 SECOND STREET             *
*                                      *                    *      DAVIS, CALIFORNIA 95616         *
* RUN DATE  07/11/1996  TIME  17:56:13 *                    *         (916) 756-1104               *
*                                      *                    *                                      *
****************************************                    ****************************************




                          HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
                          10 YEAR FREQUENCY  6-HOUR STORM per CCRFCD HC&DDM
                          SDN 5, DARF .79
                          Originally created by Boyle Engineering for CCRFCD
                            as Hiko Springs/Unnamed Wash Facilities Plan.
                          TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
                          Edited by Black & Veatch for design of Hiko Springs Detention Basin.

  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT           HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                       ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

       ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT

    JP            MULTI-PLAN OPTION
                        NPLAN           1  NUMBER OF PLANS

    JR            MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                    .79


      *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
166 KK        *        J   *
              *            *
              **************


169 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          1  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL          0.  HYDROGRAPH PLOT SCALE

168 HC        HYDROGRAPH COMBINATION
                   ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
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HYDROGRAPH AT STATION J
SUM OF 2 HYDROGRAPHS
PLAN 1. RATIO = .79

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	1323.	*	1		1230	151	25.	*	1		1845	226	4.
1		0005	2	0.	*	1		0620	77	1255.	*	1		1235	152	24.	*	1		1850	227	4.
1		0010	3	0.	*	1		0625	78	1189.	*	1		1240	153	23.	*	1		1855	228	4.
1		0015	4	0.	*	1		0630	79	1125.	*	1		1245	154	23.	*	1		1900	229	4.
1		0020	5	0.	*	1		0635	80	1063.	*	1		1250	155	22.	*	1		1905	230	4.
1		0025	6	0.	*	1		0640	81	1003.	*	1		1255	156	21.	*	1		1910	231	3.
1		0030	7	0.	*	1		0645	82	945.	*	1		1300	157	20.	*	1		1915	232	3.
1		0035	8	0.	*	1		0650	83	890.	*	1		1305	158	20.	*	1		1920	233	3.
1		0040	9	0.	*	1		0655	84	837.	*	1		1310	159	19.	*	1		1925	234	3.
1		0045	10	0.	*	1		0700	85	787.	*	1		1315	160	19.	*	1		1930	235	3.
1		0050	11	0.	*	1		0705	86	740.	*	1		1320	161	18.	*	1		1935	236	3.
1		0055	12	0.	*	1		0710	87	696.	*	1		1325	162	17.	*	1		1940	237	3.
1		0100	13	0.	*	1		0715	88	655.	*	1		1330	163	17.	*	1		1945	238	3.
1		0105	14	0.	*	1		0720	89	616.	*	1		1335	164	16.	*	1		1950	239	3.
1		0110	15	0.	*	1		0725	90	579.	*	1		1340	165	16.	*	1		1955	240	3.
1		0115	16	0.	*	1		0730	91	545.	*	1		1345	166	15.	*	1		2000	241	3.
1		0120	17	0.	*	1		0735	92	512.	*	1		1350	167	15.	*	1		2005	242	3.
1		0125	18	0.	*	1		0740	93	481.	*	1		1355	168	14.	*	1		2010	243	3.
1		0130	19	0.	*	1		0745	94	451.	*	1		1400	169	14.	*	1		2015	244	3.
1		0135	20	0.	*	1		0750	95	423.	*	1		1405	170	14.	*	1		2020	245	3.
1		0140	21	0.	*	1		0755	96	396.	*	1		1410	171	13.	*	1		2025	246	3.
1		0145	22	0.	*	1		0800	97	370.	*	1		1415	172	13.	*	1		2030	247	3.
1		0150	23	0.	*	1		0805	98	347.	*	1		1420	173	12.	*	1		2035	248	3.
1		0155	24	0.	*	1		0810	99	325.	*	1		1425	174	12.	*	1		2040	249	3.
1		0200	25	0.	*	1		0815	100	304.	*	1		1430	175	12.	*	1		2045	250	2.
1		0205	26	0.	*	1		0820	101	285.	*	1		1435	176	11.	*	1		2050	251	2.
1		0210	27	0.	*	1		0825	102	266.	*	1		1440	177	11.	*	1		2055	252	2.
1		0215	28	0.	*	1		0830	103	250.	*	1		1445	178	11.	*	1		2100	253	2.
1		0220	29	0.	*	1		0835	104	235.	*	1		1450	179	11.	*	1		2105	254	2.
1		0225	30	0.	*	1		0840	105	221.	*	1		1455	180	10.	*	1		2110	255	2.
1		0230	31	0.	*	1		0845	106	208.	*	1		1500	181	10.	*	1		2115	256	2.
1		0235	32	0.	*	1		0850	107	196.	*	1		1505	182	10.	*	1		2120	257	2.
1		0240	33	0.	*	1		0855	108	185.	*	1		1510	183	10.	*	1		2125	258	2.
1		0245	34	0.	*	1		0900	109	174.	*	1		1515	184	9.	*	1		2130	259	2.
1		0250	35	0.	*	1		0905	110	165.	*	1		1520	185	9.	*	1		2135	260	2.
1		0255	36	0.	*	1		0910	111	155.	*	1		1525	186	9.	*	1		2140	261	2.
1		0300	37	0.	*	1		0915	112	146.	*	1		1530	187	9.	*	1		2145	262	2.
[illegible]		[illegible]	[illegible]	[illegible]	*	[illegible]		[illegible]	[illegible]	[illegible]	*	[illegible]		1535	[illegible]	9.	*	1		2150	263	2.

1	0315	40	2.	*	1	0930	115	122.	*	1	1545	190	8.	*	1	2200	265	2.
1	0320	41	4.	*	1	0935	116	115.	*	1	1550	191	8.	*	1	2205	266	2.
1	0325	42	9.	*	1	0940	117	109.	*	1	1555	192	8.	*	1	2210	267	2.
1	0330	43	19.	*	1	0945	118	103.	*	1	1600	193	8.	*	1	2215	268	2.
1	0335	44	32.	*	1	0950	119	98.	*	1	1605	194	7.	*	1	2220	269	2.
1	0340	45	47.	*	1	0955	120	93.	*	1	1610	195	7.	*	1	2225	270	2.
1	0345	46	63.	*	1	1000	121	88.	*	1	1615	196	7.	*	1	2230	271	2.
1	0350	47	77.	*	1	1005	122	84.	*	1	1620	197	7.	*	1	2235	272	2.
1	0355	48	96.	*	1	1010	123	80.	*	1	1625	198	7.	*	1	2240	273	2.
1	0400	49	127.	*	1	1015	124	76.	*	1	1630	199	7.	*	1	2245	274	2.
1	0405	50	188.	*	1	1020	125	73.	*	1	1635	200	6.	*	1	2250	275	2.
1	0410	51	304.	*	1	1025	126	69.	*	1	1640	201	6.	*	1	2255	276	2.
1	0415	52	501.	*	1	1030	127	66.	*	1	1645	202	6.	*	1	2300	277	2.
1	0420	53	742.	*	1	1035	128	63.	*	1	1650	203	6.	*	1	2305	278	2.
1	0425	54	952.	*	1	1040	129	60.	*	1	1655	204	6.	*	1	2310	279	2.
1	0430	55	1112.	*	1	1045	130	58.	*	1	1700	205	6.	*	1	2315	280	2.
1	0435	56	1188.	*	1	1050	131	55.	*	1	1705	206	6.	*	1	2320	281	2.
1	0440	57	1211.	*	1	1055	132	53.	*	1	1710	207	5.	*	1	2325	282	2.
1	0445	58	1221.	*	1	1100	133	51.	*	1	1715	208	5.	*	1	2330	283	2.
1	0450	59	1238.	*	1	1105	134	48.	*	1	1720	209	5.	*	1	2335	284	2.
1	0455	60	1266.	*	1	1110	135	46.	*	1	1725	210	5.	*	1	2340	285	1.
1	0500	61	1306.	*	1	1115	136	45.	*	1	1730	211	5.	*	1	2345	286	1.
1	0505	62	1352.	*	1	1120	137	43.	*	1	1735	212	5.	*	1	2350	287	1.
1	0510	63	1402.	*	1	1125	138	41.	*	1	1740	213	5.	*	1	2355	288	1.
1	0515	64	1450.	*	1	1130	139	40.	*	1	1745	214	5.	*	2	0000	289	1.
1	0520	65	1497.	*	1	1135	140	38.	*	1	1750	215	5.	*	2	0005	290	1.
1	0525	66	1542.	*	1	1140	141	37.	*	1	1755	216	5.	*	2	0010	291	1.
1	0530	67	1582.	*	1	1145	142	35.	*	1	1800	217	4.	*	2	0015	292	1.
1	0535	68	1613.	*	1	1150	143	34.	*	1	1805	218	4.	*	2	0020	293	1.
1	0540	69	1628.	*	1	1155	144	33.	*	1	1810	219	4.	*	2	0025	294	1.
1	0545	70	1627.	*	1	1200	145	31.	*	1	1815	220	4.	*	2	0030	295	1.
1	0550	71	1615.	*	1	1205	146	30.	*	1	1820	221	4.	*	2	0035	296	1.
1	0555	72	1584.	*	1	1210	147	29.	*	1	1825	222	4.	*	2	0040	297	1.
1	0600	73	1530.	*	1	1215	148	28.	*	1	1830	223	4.	*	2	0045	298	1.
1	0605	74	1463.	*	1	1220	149	27.	*	1	1835	224	4.	*	2	0050	299	1.
1	0610	75	1393.	*	1	1225	150	26.	*	1	1840	225	4.	*	2	0055	300	1.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
(CFS)	(HR)					
1628.	5.67	(CFS)	748.	197.	189.	189.
		(INCHES)	.363	.382	.382	.382
		(AC-FT)	371.	390.	390.	390.

CUMULATIVE AREA = 19.17 SQ MI

*** ***

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          **************
          *            *
170 KK    *    DET B   *
          *            *
          **************
```

174 KO OUTPUT CONTROL VARIABLES

IPRNT 1 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

```
175 RS          STORAGE ROUTING
                   NSTPS          1  NUMBER OF SUBREACHES
                   ITYP        STOR  TYPE OF INITIAL CONDITION
                   RSVRIC     -1.00  INITIAL CONDITION
                   X            .00  WORKING R AND D COEFFICIENT

176 SV       STORAGE        .0      2.7     27.1     75.8    141.6    216.5    299.7    393.0    497.4    612.8
                         738.6    873.9   1018.9   1174.6   1343.3   1531.7   1746.1   1988.3

178 SE     ELEVATION   1002.00  1005.00  1010.00  1015.00  1020.00  1025.00  1030.00  1035.00  1040.00  1045.00
                       1050.00  1055.00  1060.00  1065.00  1070.00  1075.00  1080.00  1085.00

180 SL          LOW-LEVEL OUTLET
                   ELEVL    1007.50  ELEVATION AT CENTER OF OUTLET
                   CAREA      20.97  CROSS-SECTIONAL AREA
                   COQL         .61  COEFFICIENT
                   EXPL         .50  EXPONENT OF HEAD

181 SS          SPILLWAY
                   CREL     1077.50  SPILLWAY CREST ELEVATION
                   SPWID     550.00  SPILLWAY WIDTH
                   COQW        2.94  WEIR COEFFICIENT
                   EXPW        1.50  EXPONENT OF HEAD
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***

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	169.02	190.92	219.35	257.72	312.36	396.41	542.34	858.32
ELEVATION	1002.00	1007.50	1010.21	1010.96	1012.07	1013.81	1016.77	1022.43	1035.45	1077.50
OUTFLOW	892.86	1128.77	1764.60	2999.50	5031.27	8059.63	12281.89	17898.24	25106.23	34104.37
ELEVATION	1077.58	1077.80	1078.18	1078.70	1079.38	1080.20	1081.18	1082.30	1083.58	1085.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	2.68	14.90	27.13	29.21	36.50	47.27	64.19	75.75	99.07
OUTFLOW	.00	.00	.00	162.21	169.02	190.92	219.35	257.72	280.95	312.36
ELEVATION	1002.00	1005.00	1007.50	1010.00	1010.21	1010.96	1012.07	1013.81	1015.00	1016.77
STORAGE	141.59	178.02	216.52	299.74	393.04	402.38	497.42	612.84	738.58	873.92
OUTFLOW	362.71	396.41	429.16	486.62	537.98	542.34	584.85	628.23	668.80	707.05
ELEVATION	1020.00	1022.43	1025.00	1030.00	1035.00	1035.45	1040.00	1045.00	1050.00	1055.00
STORAGE	1018.86	1174.58	1343.32	1531.69	1638.87	1642.14	1651.83	1667.93	1690.46	1719.40
OUTFLOW	743.33	777.92	811.09	842.86	858.32	892.86	1128.77	1764.60	2999.50	5031.27
ELEVATION	1060.00	1065.00	1070.00	1075.00	1077.50	1077.58	1077.80	1078.18	1078.70	1079.38
STORAGE	1746.05	1755.90	1803.13	1857.61	1919.35	1988.34				
OUTFLOW	7263.10	8059.63	12281.89	17898.24	25106.23	34104.37				
ELEVATION	1080.00	1080.20	1081.18	1082.30	1083.58	1085.00				

****

HYDROGRAPH AT STATION DET B
PLAN 1, RATIO = .79

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	14.9	1007.5	*	1		0820	101	445.	239.3	1026.4	*	1		1640	201	200.	39.8	1011.3
1		0005	2	0.	14.9	1007.5	*	1		0825	102	444.	238.1	1026.3	*	1		1645	202	196.	38.5	1011.2

1	0020	5	0.	14.9	1007.5	*	1	0840	105	441.	234.0	1026.0	*	1	1700	205	185.	34.7	1010.8
1	0025	6	0.	14.9	1007.5	*	1	0845	106	440.	232.4	1026.0	*	1	1705	206	182.	33.5	1010.7
1	0030	7	0.	14.9	1007.5	*	1	0850	107	439.	230.8	1025.9	*	1	1710	207	178.	32.3	1010.5
1	0035	8	0.	14.9	1007.5	*	1	0855	108	438.	229.1	1025.8	*	1	1715	208	175.	31.1	1010.4
1	0040	9	0.	14.9	1007.5	*	1	0900	109	437.	227.3	1025.6	*	1	1720	209	171.	29.9	1010.3
1	0045	10	0.	14.9	1007.5	*	1	0905	110	435.	225.5	1025.5	*	1	1725	210	168.	28.8	1010.2
1	0050	11	0.	14.9	1007.5	*	1	0910	111	434.	223.6	1025.4	*	1	1730	211	164.	27.7	1010.1
1	0055	12	0.	14.9	1007.5	*	1	0915	112	433.	221.6	1025.3	*	1	1735	212	155.	26.6	1009.9
1	0100	13	0.	14.9	1007.5	*	1	0920	113	431.	219.6	1025.2	*	1	1740	213	142.	25.6	1009.7
1	0105	14	0.	14.9	1007.5	*	1	0925	114	430.	217.6	1025.1	*	1	1745	214	130.	24.7	1009.5
1	0110	15	0.	14.9	1007.5	*	1	0930	115	428.	215.5	1024.9	*	1	1750	215	119.	23.9	1009.3
1	0115	16	0.	14.9	1007.5	*	1	0935	116	426.	213.4	1024.8	*	1	1755	216	109.	23.1	1009.2
1	0120	17	0.	14.9	1007.5	*	1	0940	117	425.	211.2	1024.6	*	1	1800	217	100.	22.5	1009.0
1	0125	18	0.	14.9	1007.5	*	1	0945	118	423.	209.0	1024.5	*	1	1805	218	92.	21.8	1008.9
1	0130	19	0.	14.9	1007.5	*	1	0950	119	421.	206.8	1024.4	*	1	1810	219	84.	21.2	1008.8
1	0135	20	0.	14.9	1007.5	*	1	0955	120	419.	204.6	1024.2	*	1	1815	220	77.	20.7	1008.7
1	0140	21	0.	14.9	1007.5	*	1	1000	121	417.	202.3	1024.1	*	1	1820	221	71.	20.2	1008.6
1	0145	22	0.	14.9	1007.5	*	1	1005	122	415.	200.0	1023.9	*	1	1825	222	65.	19.8	1008.5
1	0150	23	0.	14.9	1007.5	*	1	1010	123	413.	197.8	1023.7	*	1	1830	223	60.	19.4	1008.4
1	0155	24	0.	14.9	1007.5	*	1	1015	124	411.	195.5	1023.6	*	1	1835	224	55.	19.0	1008.3
1	0200	25	0.	14.9	1007.5	*	1	1020	125	409.	193.1	1023.4	*	1	1840	225	50.	18.7	1008.3
1	0205	26	0.	14.9	1007.5	*	1	1025	126	407.	190.8	1023.3	*	1	1845	226	46.	18.4	1008.2
1	0210	27	0.	14.9	1007.5	*	1	1030	127	405.	188.5	1023.1	*	1	1850	227	43.	18.1	1008.2
1	0215	28	0.	14.9	1007.5	*	1	1035	128	403.	186.1	1023.0	*	1	1855	228	39.	17.9	1008.1
1	0220	29	0.	14.9	1007.5	*	1	1040	129	401.	183.8	1022.8	*	1	1900	229	36.	17.6	1008.1
1	0225	30	0.	14.9	1007.5	*	1	1045	130	399.	181.5	1022.7	*	1	1905	230	33.	17.4	1008.0
1	0230	31	0.	14.9	1007.5	*	1	1050	131	397.	179.1	1022.5	*	1	1910	231	31.	17.2	1008.0
1	0235	32	0.	14.9	1007.5	*	1	1055	132	395.	176.7	1022.3	*	1	1915	232	28.	17.0	1007.9
1	0240	33	0.	14.9	1007.5	*	1	1100	133	393.	174.4	1022.2	*	1	1920	233	26.	16.9	1007.9
1	0245	34	0.	14.9	1007.5	*	1	1105	134	391.	172.0	1022.0	*	1	1925	234	24.	16.7	1007.9
1	0250	35	0.	14.9	1007.5	*	1	1110	135	389.	169.7	1021.9	*	1	1930	235	22.	16.6	1007.8
1	0255	36	0.	14.9	1007.5	*	1	1115	136	387.	167.3	1021.7	*	1	1935	236	21.	16.5	1007.8
1	0300	37	0.	14.9	1007.5	*	1	1120	137	384.	165.0	1021.6	*	1	1940	237	19.	16.3	1007.8
1	0305	38	0.	14.9	1007.5	*	1	1125	138	382.	162.6	1021.4	*	1	1945	238	18.	16.2	1007.8
1	0310	39	0.	14.9	1007.5	*	1	1130	139	380.	160.3	1021.2	*	1	1950	239	16.	16.1	1007.8
1	0315	40	0.	14.9	1007.5	*	1	1135	140	378.	157.9	1021.1	*	1	1955	240	15.	16.1	1007.7
1	0320	41	0.	14.9	1007.5	*	1	1140	141	376.	155.6	1020.9	*	1	2000	241	14.	16.0	1007.7
1	0325	42	1.	15.0	1007.5	*	1	1145	142	374.	153.3	1020.8	*	1	2005	242	13.	15.9	1007.7
1	0330	43	2.	15.1	1007.5	*	1	1150	143	371.	150.9	1020.6	*	1	2010	243	12.	15.8	1007.7
1	0335	44	4.	15.2	1007.6	*	1	1155	144	369.	148.6	1020.5	*	1	2015	244	11.	15.8	1007.7
1	0340	45	7.	15.4	1007.6	*	1	1200	145	367.	146.3	1020.3	*	1	2020	245	11.	15.7	1007.7
1	0345	46	11.	15.8	1007.7	*	1	1205	146	365.	144.0	1020.2	*	1	2025	246	10.	15.7	1007.7
1	0350	47	16.	16.1	1007.8	*	1	1210	147	363.	141.7	1020.0	*	1	2030	247	9.	15.6	1007.6
1	0355	48	23.	16.6	1007.8	*	1	1215	148	360.	139.4	1019.8	*	1	2035	248	9.	15.6	1007.6
1	0400	49	30.	17.2	1008.0	*	1	1220	149	357.	137.1	1019.7	*	1	2040	249	8.	15.5	1007.6
1	0405	50	41.	18.0	1008.1	*	1	1225	150	355.	134.8	1019.5	*	1	2045	250	8.	15.5	1007.6
1	0410	51	59.	19.4	1008.4	*	1	1230	151	352.	132.6	1019.3	*	1	2050	251	7.	15.5	1007.6
1	0415	52	89.	21.6	1008.9	*	1	1235	152	349.	130.3	1019.1	*	1	2055	252	7.	15.4	1007.6
1	0420	53	136.	25.1	1009.6	*	1	1240	153	347.	128.1	1019.0	*	1	2100	253	6.	15.4	1007.6
1	0425	54	171.	29.9	1010.3	*	1	1245	154	344.	125.9	1018.8	*	1	2105	254	6.	15.4	1007.6
1	0430	55	189.	35.8	1010.9	*	1	1250	155	342.	123.7	1018.6	*	1	2110	255	6.	15.3	1007.6
1	0435	56	206.	42.3	1011.6	*	1	1255	156	339.	121.5	1018.5	*	1	2115	256	5.	15.3	1007.6
1	0440	57	224.	49.1	1012.3	*	1	1300	157	336.	119.3	1018.3	*	1	2120	257	5.	15.3	1007.6
1	0445	58	239.	55.9	1013.0	*	1	1305	158	334.	117.1	1018.1	*	1	2125	258	5.	15.3	1007.6
1	0450	59	254.	62.7	1013.7	*	1	1310	159	331.	115.0	1018.0	*	1	2130	259	5.	15.3	1007.6
1	0455	60	268.	69.5	1014.4	*	1	1315	160	329.	112.8	1017.8	*	1	2135	260	4.	15.2	1007.6
1	0500	61	282.	76.5	1015.1	*	1	1320	161	326.	110.7	1017.7	*	1	2140	261	4.	15.2	1007.6
1	0505	62	292.	83.6	1015.6	*	1	1325	162	324.	108.6	1017.5	*	1	2145	262	4.	15.2	1007.6
1	0510	63	302.	91.1	1016.2	*	1	1330	163	321.	106.5	1017.3	*	1	2150	263	4.	15.2	1007.6
1	0515	64	312.	98.8	1016.7	*	1	1335	164	319.	104.4	1017.2	*	1	2155	264	4.	15.2	1007.6
1	0520	65	321.	106.8	1017.4	*	1	1340	165	316.	102.3	1017.0	*	1	2200	265	4.	15.2	1007.6
1	0525	66	331.	115.0	1018.0	*	1	1345	166	314.	100.3	1016.9	*	1	2205	266	3.	15.2	1007.6
1	0530	67	341.	123.4	1018.6	*	1	1350	167	311.	98.2	1016.7	*	1	2210	267	3.	15.2	1007.6
1	0535	68	351.	132.0	1019.3	*	1	1355	168	308.	96.2	1016.6	*	1	2215	268	3.	15.1	1007.5
1	0540	69	[illegible]	140.7	1019.9	*	1	1400	169	304.	94.2	1016.4	*	1	2220	269	3.	15.1	1007.5

1	0550	71	378.	158.0	1021.1	*	1	1410	171	300.	90.2	1016.1	*	1	2230	271	3.	15.1	1007.5
1	0555	72	386.	166.4	1021.7	*	1	1415	172	298.	88.2	1015.9	*	1	2235	272	3.	15.1	1007.5
1	0600	73	393.	174.5	1022.2	*	1	1420	173	295.	86.3	1015.8	*	1	2240	273	3.	15.1	1007.5
1	0605	74	400.	182.0	1022.7	*	1	1425	174	292.	84.3	1015.7	*	1	2245	274	3.	15.1	1007.5
1	0610	75	406.	189.1	1023.2	*	1	1430	175	290.	82.4	1015.5	*	1	2250	275	3.	15.1	1007.5
1	0615	76	411.	195.6	1023.6	*	1	1435	176	287.	80.5	1015.4	*	1	2255	276	2.	15.1	1007.5
1	0620	77	417.	201.6	1024.0	*	1	1440	177	285.	78.6	1015.2	*	1	2300	277	2.	15.1	1007.5
1	0625	78	421.	207.2	1024.4	*	1	1445	178	282.	76.7	1015.1	*	1	2305	278	2.	15.1	1007.5
1	0630	79	426.	212.2	1024.7	*	1	1450	179	279.	74.9	1014.9	*	1	2310	279	2.	15.1	1007.5
1	0635	80	429.	216.8	1025.0	*	1	1455	180	275.	73.0	1014.7	*	1	2315	280	2.	15.1	1007.5
1	0640	81	432.	221.0	1025.3	*	1	1500	181	272.	71.2	1014.5	*	1	2320	281	2.	15.1	1007.5
1	0645	82	435.	224.7	1025.5	*	1	1505	182	268.	69.4	1014.3	*	1	2325	282	2.	15.1	1007.5
1	0650	83	437.	228.0	1025.7	*	1	1510	183	265.	67.6	1014.2	*	1	2330	283	2.	15.1	1007.5
1	0655	84	439.	230.9	1025.9	*	1	1515	184	261.	65.9	1014.0	*	1	2335	284	2.	15.1	1007.5
1	0700	85	441.	233.5	1026.0	*	1	1520	185	258.	64.2	1013.8	*	1	2340	285	2.	15.1	1007.5
1	0705	86	442.	235.7	1026.2	*	1	1525	186	254.	62.5	1013.6	*	1	2345	286	2.	15.0	1007.5
1	0710	87	444.	237.6	1026.3	*	1	1530	187	250.	60.8	1013.5	*	1	2350	287	2.	15.0	1007.5
1	0715	88	445.	239.2	1026.4	*	1	1535	188	246.	59.1	1013.3	*	1	2355	288	2.	15.0	1007.5
1	0720	89	446.	240.5	1026.4	*	1	1540	189	243.	57.5	1013.1	*	2	0000	289	2.	15.0	1007.5
1	0725	90	446.	241.6	1026.5	*	1	1545	190	239.	55.9	1013.0	*	2	0005	290	2.	15.0	1007.5
1	0730	91	447.	242.4	1026.6	*	1	1550	191	235.	54.3	1012.8	*	2	0010	291	2.	15.0	1007.5
1	0735	92	447.	242.9	1026.6	*	1	1555	192	232.	52.8	1012.6	*	2	0015	292	2.	15.0	1007.5
1	0740	93	448.	243.3	1026.6	*	1	1600	193	228.	51.3	1012.5	*	2	0020	293	2.	15.0	1007.5
1	0745	94	448.	243.4	1026.6	*	1	1605	194	225.	49.7	1012.3	*	2	0025	294	2.	15.0	1007.5
1	0750	95	448.	243.3	1026.6	*	1	1610	195	222.	48.3	1012.2	*	2	0030	295	2.	15.0	1007.5
1	0755	96	447.	243.0	1026.6	*	1	1615	196	218.	46.8	1012.0	*	2	0035	296	2.	15.0	1007.5
1	0800	97	447.	242.6	1026.6	*	1	1620	197	214.	45.3	1011.9	*	2	0040	297	2.	15.0	1007.5
1	0805	98	447.	242.0	1026.5	*	1	1625	198	211.	43.9	1011.7	*	2	0045	298	2.	15.0	1007.5
1	0810	99	446.	241.2	1026.5	*	1	1630	199	207.	42.5	1011.6	*	2	0050	299	1.	15.0	1007.5
1	0815	100	446.	240.3	1026.4	*	1	1635	200	203.	41.2	1011.4	*	2	0055	300	1.	15.0	1007.5
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	24.92-HR
448.	7.75	(CFS)	421.	197.	189.	189.
		(INCHES)	.204	.381	.381	.381
		(AC-FT)	209.	390.	390.	390.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)	6-HR	24-HR	72-HR	24.92-HR
243.	7.75	209.	94.	82.	82.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
(FEET)	(HR)	6-HR	24-HR	72-HR	24.92-HR
1026.61	7.75	1024.44	1014.17	1013.92	1013.92

CUMULATIVE AREA = 19.17 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

RATIOS APPLIED TO PRECIPITATION

OPERATION	STATION	AREA	PLAN		RATIO 1 .79
HYDROGRAPH AT	A1	2.73	1	FLOW	190.
				TIME	5.33
ROUTED TO	RA	2.73	1	FLOW	189.
				TIME	5.42
HYDROGRAPH AT	B1	1.08	1	FLOW	160.
				TIME	3.92
ROUTED TO	RB1	1.08	1	FLOW	158.
				TIME	5.00
HYDROGRAPH AT	B2	.61	1	FLOW	85.
				TIME	3.83
ROUTED TO	RB2	.61	1	FLOW	85.
				TIME	4.75
HYDROGRAPH AT	B3	2.50	1	FLOW	[illegible]
				TIME	4.42
4 COMBINED AT	B	6.92	1	FLOW	[illegible]
				TIME	5.08
ROUTED TO	[illegible]	[illegible]	1	FLOW	597.
				TIME	5.25
[illegible]	C1	1.91	1	FLOW	154.
				TIME	5.33
HYDROGRAPH AT	C2	1.68	1	FLOW	121.
				TIME	5.42
3 COMBINED AT	C	10.51	1	FLOW	871.
				TIME	5.33
ROUTED TO	RC	10.51	1	FLOW	869.
				TIME	5.42
HYDROGRAPH AT	D1	.52	1	FLOW	60.
				TIME	3.83
ROUTED TO	RD1	.52	1	FLOW	59.
				TIME	4.17
HYDROGRAPH AT	D2	.30	1	FLOW	38.
				TIME	3.75
HYDROGRAPH AT	D3	.75	1	FLOW	135.
				TIME	3.83
4 COMBINED AT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ROUTED TO	RD	12.09	1	FLOW	1017.
				TIME	5.33
HYDROGRAPH AT	E1	.50	1	FLOW	109.
				TIME	3.83
2 COMBINED AT	E	12.58	1	FLOW	1076.
				TIME	5.25
ROUTED TO	RE	12.58	1	FLOW	1073.
				TIME	5.33
HYDROGRAPH AT	F1	1.08	1	FLOW	133.
				TIME	4.00
2 COMBINED AT	F	13.66	1	FLOW	1175.
				TIME	5.33
ROUTED TO	RF	13.66	1	FLOW	1173.
				TIME	5.42
HYDROGRAPH AT	G1	1.36	1	FLOW	176.
				TIME	4.08
HYDROGRAPH AT	G2	1.02	1	FLOW	233.
				TIME	3.83
3 COMBINED AT	G	16.04	1	FLOW	1416.
				TIME	5.33
ROUTED TO	RG	16.04	1	FLOW	1413.
				TIME	5.42
HYDROGRAPH AT	H1	.56	1	FLOW	88.
				TIME	3.83
HYDROGRAPH AT	H2	.37	1	FLOW	133.
				TIME	3.67
3 COMBINED AT	H	16.98	1	FLOW	1470.
				TIME	5.42
ROUTED TO	RH	16.98	1	FLOW	1464.
				TIME	5.50
HYDROGRAPH AT	I1	1.35	1	FLOW	308.
				TIME	3.92
2 COMBINED AT	I	18.33	1	FLOW	1614.
				TIME	5.42
ROUTED TO	RI	18.33	1	FLOW	1611.
				TIME	5.75
HYDROGRAPH AT	J1	.85	1	FLOW	61.
				TIME	5.08
2 COMBINED AT	J	19.17	1	FLOW	1628.
				TIME	5.67
ROUTED TO	DET B	19.17	1	FLOW	448.
				TIME	7.75

** PEAK STAGES IN FEET **

TIME 7.75

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR PLAN = 1 RATIO= .79									
RA	MANE	3.10	189.41	327.66	.25	5.00	189.27	325.00	.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3656E+02 EXCESS= .0000E+00 OUTFLOW= .3657E+02 BASIN STORAGE= .1774E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .79									
RB1	MANE	5.00	158.67	298.34	.47	5.00	158.44	300.00	.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2317E+02 EXCESS= .0000E+00 OUTFLOW= .2730E+02 BASIN STORAGE= .7394E-01 PERCENT ERROR= -18.1

FOR PLAN = 1 RATIO= .79									
RB2	MANE	5.00	85.18	282.48	.41	5.00	84.83	285.00	.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1197E+02 EXCESS= .0000E+00 OUTFLOW= .1335E+02 BASIN STORAGE= .1375E-01 PERCENT ERROR= -11.6

FOR PLAN = 1 RATIO= .79									
RB	MANE	4.49	596.70	316.59	.33	5.00	596.55	315.00	.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1220E+03 EXCESS= .0000E+00 OUTFLOW= .1220E+03 BASIN STORAGE= .4394E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .79									
RC	MANE	2.36	870.25	323.73	.32	5.00	869.39	325.00	.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1780E+03 EXCESS= .0000E+00 OUTFLOW= .1779E+03 BASIN STORAGE= .4701E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .79									
RD1	MANE	4.88	59.70	252.91	.31	5.00	59.29	250.00	.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8546E+01 EXCESS= .0000E+00 OUTFLOW= .8589E+01 BASIN STORAGE= .9580E-04 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .79									
RD	MANE	1.31	1018.87	318.06	.33	5.00	1017.03	320.00	.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2107E+03 EXCESS= .0000E+00 OUTFLOW= .2106E+03 BASIN STORAGE= .2431E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .79									
RE	MANE	2.36	1074.03	321.40	.34	5.00	1072.99	320.00	.34

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FOR PLAN = 1  RATIO=  .79
     RF  MANE        2.52   1173.85    324.81       .34      5.00   1173.38    325.00         .34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2467E+03 EXCESS= .0000E+00 OUTFLOW= .2466E+03 BASIN STORAGE= .4209E-01 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .79
     RG  MANE        1.75   1414.85    324.07       .36      5.00   1413.27    325.00         .36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3091E+03 EXCESS= .0000E+00 OUTFLOW= .3090E+03 BASIN STORAGE= .7212E-01 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .79
     RH  MANE        4.44   1467.66    332.14       .37      5.00   1463.71    330.00         .37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3352E+03 EXCESS= .0000E+00 OUTFLOW= .3350E+03 BASIN STORAGE= .1682E+00 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .79
     RI  MANE        4.87   1612.07    341.18       .39      5.00   1611.10    345.00         .39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3826E+03 EXCESS= .0000E+00 OUTFLOW= .3821E+03 BASIN STORAGE= .4150E+00 PERCENT ERROR=    .0

*** NORMAL END OF HEC-1 ***
```

50-yr

```
****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0              *                    *         609 SECOND STREET            *
*                                      *                    *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE  07/10/1996  TIME  14:14:04 *                   *          (916) 756-1104              *
*                                      *                    *                                      *
****************************************                    ****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X         XXXXX  X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1          ID  HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
  2          ID  50 YEAR FREQUENCY  6-HOUR STORM per CCRFCD HC&DDM
  3          ID  SDN 5, DARF .79
  4          ID  Originally created by Boyle Engineering for CCRFCD
  5          ID    as Hiko Springs/Unnamed Wash Facilities Plan.
  6          ID  TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
  7          ID  Edited by Black & Veatch for design of Hiko Springs Detention Basin.
  8          IT       5       0       0     300
  9          IN       5       0       0
 10          IO       5       0       0
 11          JR    PREC     .79

 12          KK      A1
 13          KM  RUNOFF FROM SUBBASIN A1
 14          BA    2.73
 15          PB   3.892
 16          PC    .000    .020    .059    .080    .110    .144    .150    .160    .168    .171
 17          PC    .180    .182    .187    .190    .197    .202    .210    .220    .230    .241
 18          PC    .250    .259    .265    .280    .290    .300    .305    .309    .310    .317
 19          PC    .321    .327    .333    .346    .361    .381    .408    .430    .477    .514
 20          PC    .561    .630    .710    .720    .731    .752    .779    .790    .795    .804
 21          PC    .810    .820    .826    .840    .859    .889    .910    .938    .966    .970
 22          PC    .974    .979    .981    .983    .985    .989    .990    .992    .993    .996
 23          PC    .997    .999    1.00
 24          LS       0      78
 25          UD     .83

 26          KK      RA
 27          KM  ROUTE A1 RUNOFF
```

```
29          KK     B1
30          KM   RUNOFF FROM SUBBASIN B1
31          BA    1.08
32          LS      0      83
33          UD     .47

34          KK     RB1
35          KM   ROUTE B1 RUNOFF
36          RK   15500  .0503   .050         TRAP    350     25

37          KK     B2
38          KM   RUNOFF FROM SUBBASIN B2
39          BA     .61
40          LS     0       82
41          UD     .43

42          KK     RB2
43          KM   ROUTE B2 RUNOFF
44          RK   11500  .0435   .050         TRAP    200     25
```



```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


45          KK     B3
46          KM   RUNOFF FROM SUBBASIN B3
47          BA    2.5
48          LS     0       81
49          UD     .88

50          KK      B
51          KM   COMBINE RA, B1, B2, & B3
52          HC      4

53          KK     RB
54          KM   ROUTE B
55          RK    4500  .0389   .050         TRAP    300     25

56          KK     C1
57          KM   RUNOFF FROM SUBBASIN C1
58          BA   1.91
59          LS      0      80
60          UD     .83

61          KK     C2
62          KM   RUNOFF FROM SUBBASIN C2
63          BA   1.68
64          LS     0       79
65          UD     .94

66          KK      C
67          KM   COMBINE RB, C1, & C2
```

```
KK      RC
KM   ROUTE C
RK    2900   .0414    .050           TRAP     300       5

KK      D1
KM   RUNOFF FROM SUBBASIN D1
BA    .524
LS      0        80
UD     .42

KK     RD1
KM   ROUTE D1
RK    5400    .061    .050           TRAP     100      50

KK      D2
KM   RUNOFF FROM SUBBASIN D2
BA    .301
LS      0        80
UD     .34
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

KK      D3
KM   RUNOFF FROM SUBBASIN D3
BA    .753
LS      0        85
UD     .46

KK       D
KM   COMBINE RC, RD1, D2, & D3
HC       4

KK      RD
KM   ROUTE D
RK    1600   .0469    .050           TRAP     300      15

KK      E1
KM   RUNOFF FROM E1
BA    .495
LS      0        87
UD     .43

KK       E
KM   COMBINE RD & E1
HC       2

KK      RE
KM   ROUTE E
RK    2560   .0364    .050           TRAP     300      50
```

```
108          KM   RUNOFF FROM SUBBASIN F1
109          BA    1.08
110          LS     0       82
111          UD     .56

112          KK      F
113          KM   COMBINE RE & F1
114          HC      2

115          KK     RF
116          KM   ROUTE F
117          RK    3000   .0467    .050          TRAP     300      50

118          KK     G1
119          KM   RUNOFF FROM SUBBASIN G1
120          BA    1.36
121          LS     0       83
122          UD     .62

123          KK     G2
124          KM   RUNOFF FROM SUBBASIN G2
125          BA    1.02
126          LS     0       88
127          UD     .47
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


128          KK      G
129          KM   COMBINE RF, G1, & G2
130          HC      3

131          KK     RG
132          KM   ROUTE G
133          RK    2600   .0346    .050          TRAP     300       5

134          KK     H1
135          KM   RUNOFF FROM SUBBASIN H1
136          BA    .560
137          LS     0       83
138          UD     .42

139          KK     H2
140          KM   RUNOFF FROM SUBBASIN H2
141          BA    .373
142          LS     0       90
143          UD     .24

144          KK      H
145          KM   COMBINE RG, H1 & H2
146          HC      3

147          KK     RH
148          KM   ROUTE H
149          RK    9400   .0585    .070          TRAP      75       5
```

```
          KM   RUNOFF FROM SUBBASIN I1
          BA    1.35
          LS      0      89
          UD     .55

          KK      I
          KM   COMBINE RH & I1
          HC      2

          KK     RI
          KM   ROUTE I
          RK   10000   .0410    .050          TRAP     400      50

          KK     J1
          KM   RUNOFF FROM SUBBASIN J1
          BA    .847
          LS      0      75
          UD     .41

          KK      J
          KM   COMBINE RI & J1
          HC      2
          KO      1
```



```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          KK   DET B
          KM   DETENTION BASIN SITE
          KM     Spillway elevation of 1077.5 ft.: 62" dia. low-level outlet pipe;
          KM     storage capacity of 1636 ac ft.
          KO      1
          RS      1    STOR      -1
          SV      0    2.68   27.13   75.75  141.59  216.52  299.74  393.04  497.42  612.84
          SV 738.58  873.92 1018.86 1174.58 1343.32 1531.69 1746.05 1988.34
          SE   1002    1005    1010    1015    1020    1025    1030    1035    1040    1045
          SE   1050    1055    1060    1065    1070    1075    1080    1085
          SL 1007.5   20.97     .61      .5
          SS 1077.5     550   2.939     1.5
          ZZ
```

```
*****************************************                    ***************************************
*                                       *                    *                                     *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                    *   U.S. ARMY CORPS OF ENGINEERS      *
*           SEPTEMBER 1990              *                    *   HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.0                *                    *        609 SECOND STREET            *
*                                       *                    *      DAVIS, CALIFORNIA 95616        *
* RUN DATE  07/10/1996  TIME  14:14:04  *                    *         (916) 756-1104              *
*                                       *                    *                                     *
*****************************************                    ***************************************
```

```
                    HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
                    50 YEAR FREQUENCY  6-HOUR STORM per CCRFCD HC&DDM
                    SDN 5, DARF .79
                    Originally created by Boyle Engineering for CCRFCD
                      as Hiko Springs/Unnamed Wash Facilities Plan.
                    TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
                    Edited by Black & Veatch for design of Hiko Springs Detention Basin.

 10 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                   NMIN           5  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      2   0  ENDING DATE
```

```
              ICENT          19  CENTURY MARK

           COMPUTATION INTERVAL     .08 HOURS
                TOTAL TIME BASE   24.92 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

 JP          MULTI-PLAN OPTION
                  NPLAN          1  NUMBER OF PLANS

 JR          MULTI-RATIO OPTION
                RATIOS OF PRECIPITATION
                 .79


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


         **************
         *            *
166 KK   *          J *
         *            *
         **************

169 KO       OUTPUT CONTROL VARIABLES
                  IPRNT          1  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL          0. HYDROGRAPH PLOT SCALE

168 HC       HYDROGRAPH COMBINATION
                  ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                ***

*********************************************************************************************************************************

                                        HYDROGRAPH AT STATION        J
                                            SUM OF  2 HYDROGRAPHS
                                           PLAN 1,   RATIO =   .79

*********************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	3468.	*	1		1230	151	28.	*	1		1845	226	4.
1		0005	2	0.	*	1		0620	77	3267.	*	1		1235	152	27.	*	1		1850	227	4.
1		0010	3	0.	*	1		0625	78	3069.	*	1		1240	153	26.	*	1		1855	228	4.
1		0015	4	0.	*	1		0630	79	2871.	*	1		1245	154	25.	*	1		1900	229	4.
1		0020	5	0.	*	1		0635	80	2671.	*	1		1250	155	24.	*	1		1905	230	4.
1		0025	6	0.	*	1		0640	81	2472.	*	1		1255	156	23.	*	1		1910	231	3.
1		0030	7	0.	*	1		0645	82	2276.	*	1		1300	157	22.	*	1		1915	232	3.
1		0035	8	0.	*	1		0650	83	2091.	*	1		1305	158	21.	*	1		1920	233	3.
1		0040	9	0.	*	1		0655	84	1915.	*	1		1310	159	21.	*	1		1925	234	3.
1		0045	10	0.	*	1		0700	85	1748.	*	1		1315	160	20.	*	1		1930	235	3.
1		0050	11	0.	*	1		0705	86	1603.	*	1		1320	161	19.	*	1		1935	236	3.
1		0055	12	0.	*	1		0710	87	1466.	*	1		1325	162	19.	*	1		1940	237	3.
1		0100	13	0.	*	1		0715	88	1340.	*	1		1330	163	18.	*	1		1945	238	3.

1	0110	15	0.	*	1	0725	90	1126.	*	1	1340	165	17.	*	1	1955	240	3.
1	0115	16	1.	*	1	0730	91	1036.	*	1	1345	166	16.	*	1	2000	241	3.
1	0120	17	2.	*	1	0735	92	951.	*	1	1350	167	16.	*	1	2005	242	3.
1	0125	18	2.	*	1	0740	93	875.	*	1	1355	168	15.	*	1	2010	243	3.
1	0130	19	4.	*	1	0745	94	805.	*	1	1400	169	15.	*	1	2015	244	3.
1	0135	20	10.	*	1	0750	95	742.	*	1	1405	170	14.	*	1	2020	245	3.
1	0140	21	15.	*	1	0755	96	684.	*	1	1410	171	14.	*	1	2025	246	3.
1	0145	22	21.	*	1	0800	97	632.	*	1	1415	172	14.	*	1	2030	247	3.
1	0150	23	32.	*	1	0805	98	584.	*	1	1420	173	13.	*	1	2035	248	3.
1	0155	24	43.	*	1	0810	99	541.	*	1	1425	174	13.	*	1	2040	249	3.
1	0200	25	56.	*	1	0815	100	499.	*	1	1430	175	12.	*	1	2045	250	2.
1	0205	26	76.	*	1	0820	101	463.	*	1	1435	176	12.	*	1	2050	251	2.
1	0210	27	97.	*	1	0825	102	430.	*	1	1440	177	12.	*	1	2055	252	2.
1	0215	28	121.	*	1	0830	103	397.	*	1	1445	178	11.	*	1	2100	253	2.
1	0220	29	154.	*	1	0835	104	372.	*	1	1450	179	11.	*	1	2105	254	2.
1	0225	30	186.	*	1	0840	105	350.	*	1	1455	180	11.	*	1	2110	255	2.
1	0230	31	229.	*	1	0845	106	327.	*	1	1500	181	10.	*	1	2115	256	2.
1	0235	32	277.	*	1	0850	107	303.	*	1	1505	182	10.	*	1	2120	257	2.
1	0240	33	325.	*	1	0855	108	279.	*	1	1510	183	10.	*	1	2125	258	2.
1	0245	34	374.	*	1	0900	109	258.	*	1	1515	184	10.	*	1	2130	259	2.
1	0250	35	424.	*	1	0905	110	241.	*	1	1520	185	9.	*	1	2135	260	2.
1	0255	36	463.	*	1	0910	111	224.	*	1	1525	186	9.	*	1	2140	261	2.
1	0300	37	505.	*	1	0915	112	210.	*	1	1530	187	9.	*	1	2145	262	2.
1	0305	38	538.	*	1	0920	113	197.	*	1	1535	188	9.	*	1	2150	263	2.
1	0310	39	574.	*	1	0925	114	184.	*	1	1540	189	8.	*	1	2155	264	2.
1	0315	40	626.	*	1	0930	115	173.	*	1	1545	190	8.	*	1	2200	265	2.
1	0320	41	688.	*	1	0935	116	163.	*	1	1550	191	8.	*	1	2205	266	2.
1	0325	42	801.	*	1	0940	117	153.	*	1	1555	192	8.	*	1	2210	267	2.
1	0330	43	959.	*	1	0945	118	143.	*	1	1600	193	8.	*	1	2215	268	2.
1	0335	44	1178.	*	1	0950	119	135.	*	1	1605	194	7.	*	1	2220	269	2.
1	0340	45	1530.	*	1	0955	120	127.	*	1	1610	195	7.	*	1	2225	270	2.
1	0345	46	1990.	*	1	1000	121	120.	*	1	1615	196	7.	*	1	2230	271	2.
1	0350	47	2582.	*	1	1005	122	113.	*	1	1620	197	7.	*	1	2235	272	2.
1	0355	48	3313.	*	1	1010	123	107.	*	1	1625	198	7.	*	1	2240	273	2.
1	0400	49	4095.	*	1	1015	124	101.	*	1	1630	199	7.	*	1	2245	274	2.
1	0405	50	4810.	*	1	1020	125	95.	*	1	1635	200	6.	*	1	2250	275	2.
1	0410	51	5396.	*	1	1025	126	90.	*	1	1640	201	6.	*	1	2255	276	2.
1	0415	52	5829.	*	1	1030	127	86.	*	1	1645	202	6.	*	1	2300	277	2.
1	0420	53	6071.	*	1	1035	128	81.	*	1	1650	203	6.	*	1	2305	278	2.
1	0425	54	6167.	*	1	1040	129	77.	*	1	1655	204	6.	*	1	2310	279	2.
1	0430	55	6169.	*	1	1045	130	73.	*	1	1700	205	6.	*	1	2315	280	2.
1	0435	56	6136.	*	1	1050	131	69.	*	1	1705	206	6.	*	1	2320	281	2.
1	0440	57	6099.	*	1	1055	132	66.	*	1	1710	207	6.	*	1	2325	282	2.
1	0445	58	6084.	*	1	1100	133	62.	*	1	1715	208	5.	*	1	2330	283	2.
1	0450	59	6110.	*	1	1105	134	59.	*	1	1720	209	5.	*	1	2335	284	1.
1	0455	60	6162.	*	1	1110	135	57.	*	1	1725	210	5.	*	1	2340	285	1.
1	0500	61	6213.	*	1	1115	136	54.	*	1	1730	211	5.	*	1	2345	286	1.
1	0505	62	6236.	*	1	1120	137	52.	*	1	1735	212	5.	*	1	2350	287	1.
1	0510	63	6219.	*	1	1125	138	49.	*	1	1740	213	5.	*	1	2355	288	1.
1	0515	64	6161.	*	1	1130	139	47.	*	1	1745	214	5.	*	2	0000	289	1.
1	0520	65	6060.	*	1	1135	140	45.	*	1	1750	215	5.	*	2	0005	290	1.
1	0525	66	5910.	*	1	1140	141	43.	*	1	1755	216	5.	*	2	0010	291	1.
1	0530	67	5712.	*	1	1145	142	41.	*	1	1800	217	5.	*	2	0015	292	1.
1	0535	68	5472.	*	1	1150	143	39.	*	1	1805	218	4.	*	2	0020	293	1.
1	0540	69	5213.	*	1	1155	144	37.	*	1	1810	219	4.	*	2	0025	294	1.
1	0545	70	4948.	*	1	1200	145	36.	*	1	1815	220	4.	*	2	0030	295	1.
1	0550	71	4662.	*	1	1205	146	35.	*	1	1820	221	4.	*	2	0035	296	1.
1	0555	72	4392.	*	1	1210	147	33.	*	1	1825	222	4.	*	2	0040	297	1.
1	0600	73	4137.	*	1	1215	148	32.	*	1	1830	223	4.	*	2	0045	298	1.
1	0605	74	3900.	*	1	1220	149	30.	*	1	1835	224	4.	*	2	0050	299	1.
1	0610	75	3678.	*	1	1225	150	29.	*	1	1840	225	4.	*	2	0055	300	1.
				*					*					*				

****

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

6236.	5.08	(CFS)	2869.	744.	716.	716.
		(INCHES)	1.391	1.442	1.442	1.442
		(AC-FT)	1422.	1475.	1475.	1475.

CUMULATIVE AREA = 19.17 SQ MI

*** ***

```
        **************
        *            *
170 KK  *    DET B   *
        *            *
        **************
```

174 KO OUTPUT CONTROL VARIABLES

```
     IPRNT        1  PRINT CONTROL
     IPLOT        0  PLOT CONTROL
     QSCAL       0.  HYDROGRAPH PLOT SCALE
```

HYDROGRAPH ROUTING DATA

175 RS STORAGE ROUTING

```
     NSTPS        1  NUMBER OF SUBREACHES
      ITYP     STOR  TYPE OF INITIAL CONDITION
    RSVRIC    -1.00  INITIAL CONDITION
         X      .00  WORKING R AND D COEFFICIENT
```

176 SV	STORAGE	.0	2.7	27.1	75.8	141.6	216.5	299.7	393.0	497.4	612.8
		738.6	873.9	1018.9	1174.6	1343.3	1531.7	1746.1	1988.3		
178 SE	ELEVATION	1002.00	1005.00	1010.00	1015.00	1020.00	1025.00	1030.00	1035.00	1040.00	1045.00
		1050.00	1055.00	1060.00	1065.00	1070.00	1075.00	1080.00	1085.00		

180 SL LOW-LEVEL OUTLET

```
     ELEVL  1007.50  ELEVATION AT CENTER OF OUTLET
     CAREA    20.97  CROSS-SECTIONAL AREA
      COQL      .61  COEFFICIENT
      EXPL      .50  EXPONENT OF HEAD
```

181 SS SPILLWAY

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      CREL  1077.50  SPILLWAY CREST ELEVATION
     SPWID   550.00  SPILLWAY WIDTH
      COQW     2.94  WEIR COEFFICIENT
      EXPW     1.50  EXPONENT OF HEAD
```

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COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	169.02	190.92	219.35	257.72	312.36	396.41	542.34	858.32
ELEVATION	1002.00	1007.50	1010.21	1010.96	1012.07	1013.81	1016.77	1022.43	1035.45	1077.50
OUTFLOW	892.86	1128.77	1764.60	2999.50	5031.27	8059.63	12281.89	17898.24	25106.23	34104.37
ELEVATION	1077.58	1077.80	1078.18	1078.70	1079.38	1080.20	1081.18	1082.30	1083.58	1085.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	2.68	14.90	27.13	29.21	36.50	47.27	64.19	75.75	99.07
OUTFLOW	.00	.00	.00	162.21	169.02	190.92	219.35	257.72	280.95	312.36
ELEVATION	1002.00	1005.00	1007.50	1010.00	1010.21	1010.96	1012.07	1013.81	1015.00	1016.77

STORAGE	141.59	178.02	216.52	299.74	393.04	402.38	497.42	612.84	738.58	873.92
OUTFLOW	362.71	396.41	429.16	486.62	537.98	542.34	584.85	628.23	668.80	707.05
ELEVATION	1020.00	1022.43	1025.00	1030.00	1035.00	1035.45	1040.00	1045.00	1050.00	1055.00
STORAGE	1018.86	1174.58	1343.32	1531.69	1638.87	1642.14	1651.83	1667.93	1690.46	1719.40
OUTFLOW	743.33	777.92	811.04	842.86	858.32	892.86	1128.77	1764.60	2999.50	5031.27
ELEVATION	1060.00	1065.00	1070.00	1075.00	1077.50	1077.58	1077.80	1078.18	1078.70	1079.38
STORAGE	1746.05	1755.90	1803.13	1857.61	1919.35	1988.34				
OUTFLOW	7263.10	8059.63	12281.89	17898.24	25106.23	34104.37				
ELEVATION	1080.00	1080.20	1081.18	1082.30	1083.58	1085.00				

HYDROGRAPH AT STATION DET B
PLAN 1. RATIO = .79

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	14.9	1007.5	*	1		0820	101	776.	1165.0	1064.7	*	1		1640	201	662.	717.3	1049.2
1		0005	2	0.	14.9	1007.5	*	1		0825	102	775.	1162.7	1064.6	*	1		1645	202	660.	712.8	1049.0
1		0010	3	0.	14.9	1007.5	*	1		0830	103	775.	1160.2	1064.5	*	1		1650	203	659.	708.3	1048.8
1		0015	4	0.	14.9	1007.5	*	1		0835	104	774.	1157.6	1064.5	*	1		1655	204	658.	703.8	1048.6
1		0020	5	0.	14.9	1007.5	*	1		0840	105	774.	1154.7	1064.4	*	1		1700	205	656.	699.3	1048.4
1		0025	6	0.	14.9	1007.5	*	1		0845	106	773.	1151.7	1064.3	*	1		1705	206	655.	694.9	1048.3
1		0030	7	0.	14.9	1007.5	*	1		0850	107	772.	1148.6	1064.2	*	1		1710	207	653.	690.4	1048.1
1		0035	8	0.	14.9	1007.5	*	1		0855	108	771.	1145.3	1064.1	*	1		1715	208	652.	686.0	1047.9
1		0040	9	0.	14.9	1007.5	*	1		0900	109	771.	1141.8	1063.9	*	1		1720	209	650.	681.5	1047.7
1		0045	10	0.	14.9	1007.5	*	1		0905	110	770.	1138.2	1063.8	*	1		1725	210	649.	677.1	1047.6
1		0050	11	0.	14.9	1007.5	*	1		0910	111	769.	1134.5	1063.7	*	1		1730	211	648.	672.6	1047.4
1		0055	12	0.	14.9	1007.5	*	1		0915	112	768.	1130.7	1063.6	*	1		1735	212	646.	668.2	1047.2
1		0100	13	0.	14.9	1007.5	*	1		0920	113	767.	1126.8	1063.5	*	1		1740	213	645.	663.8	1047.0
1		0105	14	0.	14.9	1007.5	*	1		0925	114	766.	1122.9	1063.3	*	1		1745	214	643.	659.4	1046.9
1		0110	15	0.	14.9	1007.5	*	1		0930	115	766.	1118.8	1063.2	*	1		1750	215	642.	655.0	1046.7
1		0115	16	0.	14.9	1007.5	*	1		0935	116	765.	1114.7	1063.1	*	1		1755	216	640.	650.6	1046.5
1		0120	17	0.	14.9	1007.5	*	1		0940	117	764.	1110.5	1062.9	*	1		1800	217	639.	646.3	1046.3
1		0125	18	0.	14.9	1007.5	*	1		0945	118	763.	1106.3	1062.8	*	1		1805	218	638.	641.9	1046.2
1		0130	19	1.	14.9	1007.5	*	1		0950	119	762.	1102.0	1062.7	*	1		1810	219	636.	637.5	1046.0
1		0135	20	1.	15.0	1007.5	*	1		0955	120	761.	1097.7	1062.5	*	1		1815	220	635.	633.2	1045.8
1		0140	21	2.	15.1	1007.5	*	1		1000	121	760.	1093.3	1062.4	*	1		1820	221	633.	628.8	1045.6
1		0145	22	4.	15.2	1007.6	*	1		1005	122	759.	1088.8	1062.2	*	1		1825	222	632.	624.5	1045.5
1		0150	23	6.	15.3	1007.6	*	1		1010	123	758.	1084.4	1062.1	*	1		1830	223	631.	620.2	1045.3
1		0155	24	8.	15.5	1007.6	*	1		1015	124	757.	1079.9	1062.0	*	1		1835	224	629.	615.9	1045.1
1		0200	25	12.	15.8	1007.7	*	1		1020	125	756.	1075.3	1061.8	*	1		1840	225	628.	611.6	1044.9
1		0205	26	17.	16.2	1007.8	*	1		1025	126	755.	1070.8	1061.7	*	1		1845	226	626.	607.3	1044.8
1		0210	27	23.	16.6	1007.8	*	1		1030	127	754.	1066.2	1061.5	*	1		1850	227	625.	603.0	1044.6
1		0215	28	30.	17.2	1008.0	*	1		1035	128	753.	1061.6	1061.4	*	1		1855	228	623.	598.7	1044.4
1		0220	29	40.	17.9	1008.1	*	1		1040	129	752.	1056.9	1061.2	*	1		1900	229	621.	594.5	1044.2
1		0225	30	51.	18.8	1008.3	*	1		1045	130	751.	1052.3	1061.1	*	1		1905	230	620.	590.2	1044.0
1		0230	31	65.	19.8	1008.5	*	1		1050	131	750.	1047.6	1060.9	*	1		1910	231	618.	586.0	1043.8
1		0235	32	81.	21.0	1008.8	*	1		1055	132	749.	1042.9	1060.8	*	1		1915	232	617.	581.8	1043.7
1		0240	33	100.	22.5	1009.0	*	1		1100	133	748.	1038.2	1060.6	*	1		1920	233	615.	577.6	1043.5
1		0245	34	122.	24.1	1009.4	*	1		1105	134	747.	1033.5	1060.5	*	1		1925	234	613.	573.3	1043.3
1		0250	35	146.	25.9	1009.8	*	1		1110	135	746.	1028.7	1060.3	*	1		1930	235	612.	569.1	1043.1
1		0255	36	165.	27.9	1010.1	*	1		1115	136	744.	1024.0	1060.2	*	1		1935	236	610.	565.0	1042.9
1		0300	37	172.	30.1	1010.3	*	1		1120	137	743.	1019.2	1060.0	*	1		1940	237	609.	560.8	1042.7
1		0305	38	179.	32.5	1010.5	*	1		1125	138	742.	1014.5	1059.8	*	1		1945	238	607.	556.6	1042.6
1		0310	39	187.	35.0	1010.8	*	1		1130	139	741.	1009.7	1059.7	*	1		1950	239	606.	552.5	1042.4
1		0315	40	195.	37.9	1011.1	*	1		1135	140	740.	1004.9	1059.5	*	1		1955	240	604.	548.3	1042.2
1		0320	41	203.	41.0	1011.4	*	1		1140	141	739.	1000.1	1059.4	*	1		2000	241	602.	544.2	1042.0
1		0325	42	213.	44.7	1011.8	*	1		1145	142	737.	995.3	1059.2	*	1		2005	242	601.	540.1	1041.8
1		0330	43	224.	49.3	1012.3	*	1		1150	143	736.	990.5	1059.0	*	1		2010	243	599.	535.9	1041.7
1		0335	44	237.	55.0	1012.9	*	1		1155	144	735.	985.7	1058.9	*	1		2015	244	598.	531.8	1041.5

1	0345	46	275.	73.0	1014.7	*	1	1205	146	[illegible]	976.1	1058.5	*	1	2025	246	[illegible]	[illegible]	[illegible]
1	0350	47	296.	86.7	1015.8	*	1	1210	147	731.	971.3	1058.4	*	1	2030	247	593.	519.6	1041.0
1	0355	48	319.	104.9	1017.2	*	1	1215	148	730.	966.5	1058.2	*	1	2035	248	592.	515.5	1040.8
1	0400	49	347.	128.1	1019.0	*	1	1220	149	729.	961.7	1058.0	*	1	2040	249	590.	511.5	1040.6
1	0405	50	376.	156.3	1021.0	*	1	1225	150	728.	956.8	1057.9	*	1	2045	250	589.	507.4	1040.4
1	0410	51	406.	188.8	1023.1	*	1	1230	151	727.	952.0	1057.7	*	1	2050	251	587.	503.4	1040.3
1	0415	52	435.	224.5	1025.5	*	1	1235	152	725.	947.2	1057.5	*	1	2055	252	586.	499.4	1040.1
1	0420	53	461.	262.4	1027.8	*	1	1240	153	724.	942.4	1057.4	*	1	2100	253	584.	495.4	1039.9
1	0425	54	487.	301.3	1030.1	*	1	1245	154	723.	937.6	1057.2	*	1	2105	254	582.	491.4	1039.7
1	0430	55	509.	340.4	1032.2	*	1	1250	155	722.	932.8	1057.0	*	1	2110	255	580.	487.4	1039.5
1	0435	56	530.	379.1	1034.3	*	1	1255	156	721.	928.0	1056.9	*	1	2115	256	579.	483.4	1039.3
1	0440	57	549.	417.6	1036.2	*	1	1300	157	719.	923.2	1056.7	*	1	2120	257	577.	479.4	1039.1
1	0445	58	566.	455.7	1038.0	*	1	1305	158	718.	918.4	1056.5	*	1	2125	258	575.	475.5	1038.9
1	0450	59	583.	493.7	1039.8	*	1	1310	159	717.	913.6	1056.4	*	1	2130	259	573.	471.6	1038.8
1	0455	60	598.	531.9	1041.5	*	1	1315	160	716.	908.8	1056.2	*	1	2135	260	572.	467.6	1038.6
1	0500	61	612.	570.3	1043.2	*	1	1320	161	715.	904.0	1056.0	*	1	2140	261	570.	463.7	1038.4
1	0505	62	627.	608.9	1044.8	*	1	1325	162	713.	899.2	1055.9	*	1	2145	262	568.	459.8	1038.2
1	0510	63	639.	647.5	1046.4	*	1	1330	163	712.	894.4	1055.7	*	1	2150	263	566.	455.9	1038.0
1	0515	64	652.	685.7	1047.9	*	1	1335	164	711.	889.7	1055.5	*	1	2155	264	565.	452.0	1037.8
1	0520	65	664.	723.2	1049.4	*	1	1340	165	710.	884.9	1055.4	*	1	2200	265	563.	448.2	1037.6
1	0525	66	675.	759.8	1050.8	*	1	1345	166	709.	880.1	1055.2	*	1	2205	266	561.	444.3	1037.5
1	0530	67	685.	795.2	1052.1	*	1	1350	167	707.	875.4	1055.0	*	1	2210	267	559.	440.5	1037.3
1	0535	68	694.	828.9	1053.3	*	1	1355	168	706.	870.6	1054.9	*	1	2215	268	558.	436.6	1037.1
1	0540	69	703.	860.9	1054.5	*	1	1400	169	705.	865.8	1054.7	*	1	2220	269	556.	432.8	1036.9
1	0545	70	711.	891.0	1055.6	*	1	1405	170	703.	861.1	1054.5	*	1	2225	270	554.	429.0	1036.7
1	0550	71	718.	919.1	1056.6	*	1	1410	171	702.	856.3	1054.4	*	1	2230	271	553.	425.2	1036.5
1	0555	72	725.	945.3	1057.5	*	1	1415	172	701.	851.6	1054.2	*	1	2235	272	551.	421.4	1036.4
1	0600	73	731.	969.7	1058.3	*	1	1420	173	699.	846.9	1054.0	*	1	2240	273	549.	417.6	1036.2
1	0605	74	737.	992.3	1059.1	*	1	1425	174	698.	842.2	1053.8	*	1	2245	274	547.	413.9	1036.0
1	0610	75	742.	1013.3	1059.8	*	1	1430	175	697.	837.4	1053.7	*	1	2250	275	546.	410.1	1035.8
1	0615	76	746.	1032.8	1060.4	*	1	1435	176	695.	832.7	1053.5	*	1	2255	276	544.	406.4	1035.6
1	0620	77	750.	1050.8	1061.0	*	1	1440	177	694.	828.0	1053.3	*	1	2300	277	542.	402.7	1035.5
1	0625	78	754.	1067.5	1061.6	*	1	1445	178	693.	823.3	1053.1	*	1	2305	278	541.	398.9	1035.3
1	0630	79	758.	1082.7	1062.1	*	1	1450	179	691.	818.6	1053.0	*	1	2310	279	539.	395.2	1035.1
1	0635	80	761.	1096.6	1062.5	*	1	1455	180	690.	814.0	1052.8	*	1	2315	280	537.	391.5	1034.9
1	0640	81	763.	1109.0	1062.9	*	1	1500	181	689.	809.3	1052.6	*	1	2320	281	535.	387.8	1034.7
1	0645	82	766.	1120.1	1063.3	*	1	1505	182	687.	804.6	1052.4	*	1	2325	282	533.	384.2	1034.5
1	0650	83	768.	1129.9	1063.6	*	1	1510	183	686.	800.0	1052.3	*	1	2330	283	531.	380.5	1034.3
1	0655	84	770.	1138.4	1063.8	*	1	1515	184	685.	795.3	1052.1	*	1	2335	284	529.	376.9	1034.1
1	0700	85	772.	1145.7	1064.1	*	1	1520	185	684.	790.7	1051.9	*	1	2340	285	527.	373.3	1033.9
1	0705	86	773.	1151.9	1064.3	*	1	1525	186	682.	786.0	1051.8	*	1	2345	286	525.	369.6	1033.7
1	0710	87	774.	1157.2	1064.4	*	1	1530	187	681.	781.4	1051.6	*	1	2350	287	523.	366.0	1033.6
1	0715	88	775.	1161.5	1064.6	*	1	1535	188	680.	776.8	1051.4	*	1	2355	288	521.	362.5	1033.4
1	0720	89	776.	1165.0	1064.7	*	1	1540	189	678.	772.1	1051.2	*	2	0000	289	519.	358.9	1033.2
1	0725	90	776.	1167.8	1064.8	*	1	1545	190	677.	767.5	1051.1	*	2	0005	290	517.	355.3	1033.0
1	0730	91	777.	1169.9	1064.8	*	1	1550	191	676.	762.9	1050.9	*	2	0010	291	515.	351.8	1032.8
1	0735	92	777.	1171.4	1064.9	*	1	1555	192	674.	758.3	1050.7	*	2	0015	292	513.	348.2	1032.6
1	0740	93	777.	1172.3	1064.9	*	1	1600	193	673.	753.7	1050.6	*	2	0020	293	511.	344.7	1032.4
1	0745	94	778.	1172.7	1064.9	*	1	1605	194	672.	749.2	1050.4	*	2	0025	294	509.	341.2	1032.2
1	0750	95	778.	1172.7	1064.9	*	1	1610	195	671.	744.6	1050.2	*	2	0030	295	508.	337.7	1032.0
1	0755	96	777.	1172.3	1064.9	*	1	1615	196	669.	740.0	1050.1	*	2	0035	296	506.	334.2	1031.8
1	0800	97	777.	1171.4	1064.9	*	1	1620	197	668.	735.5	1049.9	*	2	0040	297	504.	330.8	1031.7
1	0805	98	777.	1170.3	1064.9	*	1	1625	198	666.	730.9	1049.7	*	2	0045	298	502.	327.3	1031.5
1	0810	99	777.	1168.8	1064.8	*	1	1630	199	665.	726.4	1049.5	*	2	0050	299	500.	323.9	1031.3
1	0815	100	776.	1167.0	1064.8	*	1	1635	200	663.	721.9	1049.3	*	2	0055	300	498.	320.5	1031.1
						*							*						

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
778.	7.75	(CFS)	761.	590.	568.	568.
		(INCHES)	.369	1.144	1.144	1.144
		(AC-FT)	377.	1169.	1169.	1169.

PEAK STORAGE TIME MAXIMUM AVERAGE STORAGE

1173.	7.75	1099.	666.	642.	642.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
1064.94	7.75	1062.56	1044.69	1043.32	1043.32

CUMULATIVE AREA = 19.17 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .79
HYDROGRAPH AT	A1	2.73	1	FLOW	896.
				TIME	4.25
ROUTED TO	RA	2.73	1	FLOW	895.
				TIME	4.33
HYDROGRAPH AT	B1	1.08	1	FLOW	605.
				TIME	3.83
ROUTED TO	RB1	1.08	1	FLOW	598.
				TIME	4.50
HYDROGRAPH AT	B2	.61	1	FLOW	341.
				TIME	3.83
ROUTED TO	RB2	.61	1	FLOW	336.
				TIME	4.33
HYDROGRAPH AT	B3	2.50	1	FLOW	918.
				TIME	4.33
4 COMBINED AT	B	6.92	1	FLOW	2700.

ROUTED TO	RB	6.92	1	FLOW	2659.
				TIME	4.50
HYDROGRAPH AT	C1	1.91	1	FLOW	692.
				TIME	4.25
HYDROGRAPH AT	C2	1.68	1	FLOW	539.
				TIME	4.42
3 COMBINED AT	C	10.51	1	FLOW	3839.
				TIME	4.50
ROUTED TO	RC	10.51	1	FLOW	3815.
				TIME	4.58
HYDROGRAPH AT	D1	.52	1	FLOW	270.
				TIME	3.83
ROUTED TO	RD1	.52	1	FLOW	267.
				TIME	4.00
HYDROGRAPH AT	D2	.30	1	FLOW	171.
				TIME	3.75
HYDROGRAPH AT	D3	.75	1	FLOW	464.
				TIME	3.83
4 COMBINED AT	D	12.09	1	FLOW	4206.
				TIME	4.58
ROUTED TO	RD	12.09	1	FLOW	4199.
				TIME	4.58
HYDROGRAPH AT	E1	.50	1	FLOW	338.
				TIME	3.83
2 COMBINED AT	E	12.58	1	FLOW	4328.
				TIME	4.58
ROUTED TO	RE	12.58	1	FLOW	4303.
				TIME	4.67
HYDROGRAPH AT	F1	1.08	1	FLOW	529.
				TIME	4.00
2 COMBINED AT	F	13.66	1	FLOW	4597.
				TIME	4.58
ROUTED TO	RF	13.66	1	FLOW	4593.
				TIME	4.67
HYDROGRAPH AT	G1	1.36	1	FLOW	663.
				TIME	4.00
HYDROGRAPH AT	G2	1.02	1	FLOW	697.
				TIME	3.83
3 COMBINED AT	G	16.04	1	FLOW	5272.
				TIME	4.67
ROUTED TO	RG	16.04	1	FLOW	5270.
				TIME	4.67
HYDROGRAPH AT	H1	.56	1	FLOW	330.

HYDROGRAPH AT	H2	.37	1	FLOW	359.
				TIME	3.58
3 COMBINED AT	H	16.98	1	FLOW	5547.
				TIME	4.75
ROUTED TO	RH	16.98	1	FLOW	5543.
				TIME	4.83
HYDROGRAPH AT	I1	1.35	1	FLOW	885.
				TIME	3.92
2 COMBINED AT	I	18.33	1	FLOW	6025.
				TIME	4.33
ROUTED TO	RI	18.33	1	FLOW	6021.
				TIME	4.50
HYDROGRAPH AT	J1	.85	1	FLOW	342.
				TIME	3.83
2 COMBINED AT	J	19.17	1	FLOW	6236.
				TIME	5.08
ROUTED TO	DET B	19.17	1	FLOW	778.
				TIME	7.75

** PEAK STAGES IN FEET **

1	STAGE	1064.94
	TIME	7.75

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .79									
RA	MANE	1.80	895.73	259.07	1.18	5.00	895.33	260.00	1.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1721E+03 EXCESS= .0000E+00 OUTFLOW= .1722E+03 BASIN STORAGE= .1637E-03 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .79									
RB1	MANE	4.98	598.34	268.71	1.52	5.00	597.79	270.00	1.52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8680E+02 EXCESS= .0000E+00 OUTFLOW= .8765E+02 BASIN STORAGE= .8437E-01 PERCENT ERROR= -1.1

FOR PLAN = 1 RATIO= .79									
RB2	MANE	5.00	336.98	258.18	1.45	5.00	336.18	260.00	1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4678E+02 EXCESS= .0000E+00 OUTFLOW= .4712E+02 BASIN STORAGE= .1301E-01 PERCENT ERROR= -.7

FOR PLAN = 1 RATIO= .79									
RB	MANE	2.69	2690.34	271.45	1.33	5.00	2659.36	270.00	1.33

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4898E+03 EXCESS= .0000E+00 OUTFLOW= .4900E+03 BASIN STORAGE= .4815E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
            RC  MANE        1.26   3836.85    272.71      1.31      5.00   3815.50    275.00       1.31


CONTINUITY SUMMARY (AC-FT) - INFLOW= .7344E+03 EXCESS= .0000E+00 OUTFLOW= .7346E+03 BASIN STORAGE= .5061E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
           RD1  MANE        5.00    267.70    237.07      1.31      5.00    266.72    240.00       1.31


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3651E+02 EXCESS= .0000E+00 OUTFLOW= .3662E+02 BASIN STORAGE= .1215E-03 PERCENT ERROR=   -.3


        FOR PLAN = 1  RATIO=  .79
            RD  MANE         .75   4203.11    275.90      1.33      5.00   4198.98    275.00       1.33


CONTINUITY SUMMARY (AC-FT) - INFLOW= .8584E+03 EXCESS= .0000E+00 OUTFLOW= .8584E+03 BASIN STORAGE= .2542E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
            RE  MANE        1.59   4323.83    277.93      1.35      5.00   4303.36    280.00       1.35


CONTINUITY SUMMARY (AC-FT) - INFLOW= .9061E+03 EXCESS= .0000E+00 OUTFLOW= .9064E+03 BASIN STORAGE= .3544E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
            RF  MANE        1.57   4595.44    278.93      1.36      5.00   4592.91    280.00       1.36


CONTINUITY SUMMARY (AC-FT) - INFLOW= .9891E+03 EXCESS= .0000E+00 OUTFLOW= .9892E+03 BASIN STORAGE= .4389E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
            RG  MANE        1.17   5270.88    281.68      1.40      5.00   5269.70    280.00       1.40


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1201E+04 EXCESS= .0000E+00 OUTFLOW= .1201E+04 BASIN STORAGE= .7383E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
            RH  MANE        2.83   5543.74    292.57      1.42      5.00   5543.20    290.00       1.42


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1287E+04 EXCESS= .0000E+00 OUTFLOW= .1287E+04 BASIN STORAGE= .1729E+00 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
            RI  MANE        5.00   6022.77    270.48      1.46      5.00   6021.42    270.00       1.46


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1429E+04 EXCESS= .0000E+00 OUTFLOW= .1429E+04 BASIN STORAGE= .3451E+00 PERCENT ERROR=    .0



*** NORMAL END OF HEC-1 ***
```

100-yr

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           SEPTEMBER 1990             *
*             VERSION 4.0              *
*                                      *
* RUN DATE  05/30/1996  TIME  17:02:44 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*     U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*            (916) 756-1104            *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID  HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
   2         ID  100 YEAR FREQUENCY, 6-HOUR STORM per CCRFCD HC&DDM
   3         ID  SDN 5, DARF .79
   4         ID  Originally created by Boyle Engineering for CCRFCD
   5         ID    as Hiko Springs/Unnamed Wash Facilities Plan.
   6         ID  TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
   7         ID  Edited by Black & Veatch for design of Hiko Springs Detention Basin.
   8         IT       5       0       0     300
   9         IN       5       0       0
  10         IO       5       0       0
  11         JR    PREC     .79

  12         KK      A1
  13         KM  RUNOFF FROM SUBBASIN A1
  14         BA    2.73
  15         PB    4.58
  16         PC    .000    .020    .059    .080    .110    .144    .150    .160    .168    .171
  17         PC    .180    .182    .187    .190    .197    .202    .210    .220    .230    .241
  18         PC    .250    .259    .265    .280    .290    .300    .305    .309    .310    .317
  19         PC    .321    .327    .333    .346    .361    .381    .408    .430    .477    .514
  20         PC    .561    .630    .710    .720    .731    .752    .779    .790    .795    .804
  21         PC    .810    .820    .826    .840    .859    .889    .910    .938    .966    .970
  22         PC    .974    .979    .981    .983    .985    .989    .990    .992    .993    .996
  23         PC    .997    .999    1.00
  24         LS       0      78
  25         UD     .83

  26         KK      RA
  27         KM  ROUTE A1 RUNOFF
```

```
29          KK      B1
30          KM   RUNOFF FROM SUBBASIN B1
31          BA    1.08
32          LS      0      83
33          UD     .47

34          KK     RB1
35          KM   ROUTE B1 RUNOFF
36          RK   15500   .0503    .050           TRAP     350      25

37          KK      B2
38          KM   RUNOFF FROM SUBBASIN B2
39          BA     .61
40          LS     0       82
41          UD     .43

42          KK     RB2
43          KM   ROUTE B2 RUNOFF
44          RK   11500   .0435    .050           TRAP     200      25
```



```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 45         KK      B3
 46         KM   RUNOFF FROM SUBBASIN B3
 47         BA     2.5
 48         LS     0       81
 49         UD     .88

 50         KK       B
 51         KM   COMBINE RA, B1, B2, & B3
 52         HC       4

 53         KK      RB
 54         KM   ROUTE B
 55         RK    4500   .0389    .050           TRAP     300      25

 56         KK      C1
 57         KM   RUNOFF FROM SUBBASIN C1
 58         BA    1.91
 59         LS      0      80
 60         UD     .83

 61         KK      C2
 62         KM   RUNOFF FROM SUBBASIN C2
 63         BA    1.68
 64         LS     0       79
 65         UD     .94

 66         KK       C
 67         KM   COMBINE RB, C1, & C2
```

```
 69          KK      RC
 70          KM   ROUTE C
 71          RK    2900   .0414    .050            TRAP     300       5

 72          KK      D1
 73          KM   RUNOFF FROM SUBBASIN D1
 74          BA    .524
 75          LS      0        80
 76          UD     .42

 77          KK     RD1
 78          KM   ROUTE D1
 79          RK    5400    .061    .050            TRAP     100      50

 80          KK      D2
 81          KM   RUNOFF FROM SUBBASIN D2
 82          BA    .301
 83          LS      0        80
 84          UD     .34
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 85          KK      D3
 86          KM   RUNOFF FROM SUBBASIN D3
 87          BA    .753
 88          LS      0        85
 89          UD     .46

 90          KK       D
 91          KM   COMBINE RC, RD1, D2, & D3
 92          HC       4

 93          KK      RD
 94          KM   ROUTE D
 95          RK    1600   .0469    .050            TRAP     300      15

 96          KK      E1
 97          KM   RUNOFF FROM E1
 98          BA    .495
 99          LS      0        87
100          UD     .43

101          KK       E
102          KM   COMBINE RD & E1
103          HC       2

104          KK      RE
105          KM   ROUTE E
106          RK    2560   .0364    .050            TRAP     300      50
```

```
108          KM   RUNOFF FROM SUBBASIN F1
109          BA    1.08
110          LS     0       82
111          UD     .56

112          KK      F
113          KM   COMBINE RE & F1
114          HC      2

115          KK     RF
116          KM   ROUTE F
117          RK    3000   .0467    .050           TRAP     300      50

118          KK     G1
119          KM   RUNOFF FROM SUBBASIN G1
120          BA    1.36
121          LS     0       83
122          UD     .62

123          KK     G2
124          KM   RUNOFF FROM SUBBASIN G2
125          BA    1.02
126          LS     0       88
127          UD     .47
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

128          KK      G
129          KM   COMBINE RF, G1, & G2
130          HC      3

131          KK     RG
132          KM   ROUTE G
133          RK    2600   .0346    .050           TRAP     300       5

134          KK     H1
135          KM   RUNOFF FROM SUBBASIN H1
136          BA    .560
137          LS     0       83
138          UD     .42

139          KK     H2
140          KM   RUNOFF FROM SUBBASIN H2
141          BA    .373
142          LS     0       90
143          UD     .24

144          KK      H
145          KM   COMBINE RG, H1 & H2
146          HC      3

147          KK     RH
148          KM   ROUTE H
149          RK    9400   .0585    .070           TRAP      75       5
```

```
151           KM   RUNOFF FROM SUBBASIN I1
152           BA    1.35
153           LS      0        89
154           UD     .55

155           KK      I
156           KM   COMBINE RH & I1
157           HC      2

158           KK     RI
159           KM   ROUTE I
160           RK   10000   .0410    .050           TRAP     400      50

161           KK     J1
162           KM   RUNOFF FROM SUBBASIN J1
163           BA     .847
164           LS      0        75
165           UD     .41

166           KK      J
167           KM   COMBINE RI & J1
168           HC      2
169           KO      1
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

170           KK   DET B
171           KM   DETENTION BASIN SITE
172           KM     Spillway elevation of 1077.5 ft.; 62" dia. low-level outlet pipe;
173           KM     storage capacity of 1636 ac ft.
174           KO      1
175           RS      1    STOR      -1
176           SV      0     2.68   27.13   75.75  141.59  216.52  299.74  393.04  497.42  612.84
177           SV  738.58  873.92 1018.86 1174.58 1343.32 1531.69 1746.05 1988.34
178           SE    1002    1005    1010    1015    1020    1025    1030    1035    1040    1045
179           SE    1050    1055    1060    1065    1070    1075    1080    1085
180           SL  1007.5   20.97     .61      .5
181           SS  1077.5     550   2.939     1.5
182           ZZ
```

```
****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER      *
*              VERSION 4.0             *                    *         609 SECOND STREET            *
*                                      *                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE  05/30/1996  TIME  17:02:44 *                   *           (916) 756-1104             *
*                                      *                    *                                      *
****************************************                    ****************************************
```

```
                    HIKO SPRINGS WASH  FILE: 100HIKO  DATE: 7-22-94
                    100 YEAR FREQUENCY  6-HOUR STORM per CCRFCD HC&DDM
                    SDN 5, DARF .79
                    Originally created by Boyle Engineering for CCRFCD
                      as Hiko Springs/Unnamed Wash Facilities Plan.
                    TLAGs modified by Tim Sutko per CCRFCD HC&DDM.
                    Edited by Black & Veatch for design of Hiko Springs Detention Basin.

 10 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT           HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2    0  ENDING DATE
```

```
ICENT          19  CENTURY MARK

      COMPUTATION INTERVAL     .08 HOURS
          TOTAL TIME BASE   24.92 HOURS

  ENGLISH UNITS
      DRAINAGE AREA          SQUARE MILES
      PRECIPITATION DEPTH    INCHES
      LENGTH, ELEVATION      FEET
      FLOW                   CUBIC FEET PER SECOND
      STORAGE VOLUME         ACRE-FEET
      SURFACE AREA           ACRES
      TEMPERATURE            DEGREES FAHRENHEIT

JP         MULTI-PLAN OPTION
                NPLAN          1  NUMBER OF PLANS

JR         MULTI-RATIO OPTION
              RATIOS OF PRECIPITATION
                .79


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
166 KK     *         J  *
           *            *
           **************

169 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

168 HC         HYDROGRAPH COMBINATION
                    ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                            ***

*********************************************************************************************************************************

                                        HYDROGRAPH AT STATION        J
                                            SUM OF  2 HYDROGRAPHS
                                           PLAN 1,   RATIO =   .79

*********************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	4262.	*	1		1230	151	29.	*	1		1845	226	4.
1		0005	2	0.	*	1		0620	77	3998.	*	1		1235	152	28.	*	1		1850	227	4.
1		0010	3	0.	*	1		0625	78	3731.	*	1		1240	153	27.	*	1		1855	228	4.
1		0015	4	0.	*	1		0630	79	3461.	*	1		1245	154	26.	*	1		1900	229	4.
1		0020	5	0.	*	1		0635	80	3194.	*	1		1250	155	25.	*	1		1905	230	4.
1		0025	6	0.	*	1		0640	81	2935.	*	1		1255	156	24.	*	1		1910	231	3.
1		0030	7	0.	*	1		0645	82	2686.	*	1		1300	157	23.	*	1		1915	232	3.
1		0035	8	0.	*	1		0650	83	2454.	*	1		1305	158	22.	*	1		1920	233	3.
1		0040	9	0.	*	1		0655	84	2239.	*	1		1310	159	21.	*	1		1925	234	3.
1		0045	10	0.	*	1		0700	85	2040.	*	1		1315	160	21.	*	1		1930	235	3.
1		0050	11	0.	*	1		0705	86	1858.	*	1		1320	161	20.	*	1		1935	236	3.
1		0055	12	0.	*	1		0710	87	1699.	*	1		1325	162	19.	*	1		1940	237	3.
1		0100	13	0.	*	1		0715	88	1551.	*	1		1330	163	19.	*	1		1945	238	3.

1	0110	15	1.	*	1	0725	90	1299.	*	1	1340	165	17.	*	1	1955	240	3.
1	0115	16	2.	*	1	0730	91	1188.	*	1	1345	166	17.	*	1	2000	241	3.
1	0120	17	8.	*	1	0735	92	1091.	*	1	1350	167	16.	*	1	2005	242	3.
1	0125	18	16.	*	1	0740	93	1000.	*	1	1355	168	16.	*	1	2010	243	3.
1	0130	19	25.	*	1	0745	94	919.	*	1	1400	169	15.	*	1	2015	244	3.
1	0135	20	40.	*	1	0750	95	844.	*	1	1405	170	15.	*	1	2020	245	3.
1	0140	21	61.	*	1	0755	96	777.	*	1	1410	171	14.	*	1	2025	246	3.
1	0145	22	83.	*	1	0800	97	715.	*	1	1415	172	14.	*	1	2030	247	3.
1	0150	23	112.	*	1	0805	98	659.	*	1	1420	173	13.	*	1	2035	248	3.
1	0155	24	144.	*	1	0810	99	608.	*	1	1425	174	13.	*	1	2040	249	3.
1	0200	25	179.	*	1	0815	100	562.	*	1	1430	175	13.	*	1	2045	250	3.
1	0205	26	222.	*	1	0820	101	518.	*	1	1435	176	12.	*	1	2050	251	2.
1	0210	27	264.	*	1	0825	102	480.	*	1	1440	177	12.	*	1	2055	252	2.
1	0215	28	319.	*	1	0830	103	442.	*	1	1445	178	12.	*	1	2100	253	2.
1	0220	29	378.	*	1	0835	104	411.	*	1	1450	179	11.	*	1	2105	254	2.
1	0225	30	435.	*	1	0840	105	380.	*	1	1455	180	11.	*	1	2110	255	2.
1	0230	31	485.	*	1	0845	106	354.	*	1	1500	181	11.	*	1	2115	256	2.
1	0235	32	534.	*	1	0850	107	330.	*	1	1505	182	10.	*	1	2120	257	2.
1	0240	33	605.	*	1	0855	108	306.	*	1	1510	183	10.	*	1	2125	258	2.
1	0245	34	683.	*	1	0900	109	286.	*	1	1515	184	10.	*	1	2130	259	2.
1	0250	35	750.	*	1	0905	110	266.	*	1	1520	185	10.	*	1	2135	260	2.
1	0255	36	818.	*	1	0910	111	247.	*	1	1525	186	9.	*	1	2140	261	2.
1	0300	37	877.	*	1	0915	112	231.	*	1	1530	187	9.	*	1	2145	262	2.
1	0305	38	939.	*	1	0920	113	215.	*	1	1535	188	9.	*	1	2150	263	2.
1	0310	39	1008.	*	1	0925	114	200.	*	1	1540	189	9.	*	1	2155	264	2.
1	0315	40	1097.	*	1	0930	115	188.	*	1	1545	190	8.	*	1	2200	265	2.
1	0320	41	1211.	*	1	0935	116	176.	*	1	1550	191	8.	*	1	2205	266	2.
1	0325	42	1398.	*	1	0940	117	165.	*	1	1555	192	8.	*	1	2210	267	2.
1	0330	43	1656.	*	1	0945	118	155.	*	1	1600	193	8.	*	1	2215	268	2.
1	0335	44	2008.	*	1	0950	119	146.	*	1	1605	194	8.	*	1	2220	269	2.
1	0340	45	2497.	*	1	0955	120	137.	*	1	1610	195	7.	*	1	2225	270	2.
1	0345	46	3177.	*	1	1000	121	129.	*	1	1615	196	7.	*	1	2230	271	2.
1	0350	47	4047.	*	1	1005	122	122.	*	1	1620	197	7.	*	1	2235	272	2.
1	0355	48	5075.	*	1	1010	123	115.	*	1	1625	198	7.	*	1	2240	273	2.
1	0400	49	6088.	*	1	1015	124	109.	*	1	1630	199	7.	*	1	2245	274	2.
1	0405	50	6968.	*	1	1020	125	102.	*	1	1635	200	7.	*	1	2250	275	2.
1	0410	51	7644.	*	1	1025	126	97.	*	1	1640	201	6.	*	1	2255	276	2.
1	0415	52	8034.	*	1	1030	127	93.	*	1	1645	202	6.	*	1	2300	277	2.
1	0420	53	8229.	*	1	1035	128	88.	*	1	1650	203	6.	*	1	2305	278	2.
1	0425	54	8282.	*	1	1040	129	84.	*	1	1655	204	6.	*	1	2310	279	2.
1	0430	55	8255.	*	1	1045	130	80.	*	1	1700	205	6.	*	1	2315	280	2.
1	0435	56	8212.	*	1	1050	131	75.	*	1	1705	206	6.	*	1	2320	281	2.
1	0440	57	8176.	*	1	1055	132	71.	*	1	1710	207	6.	*	1	2325	282	2.
1	0445	58	8148.	*	1	1100	133	67.	*	1	1715	208	6.	*	1	2330	283	2.
1	0450	59	8115.	*	1	1105	134	63.	*	1	1720	209	5.	*	1	2335	284	2.
1	0455	60	8063.	*	1	1110	135	60.	*	1	1725	210	5.	*	1	2340	285	1.
1	0500	61	7998.	*	1	1115	136	57.	*	1	1730	211	5.	*	1	2345	286	1.
1	0505	62	7925.	*	1	1120	137	54.	*	1	1735	212	5.	*	1	2350	287	1.
1	0510	63	7840.	*	1	1125	138	52.	*	1	1740	213	5.	*	1	2355	288	1.
1	0515	64	7725.	*	1	1130	139	49.	*	1	1745	214	5.	*	2	0000	289	1.
1	0520	65	7563.	*	1	1135	140	47.	*	1	1750	215	5.	*	2	0005	290	1.
1	0525	66	7345.	*	1	1140	141	45.	*	1	1755	216	5.	*	2	0010	291	1.
1	0530	67	7076.	*	1	1145	142	43.	*	1	1800	217	5.	*	2	0015	292	1.
1	0535	68	6768.	*	1	1150	143	41.	*	1	1805	218	4.	*	2	0020	293	1.
1	0540	69	6433.	*	1	1155	144	39.	*	1	1810	219	4.	*	2	0025	294	1.
1	0545	70	6084.	*	1	1200	145	38.	*	1	1815	220	4.	*	2	0030	295	1.
1	0550	71	5737.	*	1	1205	146	36.	*	1	1820	221	4.	*	2	0035	296	1.
1	0555	72	5406.	*	1	1210	147	34.	*	1	1825	222	4.	*	2	0040	297	1.
1	0600	73	5095.	*	1	1215	148	33.	*	1	1830	223	4.	*	2	0045	298	1.
1	0605	74	4804.	*	1	1220	149	31.	*	1	1835	224	4.	*	2	0050	299	1.
1	0610	75	4529.	*	1	1225	150	30.	*	1	1840	225	4.	*	2	0055	300	1.
				*					*					*				

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

8282.	4.42	(CFS)	3744.	971.	935.	935.
		(INCHES)	1.816	1.883	1.883	1.883
		(AC-FT)	1857.	1925.	1925.	1925.

CUMULATIVE AREA = 19.17 SQ MI

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          **************
          *            *
170 KK    *    DET B   *
          *            *
          **************

174 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          1  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

175 RS        STORAGE ROUTING
                   NSTPS          1  NUMBER OF SUBREACHES
                    ITYP       STOR  TYPE OF INITIAL CONDITION
                  RSVRIC      -1.00  INITIAL CONDITION
                       X        .00  WORKING R AND D COEFFICIENT
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176 SV	STORAGE	.0	2.7	27.1	75.8	141.6	216.5	299.7	393.0	497.4	612.8
		738.6	873.9	1018.9	1174.6	1343.3	1531.7	1746.1	1988.3		
178 SE	ELEVATION	1002.00	1005.00	1010.00	1015.00	1020.00	1025.00	1030.00	1035.00	1040.00	1045.00
		1050.00	1055.00	1060.00	1065.00	1070.00	1075.00	1080.00	1085.00		

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180 SL        LOW-LEVEL OUTLET
                   ELEVL    1007.50  ELEVATION AT CENTER OF OUTLET
                   CAREA      20.97  CROSS-SECTIONAL AREA
                    COQL        .61  COEFFICIENT
                    EXPL        .50  EXPONENT OF HEAD

181 SS        SPILLWAY
                    CREL    1077.50  SPILLWAY CREST ELEVATION
                   SPWID     550.00  SPILLWAY WIDTH
                    COQW       2.94  WEIR COEFFICIENT
                    EXPW       1.50  EXPONENT OF HEAD
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COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	169.02	190.92	219.35	257.72	312.36	396.41	542.34	858.32
ELEVATION	1002.00	1007.50	1010.21	1010.96	1012.07	1013.81	1016.77	1022.43	1035.45	1077.50
OUTFLOW	892.86	1128.77	1764.60	2999.50	5031.27	8059.63	12281.89	17898.24	25106.23	34104.37
ELEVATION	1077.58	1077.80	1078.18	1078.70	1079.38	1080.20	1081.18	1082.30	1083.58	1085.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	2.68	14.90	27.13	29.21	36.50	47.27	64.19	75.75	99.07
OUTFLOW	.00	.00	.00	162.21	169.02	190.92	219.35	257.72	280.95	312.36
ELEVATION	1002.00	1005.00	1007.50	1010.00	1010.21	1010.96	1012.07	1013.81	1015.00	1016.77

STORAGE	141.59	178.02	216.52	299.74	393.04	402.38	497.42	612.84	738.58	873.92
OUTFLOW	362.71	396.41	429.16	486.62	537.98	542.34	584.85	628.23	668.80	707.05
ELEVATION	1020.00	1022.43	1025.00	1030.00	1035.00	1035.45	1040.00	1045.00	1050.00	1055.00
STORAGE	1018.86	1174.58	1343.32	1531.69	1638.87	1642.14	1651.83	1667.93	1690.46	1719.40
OUTFLOW	743.33	777.92	811.04	842.86	858.32	892.86	1128.77	1764.60	2999.50	5031.27
ELEVATION	1060.00	1065.00	1070.00	1075.00	1077.50	1077.58	1077.80	1078.18	1078.70	1079.38
STORAGE	1746.05	1755.90	1803.13	1857.61	1919.35	1988.34				
OUTFLOW	7263.10	8059.63	12281.89	17898.24	25106.23	34104.37				
ELEVATION	1080.00	1080.20	1081.18	1082.30	1083.58	1085.00				

HYDROGRAPH AT STATION DET B
PLAN 1, RATIO = .79

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	14.9	1007.5	*	1		0820	101	849.	1572.0	1075.9	*	1		1640	201	755.	1071.7	1061.7
1		0005	2	0.	14.9	1007.5	*	1		0825	102	848.	1569.6	1075.9	*	1		1645	202	754.	1066.6	1061.5
1		0010	3	0.	14.9	1007.5	*	1		0830	103	848.	1566.9	1075.8	*	1		1650	203	753.	1061.4	1061.4
1		0015	4	0.	14.9	1007.5	*	1		0835	104	848.	1564.0	1075.8	*	1		1655	204	752.	1056.3	1061.2
1		0020	5	0.	14.9	1007.5	*	1		0840	105	847.	1560.9	1075.7	*	1		1700	205	751.	1051.2	1061.0
1		0025	6	0.	14.9	1007.5	*	1		0845	106	847.	1557.6	1075.6	*	1		1705	206	749.	1046.0	1060.9
1		0030	7	0.	14.9	1007.5	*	1		0850	107	846.	1554.2	1075.5	*	1		1710	207	748.	1040.9	1060.7
1		0035	8	0.	14.9	1007.5	*	1		0855	108	846.	1550.5	1075.4	*	1		1715	208	747.	1035.8	1060.5
1		0040	9	0.	14.9	1007.5	*	1		0900	109	845.	1546.7	1075.4	*	1		1720	209	746.	1030.7	1060.4
1		0045	10	0.	14.9	1007.5	*	1		0905	110	844.	1542.8	1075.3	*	1		1725	210	745.	1025.6	1060.2
1		0050	11	0.	14.9	1007.5	*	1		0910	111	844.	1538.8	1075.2	*	1		1730	211	744.	1020.5	1060.1
1		0055	12	0.	14.9	1007.5	*	1		0915	112	843.	1534.6	1075.1	*	1		1735	212	742.	1015.4	1059.9
1		0100	13	0.	14.9	1007.5	*	1		0920	113	843.	1530.3	1075.0	*	1		1740	213	741.	1010.4	1059.7
1		0105	14	0.	14.9	1007.5	*	1		0925	114	842.	1526.0	1074.8	*	1		1745	214	740.	1005.3	1059.5
1		0110	15	0.	14.9	1007.5	*	1		0930	115	841.	1521.5	1074.7	*	1		1750	215	739.	1000.2	1059.4
1		0115	16	0.	14.9	1007.5	*	1		0935	116	840.	1517.0	1074.6	*	1		1755	216	737.	995.2	1059.2
1		0120	17	1.	15.0	1007.5	*	1		0940	117	840.	1512.4	1074.5	*	1		1800	217	736.	990.1	1059.0
1		0125	18	2.	15.0	1007.5	*	1		0945	118	839.	1507.7	1074.4	*	1		1805	218	735.	985.1	1058.8
1		0130	19	3.	15.2	1007.6	*	1		0950	119	838.	1503.0	1074.2	*	1		1810	219	734.	980.1	1058.7
1		0135	20	6.	15.3	1007.6	*	1		0955	120	837.	1498.2	1074.1	*	1		1815	220	732.	975.1	1058.5
1		0140	21	10.	15.6	1007.7	*	1		1000	121	836.	1493.3	1074.0	*	1		1820	221	731.	970.0	1058.3
1		0145	22	15.	16.1	1007.7	*	1		1005	122	836.	1488.4	1073.9	*	1		1825	222	730.	965.0	1058.1
1		0150	23	22.	16.6	1007.8	*	1		1010	123	835.	1483.5	1073.7	*	1		1830	223	729.	960.0	1058.0
1		0155	24	32.	17.3	1008.0	*	1		1015	124	834.	1478.5	1073.6	*	1		1835	224	727.	955.1	1057.8
1		0200	25	43.	18.2	1008.2	*	1		1020	125	833.	1473.5	1073.5	*	1		1840	225	726.	950.1	1057.6
1		0205	26	57.	19.2	1008.4	*	1		1025	126	832.	1468.4	1073.3	*	1		1845	226	725.	945.1	1057.5
1		0210	27	73.	20.4	1008.6	*	1		1030	127	831.	1463.4	1073.2	*	1		1850	227	724.	940.2	1057.3
1		0215	28	92.	21.9	1008.9	*	1		1035	128	830.	1458.3	1073.1	*	1		1855	228	722.	935.2	1057.1
1		0220	29	115.	23.5	1009.3	*	1		1040	129	830.	1453.1	1072.9	*	1		1900	229	721.	930.3	1056.9
1		0225	30	140.	25.5	1009.7	*	1		1045	130	829.	1448.0	1072.8	*	1		1905	230	720.	925.3	1056.8
1		0230	31	164.	27.6	1010.0	*	1		1050	131	828.	1442.8	1072.6	*	1		1910	231	719.	920.4	1056.6
1		0235	32	171.	29.9	1010.3	*	1		1055	132	827.	1437.6	1072.5	*	1		1915	232	717.	915.5	1056.4
1		0240	33	179.	32.7	1010.6	*	1		1100	133	826.	1432.4	1072.4	*	1		1920	233	716.	910.6	1056.3
1		0245	34	189.	35.8	1010.9	*	1		1105	134	825.	1427.2	1072.2	*	1		1925	234	715.	905.6	1056.1
1		0250	35	199.	39.4	1011.3	*	1		1110	135	824.	1421.9	1072.1	*	1		1930	235	714.	900.7	1055.9
1		0255	36	209.	43.4	1011.7	*	1		1115	136	823.	1416.7	1071.9	*	1		1935	236	713.	895.9	1055.8
1		0300	37	220.	47.8	1012.1	*	1		1120	137	823.	1411.4	1071.8	*	1		1940	237	711.	891.0	1055.6
1		0305	38	231.	52.5	1012.6	*	1		1125	138	822.	1406.1	1071.7	*	1		1945	238	710.	886.1	1055.4
1		0310	39	243.	57.6	1013.1	*	1		1130	139	821.	1400.8	1071.5	*	1		1950	239	709.	881.2	1055.3
1		0315	40	255.	63.1	1013.7	*	1		1135	140	820.	1395.5	1071.4	*	1		1955	240	708.	876.4	1055.1
1		0320	41	268.	69.2	1014.3	*	1		1140	141	819.	1390.1	1071.2	*	1		2000	241	706.	871.5	1054.9
1		0325	42	282.	76.3	1015.0	*	1		1145	142	818.	1384.8	1071.1	*	1		2005	242	705.	866.7	1054.7
1		0330	43	293.	84.9	1015.7	*	1		1150	143	817.	1379.4	1071.0	*	1		2010	243	704.	861.9	1054.6
1		0335	44	307.	95.4	1016.5	*	1		1155	144	816.	1374.1	1070.8	*	1		2015	244	702.	857.0	1054.4

1	0345	46	344.	126.0	1018.8	*	1	1205	146	814.	1363.4	1070.5	*	1	2025	246	700.	847.4	1054.0
1	0350	47	369.	148.4	1020.5	*	1	1210	147	814.	1358.0	1070.4	*	1	2030	247	698.	842.6	1053.8
1	0355	48	396.	177.2	1022.4	*	1	1215	148	813.	1352.7	1070.2	*	1	2035	248	697.	837.8	1053.7
1	0400	49	426.	212.8	1024.8	*	1	1220	149	812.	1347.3	1070.1	*	1	2040	249	696.	833.1	1053.5
1	0405	50	456.	254.7	1027.3	*	1	1225	150	811.	1341.9	1070.0	*	1	2045	250	694.	828.3	1053.3
1	0410	51	488.	301.8	1030.1	*	1	1230	151	810.	1336.5	1069.8	*	1	2050	251	693.	823.5	1053.1
1	0415	52	516.	352.3	1032.8	*	1	1235	152	809.	1331.2	1069.6	*	1	2055	252	691.	818.8	1053.0
1	0420	53	543.	404.7	1035.6	*	1	1240	153	808.	1325.8	1069.5	*	1	2100	253	690.	814.0	1052.8
1	0425	54	567.	457.7	1038.1	*	1	1245	154	807.	1320.4	1069.3	*	1	2105	254	689.	809.3	1052.6
1	0430	55	590.	510.7	1040.6	*	1	1250	155	805.	1315.0	1069.2	*	1	2110	255	687.	804.6	1052.4
1	0435	56	610.	563.2	1042.9	*	1	1255	156	804.	1309.6	1069.0	*	1	2115	256	686.	799.9	1052.3
1	0440	57	629.	615.4	1045.1	*	1	1300	157	803.	1304.3	1068.8	*	1	2120	257	685.	795.2	1052.1
1	0445	58	646.	667.2	1047.2	*	1	1305	158	802.	1298.9	1068.7	*	1	2125	258	683.	790.5	1051.9
1	0450	59	662.	718.7	1049.2	*	1	1310	159	801.	1293.5	1068.5	*	1	2130	259	682.	785.8	1051.7
1	0455	60	678.	769.8	1051.2	*	1	1315	160	800.	1288.2	1068.4	*	1	2135	260	681.	781.1	1051.6
1	0500	61	692.	820.4	1053.0	*	1	1320	161	799.	1282.8	1068.2	*	1	2140	261	680.	776.4	1051.4
1	0505	62	706.	870.4	1054.9	*	1	1325	162	798.	1277.4	1068.0	*	1	2145	262	678.	771.8	1051.2
1	0510	63	719.	919.8	1056.6	*	1	1330	163	797.	1272.1	1067.9	*	1	2150	263	677.	767.1	1051.1
1	0515	64	731.	968.4	1058.3	*	1	1335	164	796.	1266.7	1067.7	*	1	2155	264	676.	762.5	1050.9
1	0520	65	743.	1016.0	1059.9	*	1	1340	165	795.	1261.3	1067.6	*	1	2200	265	674.	757.8	1050.7
1	0525	66	753.	1062.2	1061.4	*	1	1345	166	794.	1256.0	1067.4	*	1	2205	266	673.	753.2	1050.5
1	0530	67	763.	1106.6	1062.8	*	1	1350	167	793.	1250.6	1067.3	*	1	2210	267	672.	748.6	1050.4
1	0535	68	772.	1149.0	1064.2	*	1	1355	168	792.	1245.3	1067.1	*	1	2215	268	670.	744.0	1050.2
1	0540	69	781.	1189.1	1065.4	*	1	1400	169	791.	1239.9	1066.9	*	1	2220	269	669.	739.4	1050.0
1	0545	70	788.	1226.8	1066.5	*	1	1405	170	790.	1234.6	1066.8	*	1	2225	270	668.	734.8	1049.9
1	0550	71	795.	1262.1	1067.6	*	1	1410	171	789.	1229.3	1066.6	*	1	2230	271	666.	730.2	1049.7
1	0555	72	802.	1294.9	1068.6	*	1	1415	172	788.	1223.9	1066.5	*	1	2235	272	665.	725.7	1049.5
1	0600	73	808.	1325.5	1069.5	*	1	1420	173	787.	1218.6	1066.3	*	1	2240	273	663.	721.1	1049.3
1	0605	74	813.	1354.1	1070.3	*	1	1425	174	786.	1213.3	1066.1	*	1	2245	274	662.	716.5	1049.1
1	0610	75	817.	1380.6	1071.0	*	1	1430	175	784.	1208.0	1066.0	*	1	2250	275	660.	712.0	1048.9
1	0615	76	821.	1405.2	1071.6	*	1	1435	176	783.	1202.7	1065.8	*	1	2255	276	659.	707.5	1048.8
1	0620	77	825.	1428.0	1072.2	*	1	1440	177	782.	1197.4	1065.7	*	1	2300	277	657.	703.0	1048.6
1	0625	78	829.	1448.9	1072.8	*	1	1445	178	781.	1192.0	1065.5	*	1	2305	278	656.	698.4	1048.4
1	0630	79	832.	1468.0	1073.3	*	1	1450	179	780.	1186.7	1065.4	*	1	2310	279	654.	693.9	1048.2
1	0635	80	835.	1485.1	1073.8	*	1	1455	180	779.	1181.5	1065.2	*	1	2315	280	653.	689.5	1048.0
1	0640	81	838.	1500.5	1074.2	*	1	1500	181	778.	1176.2	1065.0	*	1	2320	281	652.	685.0	1047.9
1	0645	82	840.	1514.1	1074.5	*	1	1505	182	777.	1170.9	1064.9	*	1	2325	282	650.	680.5	1047.7
1	0650	83	842.	1526.0	1074.8	*	1	1510	183	776.	1165.6	1064.7	*	1	2330	283	649.	676.0	1047.5
1	0655	84	844.	1536.3	1075.1	*	1	1515	184	775.	1160.3	1064.5	*	1	2335	284	647.	671.6	1047.3
1	0700	85	845.	1545.2	1075.3	*	1	1520	185	774.	1155.1	1064.4	*	1	2340	285	646.	667.1	1047.2
1	0705	86	846.	1552.8	1075.5	*	1	1525	186	772.	1149.8	1064.2	*	1	2345	286	644.	662.7	1047.0
1	0710	87	847.	1559.3	1075.6	*	1	1530	187	771.	1144.6	1064.0	*	1	2350	287	643.	658.3	1046.8
1	0715	88	848.	1564.6	1075.8	*	1	1535	188	770.	1139.3	1063.9	*	1	2355	288	641.	653.9	1046.6
1	0720	89	848.	1569.0	1075.9	*	1	1540	189	769.	1134.1	1063.7	*	2	0000	289	640.	649.5	1046.5
1	0725	90	849.	1572.5	1076.0	*	1	1545	190	768.	1128.8	1063.5	*	2	0005	290	639.	645.1	1046.3
1	0730	91	849.	1575.2	1076.0	*	1	1550	191	767.	1123.6	1063.4	*	2	0010	291	637.	640.7	1046.1
1	0735	92	849.	1577.2	1076.1	*	1	1555	192	765.	1118.4	1063.2	*	2	0015	292	636.	636.3	1045.9
1	0740	93	850.	1578.6	1076.1	*	1	1600	193	764.	1113.2	1063.0	*	2	0020	293	634.	632.0	1045.8
1	0745	94	850.	1579.3	1076.1	*	1	1605	194	763.	1108.0	1062.9	*	2	0025	294	633.	627.6	1045.6
1	0750	95	850.	1579.6	1076.1	*	1	1610	195	762.	1102.8	1062.7	*	2	0030	295	632.	623.3	1045.4
1	0755	96	850.	1579.3	1076.1	*	1	1615	196	761.	1097.6	1062.5	*	2	0035	296	630.	618.9	1045.2
1	0800	97	850.	1578.6	1076.1	*	1	1620	197	760.	1092.4	1062.4	*	2	0040	297	629.	614.6	1045.1
1	0805	98	849.	1577.5	1076.1	*	1	1625	198	759.	1087.2	1062.2	*	2	0045	298	627.	610.3	1044.9
1	0810	99	849.	1576.0	1076.0	*	1	1630	199	757.	1082.0	1062.0	*	2	0050	299	626.	606.0	1044.7
1	0815	100	849.	1574.2	1076.0	*	1	1635	200	756.	1076.9	1061.9	*	2	0055	300	624.	601.7	1044.5
						*							*						

****

PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	24.92-HR
(CFS)	(HR)					
850.	7.83	(CFS)	837.	675.	650.	650.
		(INCHES)	.406	1.309	1.309	1.309
		(AC-FT)	415.	1338.	1338.	1338.

PEAK STORAGE TIME MAXIMUM AVERAGE STORAGE

1580.	7.83	1497.	969.	934.	934.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
1076.12	7.83	1074.03	1055.39	1053.62	1053.62

CUMULATIVE AREA = 19.17 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .79
HYDROGRAPH AT	A1	2.73	1	FLOW	1202.
				TIME	4.25
ROUTED TO	RA	2.73	1	FLOW	1200.
				TIME	4.33
HYDROGRAPH AT	B1	1.08	1	FLOW	780.
				TIME	3.83
ROUTED TO	RB1	1.08	1	FLOW	773.
				TIME	4.42
HYDROGRAPH AT	B2	.61	1	FLOW	442.
				TIME	3.83
ROUTED TO	RB2	.61	1	FLOW	435.
				TIME	4.25
HYDROGRAPH AT	B3	2.50	1	FLOW	1202.
				TIME	4.33
4 COMBINED AT	B	6.92	1	FLOW	3556.

ROUTED TO	RB	6.92	1	FLOW	3541.
				TIME	4.50
HYDROGRAPH AT	C1	1.91	1	FLOW	914.
				TIME	4.25
HYDROGRAPH AT	C2	1.68	1	FLOW	717.
				TIME	4.42
3 COMBINED AT	C	10.51	1	FLOW	5124.
				TIME	4.42
ROUTED TO	RC	10.51	1	FLOW	5107.
				TIME	4.50
HYDROGRAPH AT	D1	.52	1	FLOW	355.
				TIME	3.83
ROUTED TO	RD1	.52	1	FLOW	351.
				TIME	4.00
HYDROGRAPH AT	D2	.30	1	FLOW	225.
				TIME	3.75
HYDROGRAPH AT	D3	.75	1	FLOW	589.
				TIME	3.83
4 COMBINED AT	D	12.09	1	FLOW	5637.
				TIME	4.50
ROUTED TO	RD	12.09	1	FLOW	5632.
				TIME	4.50
HYDROGRAPH AT	E1	.50	1	FLOW	424.
				TIME	3.83
2 COMBINED AT	E	12.58	1	FLOW	5801.
				TIME	4.50
ROUTED TO	RE	12.58	1	FLOW	5780.
				TIME	4.50
HYDROGRAPH AT	F1	1.08	1	FLOW	687.
				TIME	3.92
2 COMBINED AT	F	13.66	1	FLOW	6189.
				TIME	4.50
ROUTED TO	RF	13.66	1	FLOW	6162.
				TIME	4.58
HYDROGRAPH AT	G1	1.36	1	FLOW	855.
				TIME	4.00
HYDROGRAPH AT	G2	1.02	1	FLOW	869.
				TIME	3.83
3 COMBINED AT	G	16.04	1	FLOW	7117.
				TIME	4.50
ROUTED TO	RG	16.04	1	FLOW	7115.
				TIME	4.50
HYDROGRAPH AT	[illegible]	[illegible]	1	FLOW	424

HYDROGRAPH AT	H2	.37	1	FLOW	441.
				TIME	3.58
3 COMBINED AT	H	16.98	1	FLOW	7381.
				TIME	4.50
ROUTED TO	RH	16.98	1	FLOW	7377.
				TIME	4.58
HYDROGRAPH AT	I1	1.35	1	FLOW	1096.
				TIME	3.92
2 COMBINED AT	I	18.33	1	FLOW	8067.
				TIME	4.33
ROUTED TO	RI	18.33	1	FLOW	8063.
				TIME	4.42
HYDROGRAPH AT	J1	.85	1	FLOW	469.
				TIME	3.83
2 COMBINED AT	J	19.17	1	FLOW	8282.
				TIME	4.42
ROUTED TO	DET B	19.17	1	FLOW	850.
				TIME	7.83

** PEAK STAGES IN FEET **

1	STAGE	1076.12
	TIME	7.83

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
						INTERPOLATED TO COMPUTATION INTERVAL			
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .79									
RA	MANE	1.72	1201.89	258.42	1.59	5.00	1199.66	260.00	1.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2312E+03 EXCESS= .0000E+00 OUTFLOW= .2313E+03 BASIN STORAGE= .1725E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .79									
RB1	MANE	5.00	777.54	265.86	1.97	5.00	773.15	265.00	1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1128E+03 EXCESS= .0000E+00 OUTFLOW= .1134E+03 BASIN STORAGE= .7786E-01 PERCENT ERROR= -.6

FOR PLAN = 1 RATIO= .79									
RB2	MANE	4.79	438.38	255.85	1.89	5.00	434.65	255.00	1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6118E+02 EXCESS= .0000E+00 OUTFLOW= .6143E+02 BASIN STORAGE= .1471E-01 PERCENT ERROR= -.4

FOR PLAN = 1 RATIO= .79									
RB	MANE	2.53	3551.09	268.09	1.75	5.00	3541.34	270.00	1.75

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6468E+03 EXCESS= .0000E+00 OUTFLOW= .6471E+03 BASIN STORAGE= .4882E-01 PERCENT ERROR=   -.1


        FOR PLAN = 1  RATIO=  .79
             RC  MANE        1.19   5119.21    267.98      1.73       5.00   5106.85    270.00         1.73


CONTINUITY SUMMARY (AC-FT) - INFLOW= .9720E+03 EXCESS= .0000E+00 OUTFLOW= .9722E+03 BASIN STORAGE= .5358E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
            RD1  MANE        4.85    354.45    238.65      1.74       5.00    351.24    240.00         1.74


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4837E+02 EXCESS= .0000E+00 OUTFLOW= .4850E+02 BASIN STORAGE= .1061E-03 PERCENT ERROR=   -.3


        FOR PLAN = 1  RATIO=  .79
             RD  MANE         .69   5634.16    270.83      1.76       5.00   5631.69    270.00         1.76


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1134E+04 EXCESS= .0000E+00 OUTFLOW= .1134E+04 BASIN STORAGE= .2596E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
             RE  MANE        1.37   5797.70    272.39      1.78       5.00   5779.84    270.00         1.78


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1194E+04 EXCESS= .0000E+00 OUTFLOW= .1194E+04 BASIN STORAGE= .3661E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
             RF  MANE        1.56   6183.96    272.92      1.79       5.00   6162.28    275.00         1.79


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1303E+04 EXCESS= .0000E+00 OUTFLOW= .1303E+04 BASIN STORAGE= .4480E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
             RG  MANE        1.10   7115.40    270.53      1.84       5.00   7115.05    270.00         1.84


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1574E+04 EXCESS= .0000E+00 OUTFLOW= .1574E+04 BASIN STORAGE= .7316E-01 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
             RH  MANE        2.62   7379.38    274.30      1.86       5.00   7376.80    275.00         1.86


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1684E+04 EXCESS= .0000E+00 OUTFLOW= .1684E+04 BASIN STORAGE= .1679E+00 PERCENT ERROR=    .0


        FOR PLAN = 1  RATIO=  .79
             RI  MANE        4.82   8064.60    269.29      1.91       5.00   8063.42    265.00         1.91


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1862E+04 EXCESS= .0000E+00 OUTFLOW= .1862E+04 BASIN STORAGE= .3505E+00 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
```

Department of Public Works

M. J. MANNING
DIRECTOR

CLARK COUNTY GOVERNMENT CENTER
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July 25, 1996

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HIKO SPRINGS DETENTION BASIN - O & M PROCEDURE

Dear Mr. Swengle:

In response to your request, at the behest of the Federal Emergency Management Agency, please be advised that Clark County, and entities within the County, are admonished to perform storm drainage facility maintenance in accordance with the Clark County Regional Flood Control District (RFCD) "Operations and Maintenance Manual" (O & M Manual), adopted July 13, 1995.

Additionally, the RFCD Stormwater Quality Management Committee is charged with oversight of the NPDES Stormwater Discharge Permit No. NV0021911 relative to stormwater pollution abatement. Its function is closely related to review of proper conformance with requirements of the O&M Manual by the sundry entities.

For your perusal and use, please find enclosed one copy of the referenced O&M Manual. Should there be specific questions regarding Clark County's O&M functions please call Gil Suckow at (702) 455-7540. If there are other questions, please call the undersigned at (702 455-6070.

M. J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: William C Brandt
WILLIAM C. BRANDT, P.E.
Principal Civil Engineer

WCB:dfe

Enclosure

cc: Kevin Eubanks, Regional Flood Control District
M. J. Manning
Les Henley
Denis Cederburg

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CLARK COUNTY

REGIONAL FLOOD CONTROL DISTRICT

OPERATIONS AND MAINTENANCE MANUAL

Adopted: July 13, 1995

Clark County Regional Flood Control District

OPERATIONS AND MAINTENANCE MANUAL

Adopted: July 13, 1995

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

TABLE OF CONTENTS

Page

CHAPTER 1 - EXECUTIVE SUMMARY

1.10 EXECUTIVE SUMMARY 1-1

CHAPTER 2 - INTRODUCTION

2.10 BACKGROUND 2-1
2.20 AUTHORITY 2-1
2.30 RESPONSIBILITY 2-1
2.40 APPROACH 2-2
2.50 DEFINITIONS 2-3

CHAPTER 3 - POLICY STATEMENT

3.10 GOAL 3-1
3.20 POLICIES 3-1

CHAPTER 4 - PROCEDURES

4.10 FUNDING PROCEDURES 4-1
- 4.11 Purpose 4-1
- 4.12 Payment Procedures 4-1

4.20 ADMINISTRATIVE PROCEDURES 4-5
- 4.21 Purpose 4-5
- 4.22 Annual Work Plans 4-5
- 4.23 Approval of Annual Work Plan 4-8
- 4.24 Work Plan and Budget Amendments 4-8
- 4.25 Certification of Compliance 4-9
- 4.26 Interlocal Contract Document 4-9
- 4.27 Contract for Maintenance Performance 4-10

4.30 MAINTENANCE PROCEDURES 4-10
- 4.31 Purpose 4-10
- 4.32 Activities 4-11
- 4.33 Standards 4-12
- 4.34 Scheduling 4-14
- 4.35 Reporting 4-35

4.40 INVENTORY PROCEDURES 4-38
- 4.41 Purpose 4-38
- 4.42 Physical System Summary 4-38

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

LIST OF FIGURES

Figure No.	Description	Page
4-1	Funding Flow Diagram	4-2
4-2	Disbursement / Amended Budget Request	4-4
4-3	Quarterly Status Report	4-7
4-4	Sample Work Calendar	4-16
4-5	Daily Work Activity Report	4-37

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

APPENDICES

APPENDIX A: The District's Statutory Responsibility for Maintenance

APPENDIX B: Sample Authorization-To-Proceed Interlocal Contract

APPENDIX C: Sample Interlocal Contract

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 1
EXECUTIVE SUMMARY

1.10 EXECUTIVE SUMMARY

The Clark County Regional Flood Control District (District) was created under NRS 543 with responsibility to plan, construct and maintain drainage and flood control facilities throughout Clark County. In order to comply with NRS 543.340(4), this *Operations and Maintenance Manual* has been prepared through the cooperation and support of all of the affected Entities in the County. The document sets forth both policies and procedures by which the maintenance of the drainage and flood control facilities will be achieved to assure their proper working order at the time of need. The overall goal of the maintenance program as adopted by the District Board is as follows:

> *Comply with the provisions of NRS 543.340(4) and assure that facilities in the master plan are maintained in a manner that maximizes their useful life and ensures their operation at design capacity during a storm event.*

Ten policy statements were also adopted supporting the above goal.

In order to achieve the goal, and to comply with the adopted policies, the following procedures have been developed in an open and very participatory manner.

Funding Procedure - Provides for a means by which the Entities can be reimbursed for activities associated with maintenance of drainage and flood control facilities on the Master Plan provided they meet criteria as set forth in the manual.

Administrative Procedure - Provides for establishing standards and levels of service by which maintenance will be achieved. This procedure includes the steps and schedule by which an annual work plan is established and adopted by the District Board. It also provides for the certification of performance by each Entity in accordance with the annual interlocal contract. The ability for the Entity to contract maintenance activities to private contractors is also authorized under this procedure.

Maintenance Procedures - This procedure provides the specific activities under which the maintenance program is to be carried out as listed below:

ACTIVITY NUMBER	ACTIVITY NAME	WORK MEASURE UNIT
05	Inspect Channels	Miles
10	Clean and Reshape Channels	Cubic Yards
15	Repair Lined Channel	Each
20	Provide/Maintain Erosion Control	Square Feet
25	Clean and Inspect Detention/Debris Basins	Cubic Yards
30	Erosion Repair	Cubic Yards
35	Fence Repair	Linear Feet
40	Vegetation Control - Chemical	Acres
45	Vegetation Control - Mechanical	Acres
50	Maintain Access Road	Miles
55	Clean and Inspect Inlet/Outlet Structures	Each
60	Repair Inlet/Outlet Structures	Each
65	Clean Storm Sewer Lines	Linear Feet
70	Storm Sewer Repair	Repairs
75	Clean/Flush Culverts & Bridges	Each
80	Misc. Work Activities	Labor Hours
85	Engineering	Labor Hours

A specific performance standard has been developed for each activity setting forth the following elements:

- The most effective crew size.
- The kinds and number of equipment required.
- The major types of material that should be used.
- Recommended procedures for performing the work.
- An estimate of expected average daily accomplishment with standard crew size, equipment and procedures.
- Authorization and scheduling criteria.

Inventory Procedures - A critical element of any maintenance program is the identification and condition of the overall drainage and flood control system. In the case of this program, the inventory also identifies those facilities that are "eligible" for reimbursement of maintenance activities, provided the work is a part of the annual plan. Facilities eligible are those identified in the Regional Flood Control District's Master Plan and any revisions, amendments, and/or changes subsequently approved. Only those facilities that exist as Master Plan facilities, or exist in the same alignment as a proposed Master Plan facility and appurtenant facilities are eligible.

Maintenance is an ongoing and very dynamic function of a successful drainage and flood control program. This *Operations and Maintenance Manual* sets forth an initial set of policies and procedures, including the various actions required to achieve the maintenance goal. The manual will need to be updated on a regular basis to reflect fiscal implications and the experience gained as the District continuous to grow and to serve the citizens and tax payers of Clark County.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 2 INTRODUCTION

2.10 BACKGROUND

The Clark County Regional Flood Control District (District) was established in 1986 to plan, construct, and maintain drainage and flood control facilities. These responsibilities focused on alleviating the potential for flooding and protecting the lives and property of District residents. The initial phases of the District's program succeeded in preparing a Master Plan, uniform design criteria, regulatory standards, and constructing facilities. As these areas have progressed, the District, along with other agencies and Entities in the County, has oriented its efforts towards assuring adequate maintenance of flood control facilities and conveyance systems. This orientation is consistent with the vital role maintenance plays in all comprehensive flood control programs. This *Operations and Maintenance Manual* has been prepared through the District with the support and cooperation of each affected Entity. It represents a commitment to uniform flood control system standards and establishes a blueprint for a cost effective and consistent maintenance program throughout the District.

2.20 AUTHORITY

Nevada Revised Statute (NRS) 543 mandates that the District shall undertake programs for both construction and maintenance of flood control facilities. A commitment to building and maintaining flood control facilities within Clark County is reiterated in the District's *Uniform Regulations for the Control of Drainage* which states that capital improvements, operation, and maintenance are all interrelated parts of the District's overall flood control program. In accordance with NRS 543.340(4) and the Uniform Regulations, the District authorized URS Consultants to prepare a specific *Operations and Maintenance Manual*, which was adopted by the District Board on November 8, 1990. To reflect fiscal implications and experience gained, the manual was updated in 1995.

2.30 RESPONSIBILITY

The District was formed, in part, to fund and coordinate the construction and maintenance of facilities to alleviate flooding and protect the life and property of citizens within the boundaries of the District. It is the responsibility of the District to prepare and update the Master Plan for the control of floods, and manage the Regional Fund for the Control of Floods in a manner consistent with NRS 543.

2.40 APPROACH

The maintenance program must assure that the flood control projects funded by the District are maintained at a level which maximizes their useful life and assures that facilities operate to design capacity. As an interconnected network of conveyances and structures, failure of any flood control facility to operate properly may affect the performance of the overall system within a specific watershed.

Flood control facilities require regular maintenance if they are to be functional, visually attractive, and last through their design life. Accordingly, the development of a maintenance program is just as critical to the overall success of a comprehensive flood control effort as basin planning and regulation enforcement. As stormwater and flood control programs begin to address nonpoint pollution/water quality issues, the maintenance program will play an even greater role by enabling cost effective reductions in pollutant loadings to receiving waters. Finally, visibility of the program to the public, which a comprehensive maintenance program affords, is an important factor in demonstrating that flood control management is truly a full-time commitment and not simply a priority only after a storm event. The primary objectives of the District's maintenance program are:

- To develop a complete physical feature inventory for the system.
- To establish overall policies and levels of service.
- To develop operating procedures.

It is also critical that ongoing inspection and reporting procedures continue to assure all systems are ready when needed.

Due to the multiple jurisdictions involved with maintenance of the flood control system, a commitment to this program from all Entities within the Flood Control District was essential. This commitment was made through the Maintenance Technical Committee during the development of the manual in 1990. It was also recognized that coordination of this maintenance program with state transportation programs was critical. The level and consistency of the long range commitment has a direct impact on how effective the resulting maintenance system becomes. This commitment begins with a credible *Operations and Maintenance Manual.*

An essential building block for a successful flood control maintenance program in Clark County is a complete physical feature inventory of the system. It is also important to note that no maintenance program is ever truly "complete". Rather, these programs are constantly evolving as inventories are defined and standards/costs are further refined. A similar evolution is anticipated for this program. The flexibility to adjust to this evolutionary process has been built into this manual.

2.50 DEFINITIONS

In addition to the definitions of terms and phrases set forth in other District documents, the following apply to operation and maintenance:

Annual Budget: "Annual Budget" means the anticipated costs associated with completion of each activity outlined within the annual work plan submitted by each of the Entities, and ultimately approved by the District Board of Directors prior to the start of each fiscal year.

Annual Work Plan: "Annual work plan" means a plan submitted by each of the Entities setting forth the type and quantity of maintenance to be performed during the ensuing budget year in a form prescribed by the District specifically requesting funds for budgeting purposes.

Certification: "Certification" means the documentation which evidences that required maintenance by an Entity has been completed in accordance with established standards.

Maintenance Program: "Maintenance Program" means that program set annually by the Board based upon the annual work programs submitted by each Entity. The work activities undertaken through the Maintenance Program are funded and contracted for through the annual interlocal contracts between each Entity and the District. No matching funds are required, except in those cases where an arrangement has been made to cooperatively fund a particular field activity.

Maintenance work typically excludes local drainageway maintenance such as curb and gutter work, inlet maintenance, and repairs to small piped storm sewer systems. The Maintenance Program contains three broad categories of work.

Routine and/or Preventive Maintenance: "Routine and/or Preventive Maintenance" means work on existing facilities to keep them in proper working conditions, including but not limited to, debris/sedimentation removal, vegetative control, and reshaping.

Restoration: "Restoration" means the repair to existing facilities after a storm event including, erosion repair fence replacement, repairing/replacing trash racks, major debris removal, and similar "one time" work activity.

Rehabilitation: "Rehabilitation" means rebuilding a facility or conveyance after it is destroyed by an event or has deteriorated to the extent that it must be replaced "in kind" including, replacing drop structures, reshaping channels, bank protection restoration, etc. In general, the rehabilitative projects are designed by consultants and the construction contracts are awarded through a bid process.

Acceptance for Maintenance: "Acceptance for Maintenance" means that a project funded by the District, Entity, or other public/private funds is a part of the Master Plan and has been constructed in accordance with District standards and therefore eligible for maintenance funding by the District.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 3
POLICY STATEMENT

It is important that a maintenance policy statement be adopted which reflects the objectives of both the elected officials and the operations staff charged with its implemention. The initial policy document was prepared and reviewed by District staff and the Maintenance Committee. Following input from the group, it was reviewed by the respective Public Works Directors of all Entities and further revised to reflect their input. The document was then reviewed by the Technical Advisory Committee (TAC) and the Citizens Advisory Committee (CAC) before final adoption by the Board on November 8, 1990. The final adopted policy statement is as follows:

3.10 GOAL

Comply with the provisions of NRS 543.340 (4) and assure that facilities in the Master Plan are maintained in a manner that maximizes their useful life and ensures their operation at design capacity during a storm event.

3.20 POLICIES

1. Flood control facilities identified in the Master Plan are eligible for District maintenance funding.

2. As specified in the *Uniform Regulation for the Control of Drainage* Section 12.050, facilities funded through the District shall be inspected on an annual basis to assure proper maintenance has been provided.

3. In cases where funded maintenance by the lead Entity is not performed to the standards specified, the District shall perform or cause to be performed the maintenance necessary to assure proper operations of the facility. Costs incurred by the District shall be deducted from the amount authorized in the maintenance agreement between the lead Entity and the District.

4. Flood control facilities improved or constructed after adoption of this policy, must be designed in accordance with District criteria and standards to be eligible for maintenance funding.

5. Access to the facility must be guaranteed to the lead Entity and the District in order to be eligible for maintenance funding.

6. The maintenance requirements applied to these facilities shall be based on the standards contained in the District's *Operations and Maintenance Manual.*

7. The lead Entity must develop an annual work plan to be eligible for maintenance funds. Upon completion of the work, the Entity must certify that the work was completed in accordance with the standards contained in the District's *Operations and Maintenance Manual.*

8. Maintenance funding is available only for repair or maintenance of existing facilities and is not intended to supplement the District's capital improvement program. For example, if the intent of the field activity is to increase the designed capacity of a facility or conveyance, then that function is capital in nature.

9. All facilities eligible for maintenance funding must be publicly owned.

10. Funds may be provided by the District for maintenance of Master Plan facilities by outside contractors under conditions where the use of such an approach is deemed the most efficient and cost effective by the lead Entity.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

CHAPTER 4
PROCEDURES

4.10 FUNDING PROCEDURES

4.11 Purpose

This element of the *Operations and Maintenance Manual* provides the Entities with procedures for the appropriation, expenditure and reimbursement of funds to perform maintenance activities. A principle role of the District shall be to manage and disburse payments to the Entities for maintenance that is performed in compliance with the approved plans. A diagram of the funding flow is shown on **Figure 4-1**.

The District has authorized funding to assist the Entities with major drainageway maintenance in accordance with the priorities listed below:

1. First priority - District owned facilities.

2. Second priority - facilities owned by other public agencies, but totally or partly financed by District funds. (Capital Improvement and Maintenance Project)

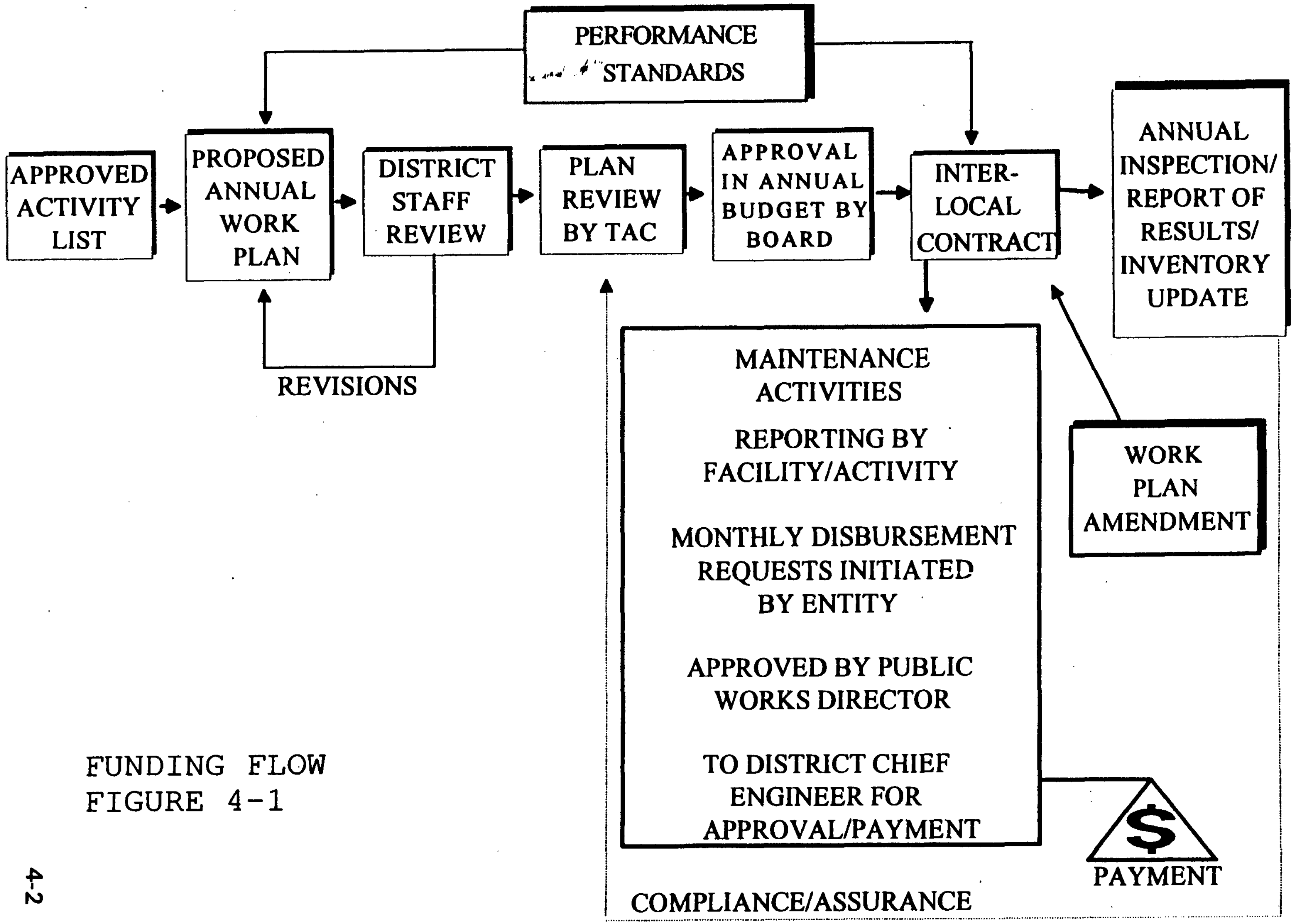
3. Third priority - facilities owned by others and constructed by others without District assistance.

4. Fourth priority - unimproved drainageways.

Projects eligible for District maintenance funding are those identified in the Regional Flood Control District's Master Plan and any revisions, amendments, and/or changes subsequently approved. Only those facilities that exist as Master Plan Facilities or exist in the same alignment as a proposed Master Plan facility, and appurtenant facilities are eligible.

4.12 Payment Procedures

Payment for work performed will be made in accordance with the annual interlocal contract executed as part of the approved work plan and the payment procedures outlined herein. The primary mechanism for reimbursements shall occur through a purchase order established between the District and each Entity. In cases where the Entity directs the District to make payments to a contractor or supplier directly, the purchase orders will be established between the District and the contractor, consultant, or supplier, at the Entity's request. Unless otherwise contained within this manual, all District *Policies and Procedures* relating to disbursement of funds and reimbursement to Entities apply.



FUNDING FLOW
FIGURE 4-1

Schedule

Disbursement requests (invoices) from each Entity may only be submitted for completed work activity and may not be submitted more than once in a 30-day period. Disbursement requests must be accompanied by a verification statement from the Entity that the work for which payment is due has been completed in accordance with the standards contained in this manual. The disbursement request must identify the Master Plan facility maintained, specific plan activity or activities for which reimbursement is sought, and separately identify personnel, equipment, and other related costs. (**Figure 4-2** represents a sample of the reporting required, and can be obtained on diskette from the District.) Administrative costs incurred by the Entity in the management of the interlocal contract are not reimbursable. Examples include cost accounting work, secretarial/clerical work, the preparation of requests for payment, and certification statements for work performed under the contract.

All invoices from the Entities requesting reimbursement to the Entity or direct payment to the Entity contractor or vendor must first be submitted to and approved by the Entity's Public Works Director or other designated responsible person in charge of the project. The Chief Engineer or designated District staff will process and approve such payments within 30 days providing the required approval has been obtained and terms of the interlocal contract have been satisfied.

Direct payments to contractors must originate from the Entity, be accompanied by a written invoice to the Entity from the contractor, and a certification of work performed by the contractor signed by the Entity.

Reporting

Monthly and annual summaries of purchase order balances, budget status, and facility expenditures shall be prepared by the District as a part of the routine financial reporting procedures to the Board.

Figure 4-2
Disbursement / Amended Budget Request

REGIONAL FLOOD CONTROL DISTRICT FACILITIES
MAINTENANCE WORK PROGRAM
FISCAL YEAR 1995/96

ENTITY: ____________________

[ ] Disbursement Request

Vendor Name: ____________________

Invoice Number: ____________________

Amount Requested: ____________________

RFCD Purchase Order #:

[ ] Amended Annual Budget Request

Approved: ____________________

General Manager/Chief Engineer   Date

Clark County Regional Flood Control District

Master Plan No./ Facility Number	____	____	____	____	____	____	____	____	____	____	TOTAL
Activity 05											0.00
Activity 10											0.00
Activity 15											0.00
Activity 20											0.00
Activity 25											0.00
Activity 30											0.00
Activity 35											0.00
Activity 40											0.00
Activity 45											0.00
Activity 50											0.00
Activity 55											0.00
Activity 60											0.00
Activity 65											0.00
Activity 70											0.00
Activity 75											0.00
Activity 80											0.00
Activity 85											0.00
											0.00

I certify that the above described maintenance was performed in accordance with the criteria/standards contained in the District's Operations and Maintenance Manual. Further, the information contained in this Disbursement Request accurately reflects those costs incurred during the performance of this work.

____
Signed   Date

4.20 ADMINISTRATIVE PROCEDURES

4.21 Purpose

The purpose of this element of the *Operations and Maintenance Manual* is to provide specific procedures for establishing standards and levels of service, preparing the annual work plan, administrating the planning, approval and enforcement elements, and updating the manual over time. The principal role of the District shall be to review and approve annual maintenance work plans and monitor the performance of work activities. The principal role of the Entities shall be development of annual work plans that are consistent with the District's approved maintenance activity list; performance of the maintenance work set forth in the approved work plans; and the submittal of quarterly reports that summarize work performance while certifying compliance with maintenance activity performance standards as set forth in the *Operations and Maintenance Manual.*

4.22 Annual Work Plans

In accordance with the schedule on the following page, each Entity shall submit a proposed annual maintenance work plan containing the following components:

Section 1	Program Summary by Maintenance Project Including Cost for Each Project
Section 2	Summary by Maintenance Activity
Section 3	Individual Maintenance Projects Showing Narrative, Location Map, Work Activities, Results, Costs

District staff shall review the proposed plans and work with the Entities to resolve any discrepancies found with District maintenance standards and policy objectives. After the initial staff review, the plans shall be forwarded to the Technical Advisory Committee. Lastly, the plans will be incorporated in the annual District budget and submitted to the Board for final approval.

The activities in the work plan shall be consistent with the District's approved activity list for maintenance of flood control and drainage facilities. Work plans should also describe locally funded work activities that may be linked to the District maintenance work activities to show overlapping areas of responsibility for personnel and equipment. Where local personnel and equipment are going to be used to perform both District funded activities and locally funded activities, the Entity will describe how these resources are to be managed and the procedures for tracking costs related to both sets of activities.

Entities may contract for the performance of maintenance work activities. The proposed work plan must specify that a contractor is to be utilized and the time frame for selection of a contractor. In the event that maintenance work is performed under contract, the contract must specify that the District has the authority to inspect all work performed under the contract and approve or deny payments to contractors based on inspection findings.

All work performed must comply with District approved maintenance activity performance standards as set forth in subsequent sections of this Manual. The Entity is required to inspect Master Plan facilities annually, including any maintenance work performed by Entities on Master Plan Facilities, and shall notify the District prior to the annual inspection of completed maintenance work. Entities shall facilitate the inspection of maintenance work by the District. The District may withhold funding, require additional maintenance work, or seek repayment of disbursed funds when an inspection reveals that work activities were not performed in conformance with activity performance standards.

Schedule

February 1	-	Submittal of preliminary work plan proposal to District staff for review, recommendations, and coordination with entities.
April 10	-	Submittal of the Entities' final annual work plans, budgets, and interlocal contracts to TAC, CAC, and to the Board for final approval and authorization of the interlocal contracts.
July 1	-	Beginning of maintenance plan contract period.

Reporting

Each Entity will submit quarterly reports indicating the status of the work completed under the current fiscal year's program (**Figure 4-3**). The reports are due 30 days after the close of the quarter, and will be submitted to the Board for review. Also, each Entity shall submit an annual 4certification to the District stating that all work contained in the work plan and reimbursed through the interlocal contract has been performed to the specifications established in this manual.

Figure 4-3
Sample Quarterly Status Report

REGIONAL FLOOD CONTROL DISTRICT
MAINTENANCE WORK PROGRAM
QUARTERLY STATUS REPORT - FY 1995/96

Entity: ______________________ Date Prepared: ______________
Facility: ______________________

Force Account/ Contract	Activity	Approved Work Plan Amount ($)	Amended Work Plan Amount ($)	Percent Complete	Scheduled Completion Date
	5 Inspect Channels				
	10 Clean and Reshape Channels				
	15 Repair Lined Channel				
	20 Provide/Maintain Erosion Control				
	25 Clean & Inspect DetentionDebris Basins				
	30 Erosion Repair				
	35 Fence Repair				
	40 Vegetation Control - Chemical				
	45 Vegetation Control - Mechanical				
	50 Maintain Access Road				
	55 Clean & Inspect Inlet/Outlet Structures				
	60 Repair Inlet/Outlet Structures				
	65 Clean Storm Sewer Lines				
	70 Storm Sewer Repair				
	75 Clean/Flush Culverts & Bridges				
	80 Miscellaneous Work Activities				
	85 Engineering				
	TOTALS	$0	$0		

Delays or Problem Areas:

Work to be Completed During Current Quarter:

Work to be Completed during Next Quarter:

Consultant/
Contractor: ______________________
Project
Manager: ______________________ Phone Number: ______________

4.23 Approval of Annual Work Plan

The work plans received by the District will be reviewed and budget requests compiled into a summary showing the dollar amount by Entity for each of the priority areas set forth in **Section 4.11.** The Chief Engineer shall review the total maintenance budget requests against the District's proposed annual total budget for facility maintenance and make a recommendation to the District as to the amount of maintenance funds to be disbursed to each respective Entity based upon equity and need.

Once the Technical Advisory Committee has reviewed the maintenance work plans and budget appropriation recommendation, the Chief Engineer will forward the compiled summary to the Board for consideration and approval as a key element of the Annual District Budget.

Schedule

The Entities will submit the proposed work plan to the Chief Engineer as outlined in **Section 4.22.**

Reporting

The Chief Engineer's report to the District Board shall show both the budget requested by the agency and the recommended amount to be appropriated, the report will also make comments on any adjustments made to the initial request.

4.24 Work Plan and Budget Amendments

Requests for amendments to approved work plans and budgets must be submitted to the Chief Engineer in writing. The amendment request must specify the work elements affected, describe the reasons for the amendment request, and describe the impact of the proposed amendment on the affected work plan objectives.

Formal approval of work plan and/or budget amendments requiring a reallocation of funds between facilities must be obtained from the Chief Engineer prior to submittal of payment requests. (See **Figure 4-2.**) The Entity shall also notify District staff of work plan and/or budget amendments within a facility. Requests requiring an increase in the overall work plan budget must be submitted to the Board for approval with a supplemental interlocal contract for the amended work in accordance with **Section 4.6** of the District *Policy and Procedures Manual.*

Schedule

Amendment requests shall be reviewed by District staff and responded to in writing within 15 days of receipt of the original request. Work plan amendments which require an increase in the Entity's annual budget will require submittal of an item and supplemental interlocal contract for approval by the District Board of Directors.

Reporting

Annual certification of results will include addressing all amendments made to the annual work plan.

4.25 Certification of Compliance

It is the intent of the District to rely to the maximum extent possible on the Entities to carry out the maintenance activities and comply "voluntarily" with the procedures and standards set forth in this manual. The District shall from time to time inspect facilities funded by the District or those on the Master Plan to assure compliance with the interlocal contract. Each Entity shall submit an annual certification to the District stating that all work contained in the work plan and reimbursed through the interlocal contract has been performed to the specifications established in this manual. This certification shall be signed by the person executing the interlocal contract or designee. The certification should summarize proposed and actual plan accomplishments. It should also describe any major maintenance problems that have implications for the District as a whole, such as significant deterioration of major conveyance system components, or the failure of system components to perform as intended, and suggest revisions to the activity list provisions.

Schedule

The certification and final payment requests shall be submitted to the District within 30 calendar days of the termination of the annual interlocal contract for maintenance funding.

Reporting

The certification shall be brief and may be in the form of a letter.

4.26 Interlocal Contract Document

The performance of work outlined in the approved maintenance plan shall be guided by an interlocal contract entered into annually between the District and each Entity. Sample contracts are contained in **Appendices B and C**. Major provisions of the contract include: the adoption of the Board approved work plan as the document outlining the work to be performed; references to the performance standards, reimbursement and payment procedures, and plan amendment procedures outlined in this manual for governing maintenance work performance evaluations, and contract amendments; and a requirement for submittal of an annual certification of results.

Schedule

All Entities will enter into an "annual" interlocal contract in conjunction with adoption of the District and respective agency budgets.

Reporting

Reporting requirements will be as prescribed in the respective interlocal contracts.

4.27 Contract for Maintenance Performance

Where, in the opinion Entities, it appears to be most cost effective (or due to an emergency) to utilize the services of private contractors to perform maintenance functions, the Entity shall solicit bids from qualified contractors in compliance with their statutory procedures for the necessary work. The Entity will provide to the District copies of bid specifications and bid tabulation as well as copies of the respective contract documents. All expenditures must comply with NRS 332, Local Government Purchasing Act, NRS 338, the Public Works Act, and all relevant statutes, rules, regulations, and policies.

Schedule

All contracts for maintenance services shall be bid on an annual basis or for a specific projection location.

Reporting

The Entity shall advise the District in advance that they intend to utilize a private contractor (may be included as part of annual work plan). They shall also provide a summary of work performed, as well as a statement of inspection, as a part of the request for reimbursement to the Entity or directly by the District to the contractor.

4.3 MAINTENANCE PROCEDURES

4.31 Purpose

As a part of the overall operations and maintenance procedures adopted by the District, an outline for specific maintenance procedures has been developed. The accepted maintenance procedures are centered around specific elements of a management system for field maintenance, and include defined maintenance activities, standards, scheduling, and reporting procedures.

Due to the diversity in physical features among the various agencies involved, and the varied resources employed in maintenance activities, it is essential to treat these procedures as general guidelines which must be tailored to meet the situation at hand. It is also essential that these procedures remain dynamic, be actively reviewed, and periodically updated. An annual review is recommended.

4.32 Activities

Maintenance work activities identify all major maintenance work and include all activities which are performed frequently and in amounts that make them a significant part of the total work program. Each activity must be clearly defined so maintenance personnel at all levels of management uniformly understand the operation to be performed and the type of deficiency to be corrected.

Personnel who plan, schedule, perform, report, or evaluate maintenance work must know what each work activity means. Work activities are used for the following purposes:

- Planned maintenance work is identified in the annual maintenance work plan by activity name and number.
- Activity names and numbers are used for authorizing, assigning, and reporting work.
- Activity names and numbers are used on work scheduling guides and work performance summaries.

Work measurement units are established for the major maintenance activities. For example, "Acres Covered" is the work measurement unit for vegetation control while "Cubic Yards Removed" is the work unit for cleaning and reshaping channels. These measurement units are used to describe how much work is planned and to report how much work is accomplished for each activity.

For some activities, specific work measurement units--other than labor hours--would not be meaningful. For example, the miscellaneous maintenance activity includes a number of different operations. This activity cannot be measured by a common unit other than labor hours.

Following is the accepted maintenance activity list for the District including work measure units.

ACTIVITY NUMBER	ACTIVITY NAME	WORK MEASURE UNIT
05	Inspect Channels	Miles
10	Clean and Reshape Channels	Cubic Yards
15	Repair Lined Channel	Each
20	Provide/Maintain Erosion Control	Square Feet
25	Clean and Inspect Detention/Debris Basins	Cubic Yards
30	Erosion Repair	Cubic Yards
35	Fence Repair	Linear Feet
40	Vegetation Control - Chemical	Acres
45	Vegetation Control - Mechanical	Acres
50	Maintain Access Road	Miles
55	Clean and Inspect Inlet/Outlet Structures	Each
60	Repair Inlet/Outlet Structures	Each
65	Clean Storm Sewer Lines	Linear Feet
70	Storm Sewer Repair	Repairs
75	Clean/Flush Culverts & Bridges	Each
80	Misc. Work Activities	Labor Hours
85	Engineering	Labor Hours

4.33 Standards

"Performance Standards" have been established for each of the major maintenance work activities. These performance standards specify:

- The most effective crew size.
- The kinds and number of equipment required.
- The major types of material that should be used.
- Recommended procedures for performing the work.
- An estimate of expected average daily accomplishment with standard crew size, equipment and procedures.
- Authorization and scheduling criteria.

Following is an item-by-item description of the format of the performance standards.

1. Activity Identification/Date. The activity number and name are shown as well as the "effective date" of the performance standard--to be used when updating or replacing performance standards.

2. Description and Purpose. The Description and Purpose section of the performance standards explains the work activity and the kinds of defects to be corrected or reasons for doing the work.

3. Authorized By and Work Control Category. The level of management responsible for authorizing the work is identified. Certain activities requiring special equipment, coordination, or expertise are Engineer-authorized activities and should not be scheduled or performed without the Engineer's approval.

   The type of control to be placed on the quantity of work performed is identified. This control is unlimited or limited in terms of the amount of work done (accomplishment) or the amount of labor input (crew-day).

4. Performance Criteria. This section includes important information for the "scheduler" about when to schedule the work and for the crew leader to identify the work to be done.

5. Crew Size. The crew size outlines the numbers of personnel needed to do the work. The crew size is based on average conditions. Sometimes, there will be a need to add or delete people to satisfy special traffic safety conditions or hauling requirements.

6. Equipment. The basic requirements for major pieces of equipment are listed. Situations such as the breakdown or unavailability of equipment or special materials hauling requirements may require the addition, deletion or substitution of equipment.

7. Materials. The materials section includes a list of the major materials to be used for the activity.

8. Work Method. The work method outlines, step-by-step, the recommended procedures for performing the work. Each step should be performed in order to correctly maintain the feature as well as provide the quality of work desired.

9. Average Daily Production. The average daily production is an estimate of the amount of work a crew can accomplish during a day using the recommended crew size, equipment, materials and work method. This estimate is shown as a range and should be attainable over a period of time. Some days the accomplishment may be more or less than the estimate, but eventually, the average should fall in line.

10. Notes. Any other relevant, helpful information or instructions.

Use of Performance Standards

Maintenance supervisory personnel should become thoroughly familiar with these performance standards. It is important that the performance standards be used when making assignments and performing work. Some situations will require deviation from the performance standards--such as more or less flagmen or additional haul trucks. These situations are recognized, and crew leaders are expected to consider such situations when organizing and managing their activities.

Haul truck needs should be determined using factors such as haul distance and time estimates (spot, dump, load, and cycle times.)

The performance standards also provide guidance and a measure for supervisors to use when evaluating work in progress and completed.

Field personnel are in the best position to identify new or better work methods or difficulties with the current performance standards. These suggestions for improvements or questions should be directed to the crew leader or supervisor.

The performance standards should be reviewed and updated annually. If other changes occur that require more frequent review and update or development, the performance standards can be changed to suit these needs.

4.34 Scheduling

The objectives of work scheduling are:

- To do the planned amount of work.
- To perform the work when it should be done.
- To do the work where it should be done.
- To use the proper people, equipment and supplies to do the work.

Three tools are available to help supervisors meet these objectives. The WORK PROGRAM defines the estimated amount of work and the estimated labor-days required for each activity to provide the desired levels of service; a WORK CALENDAR helps to establish when the various activities should be done; and the PERFORMANCE STANDARDS provide information about quantity standards, personnel requirements and how much work can be done in a given time.

The annual work program establishes the kinds and amount of work to be done during the year and the resources that will be required to do that work. This annual plan needs to be broken into a monthly plan for effective scheduling of work and to permit timely evaluations of work program performance.

The process of "distributing" the annual work load throughout the year is done by allocating a part of the work (in labor-hours, by activity) to specific months. Some types of work -- emergency or service activities -- must be done throughout the year as the need arises. Other types of work must be done on a regularly scheduled basis -- such as preventive maintenance work. Finally, some types of work can be done during certain periods but can be shifted from one month to the other, and still other work can be done almost any time during the year.

These factors must be considered when distributing the different types of work. Preventive maintenance and other types of work which must be performed on a regularly scheduled basis are distributed so as to level labor power needs as much as possible. Finally, work which can be performed any time is distributed to those months with the fewest labor-days. In this way, staffing needs are kept as uniform as possible resulting in more efficient use of available labor power.

A work calendar lists -- activity by activity -- the labor-hours for each month. These labor-hours are used in conjunction with the work program annual work quantities for work scheduling and the preparation of periodic Activity Status Reports. A sample work calendar is included on **Figure 4-4**.

Once the work program and staffing levels have been set, the work load distribution can be finalized and the calendar prepared to summarize/communicate the planned monthly distribution of the work program.

Work scheduling is the process of using the Work Calendar and specific scheduling procedures to plan ahead, establish work priorities and accomplish the work.

The performance standards outlined in the previous sections apply to corrective and preventive maintenance activities. These procedures are not as rigid or foolproof as implied by the description. Equipment breakdowns, emergencies, or bad weather will disrupt a schedule -- but part of the scheduling process is to be aware that these situations will occur and to be prepared to respond with little or no difficulty. Because of these situations, supervisors should not expect to accomplish all of the work as scheduled. Generally, a supervisor can consider his scheduling efforts to be successful if 75 to 80 percent of the scheduled work is completed as planned.

Figure 4-4
Sample Work Calendar

REPORT NO.		YEAR CY 1996	WORK MANAGEMENT SYSTEM										DATE 07/01/96		PAGE 1

WATER UTILITY DEPARTMENT

WORK CALENDAR

MANAGEMENT UNIT
VALVE/HYDRANT

ACTIVITY NO	ACTIVITY NAME	SUB UNIT	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	CREW DAYS
2010	INSTALL HYDRANT	0	1	1	1	1	1	2	2	2	1	1	1	1	15
2020	REPLACE HYDRANT	0	7	6	8	4	7	6	7	6	4	6	7	7	75
2030	REMOVE HYDRANT	0												4	4
2040	REPAIR HYDRANT	0	2	2	2	2	2	1	1	1	1	2	2	2	20
2041	REPAIR HYDR-OT	0	1		1	1		1	1		1	1		1	8
2050	RELOCATE HYDRANT	0	2	6	2	5	6	7	2	2	7	1	5		45
2060	ADJUST HYDRANT	0	2	1	4	1	4	4	1		1		1	1	20
2100	FLOW TEST HYD	0	8	8	8	8	8	8	8	8	8	8	8	8	96
2110	HYDRANT P M	0	15	14	17	15	15	13	14	17	18	17	13	16	184
2120	FLUSH SYSTEM	0	38	38	37	37	37	37	38	38	37	37	38	38	450
2210	INSTALL NEW VALVE	0	5	4	6	6	2	10	7	3		3	2	2	50
2220	REPLACE VALVE	0	10	12	16	6	10	6	6	6	4	14	6	4	100
2230	REPAIR VALVE	0	12	12	12	10	12	12	12	10	12	12	12	12	140
2231	REPAIR VALV-OT	0		1	1	1	1	1	1	1	1	1	1		10
2240	LOCA/REF VALVES	0	20	22	20	35	20	20	10	20	25	25	23	10	250
2300	EXERC LGE VALVES	0	9	8	9	9	9	9	8	9	9	9	9	8	105
2310	VALVE P M	0	6	6	6	6	6	6	6	6	6	6	4	5	69
2320	SYSTEM SHUTDOWN	0	7	2	5	4	5	4	3	4	3	6	5	4	52
2410	TST NEW VLV (SHOP)	0	1	1	1	1	1	1	1	1	1	1	1	1	12
2420	RENEW VLV/HYD (SHOP)	0	2	2	2	3	3	3	3	3	2	2	2	2	29
2510	TANK MAINT-GROUND	0				1	1	1	1	1					5
2520	TANK MAINT-HIGH	0			1	1	1	1	1	1	1	1	1	1	10
3300	MISC WORK ACTS	0	6	6	6	6	6	6	6	6	6	6	6	6	72

Following are some additional hints or techniques to consider:

- It is not necessary to "formally schedule" the daily, routine activities. It is necessary, however, to regularly check the work reports and accomplishments to verify the distribution of work assignments. A periodic review and adjustment of the work assignments may be necessary to maintain a "balanced work load."

- It is usually best to prepare a schedule (and work assignments) assuming everything will work as planned -- no equipment breakdowns, no emergencies, etc. But make sure a backlog of "alternate" work is available so that little time is wasted when adjustments to the schedule must be made.

- Some guidelines for identifying alternate work:

  + Low priority work that needs to be done, but not necessarily during the next week or so.

  + Work that does not require special equipment or a lot of preparation time.

  + Preventive maintenance on light equipment.

- Take time to estimate the amount of work needed and the number of hours required to do the work. Good estimates will improve the scheduling process significantly. The performance standards, inspections and sound judgment based on experience all help the estimating process.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
05	INSPECT CHANNELS	7/95

DESCRIPTION & PURPOSE

Inspect both improved and unimproved flood channels for proper cross-section, sedimentation, debris and erosion damage, in order to schedule cleaning or repairs as needed.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Perform complete inspection of channels on an annual basis and after major storm events.

CREW SIZE

- 1 Crew Supervisor
-
-
-
- 1 TOTAL

EQUIPMENT

- 1 Pickup
-
-
-
-
-

WORK METHOD

1. Use safety devices, as required.
2. Visually inspect channels for cross-section, sediment, debris, erosion, and vegetation.
3. Prioritize a list of channels requiring maintenance.
4. Schedule cleaning of channels referring to prioritized list.

MATERIAL

-
-
-
-
-
-

AVERAGE DAILY PRODUCTION

8 miles/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
10	CLEAN & RESHAPE CHANNELS	7/95

DESCRIPTION & PURPOSE

Mechanical silt, vegetation, and debris removal, and reshaping of unlined channels to restore adequate flow.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Improved earth channels should be scheduled for cleaning and reprofiling on an annual schedule, or as appropriate following a flood event. Natural channels on a 3-year cycle.

CREW SIZE

- 2 Equipment Operators
- 1 Truck Driver
- .5 Foreman
-
- 3.5 TOTAL

EQUIPMENT

- 1* 10-wheel Dump Truck
- 1 Scraper
- 1 Gradall
-
-
-

WORK METHOD

1. Set up safety devices as required.
2. Remove silt and vegetation.
3. Load and haul removed material to proper disposal site.
4. Reshape channel.
5. Clean up work site.
6. Remove safety devices.

MATERIAL

- Disposal Fees
-
-
-
-
-

AVERAGE DAILY PRODUCTION

300 Cubic Yards/day

NOTES:

*Schedule sufficient trucks to insure maximum utilization of excavation equipment.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
15	REPAIR LINED CHANNELS	7/95

DESCRIPTION & PURPOSE

Repair of damaged concrete, rip rap, gabion, or other channel linings, retaining walls, etc., to restore to original condition and prevent further deterioration.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Repairs of channel linings, retaining walls, and other structures critical to the protection of a facility are to be scheduled immediately upon detection of damage.

CREW SIZE

- 1 Maintenance Foreman
- 2 Maintenance Workers
-
-
- 3 TOTAL

EQUIPMENT

- Pickup
- Flatbed Dump
- Concrete Mixer

WORK METHOD

1. Obtain from storekeeper safety equipment, materials, tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Clean and prepare damaged area.
4. Build and place forms as necessary.
5. Place and finish concrete.
6. Remove forms and back fill.

MATERIAL

- Assorted lumber
- 6-30 bags sacked concrete
- 3-15 tons concrete gravel mix
- 2-10 CY ready-mix concrete

AVERAGE DAILY PRODUCTION

1 Each/Day

NOTES:

Crew size and equipment may vary significantly depending on urgency, extent and complexity of repair.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
20	PROVIDE / MAINTAIN EROSION CONTROL	7/95

DESCRIPTION & PURPOSE

Placement of rip rap, sand bags, or other erosion control materials and repair of damaged areas of erosion protection to restore material to original condition. This work is done to prevent further deterioration and eliminate potential erosion problems.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Work is to be scheduled when damage or deterioration is severe enough to present potential erosion problems. Erosion undercutting roadways, sidewalks, or prepared embankments/improvements shall be repaired immediately. Repair of undermined stabilizers shall be scheduled immediately.

CREW SIZE

- 1 Foreman
- 2 Equipment Operators
- 2 Maintenance Workers
-
- 5 TOTAL

EQUIPMENT

- 1 Truck Crane
- -or- Backhoe
- 1 Dump Truck
- 1 Pickup

WORK METHOD

1. Obtain from storekeeper safety equipment, materials and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Shape work area to receive riprap, or other erosion control materials.
4. Place material and grout where applicable.
5. Back fill as necessary.

MATERIAL

- 20-50 Tons Rock for riprap (delivered)
- 5-12 yards ready mix concrete (if needed)
- 5,000-15,000 gal Water

AVERAGE DAILY PRODUCTION

1300 Square Feet/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
25	CLEAN & INSPECT DETENTION/DEBRIS BASINS	7/95

DESCRIPTION & PURPOSE

Inspection and removal, by loader (including hauling and disposal), of sediment and debris deposited in detention and debris basins to restore full capacity and original shape.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Remove sediment bi-annually or when debris basins or dams detention capacity is significantly reduced. Clean out is normally justified when the sedimentation reaches 1 to 2 feet in depth or as established by the design.

CREW SIZE

- 1 Foreman
- 3 Equipment Operators
- 1 Maintenance Worker
-
- 5 TOTAL

EQUIPMENT

- 1 Pickup
- 1 Loader
- 2* Dump Trucks
-
-
-

WORK METHOD

1. Obtain from storekeeper safety equipment, materials and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Prepare removal and disposal sites for access.
4. Stockpile material for removal.
5. Load material and haul to designated disposal site.
6. Shape dam or basin to desired line and grade.
7. Grade disposal site as necessary.

MATERIAL

- Disposal Fees
-
-
-
-
-

AVERAGE DAILY PRODUCTION

1000 Cubic Yards/day

NOTES:

*Schedule sufficient trucks to insure maximum utilization of excavation equipment.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
30	EROSION REPAIR	7/95

DESCRIPTION & PURPOSE

The replacement and compaction of material removed by erosion, using hand tools or other methods, to restore Flood Control channels, supporting embankments, levees or access roads.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

As needed when damage has occurred which has affected or will affect the structural integrity of a channel embankment, levee, or access road,at a location where mechanical methods cannot be used.

CREW SIZE

- 1 Foreman
- 2 Maintenance Workers
-
-
- 3 TOTAL

EQUIPMENT

- 1 1-Ton Dump
- -or- Flatbed
- 1 Air Compressor w/compactor
- 1 Pickup w/Water Tank
- -or- Auxiliary Spray Truck

WORK METHOD

1. Obtain from storekeeper safety equipment, materials, and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Remove debris and growth from damage location.
4. Haul fill material from pre-determined source.
5. Place and compact fill material in lifts.
6. Shape repair area to conform to adjacent areas.
7. Clean up work area as necessary.

MATERIAL

- 15-30 Tons Select Fill Material
-
-
-
-
-

AVERAGE DAILY PRODUCTION

15 Cubic Yards

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
35	FENCE REPAIR	7/95

DESCRIPTION & PURPOSE

The repair and/or re-establishment of downed or damaged fences to restore fence to proper condition and to provide right-of-way control.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Repair of downed or open fence areas to be performed upon detection. Repairs to damaged locations that remain partially functional are to be scheduled in priority with other work.

CREW SIZE

- 2 Maintenance Workers
-
-
-
- 2 TOTAL

EQUIPMENT

- 1 Fence Truck
- 1 Concrete Mixer (if needed)
-
-
-
-

WORK METHOD

1. Obtain from storekeeper safety equipment, materials and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Perform necessary repairs to:
   - Posts
   - Fabric
   - Top rail

MATERIAL

- 40-50 Linear Ft Fence Fabric
- Miscellaneous Hardware
- 5 bags "Readycrete"
-
-
-

AVERAGE DAILY PRODUCTION

100 Linear Feet/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
40	VEGETATION CONTROL - CHEMICAL	7/95

DESCRIPTION & PURPOSE

The application of herbicides, to designated areas, with a boom-mounted spray bar to prevent new growth and/or control existing vegetation, for the purpose of insuring the capacity and integrity of Flood Control facilities.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Spray pre-emergence herbicide and post-emergence herbicide annually to designated areas combining applications where possible.

CREW SIZE

- 2 Maintenance Workers
-
-
-
- 2 TOTAL

EQUIPMENT

- 1 Truck-mounted chemical tank with spray bar and hand sprayer
-
-
-

MATERIAL

- Pre 12.5-25 lb/Ac
- Emerg Contact: 12.5-25 lb/Ac
- Post Brush: 120 lb/Ac
- Emerg Grass: 30 lb/Ac
- Waterweed: 1 gal/Ac
- Spreader: 1 gal/Ac
- Water 200 gal/Ac

WORK METHOD

1. Set up safety devices as required.
2. Treat channel areas as required.
3. Remove safety devices.

AVERAGE DAILY PRODUCTION

Acres

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
45	VEGETATION CONTROL - MECHANICAL	7/95

DESCRIPTION & PURPOSE

The mechanical removal of brush and weeds to maintain detention, debris basins, and channels free of vegetation.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Work to be scheduled when weeds and willows grow up at unsprayable locations, or when growth is too high for effective spraying.

CREW SIZE	WORK METHOD
▪ 1 Equipment Operator ▪ ▪ ▪ ▪ 1 TOTAL	1. Obtain from storekeeper safety equipment, materials, and tools necessary for the day's work. 2. Begin applicable safety procedures and/or traffic control. 3. Mow, blade down, or turn under unwanted vegetation.
EQUIPMENT	
▪ 1 Mower or Grader ▪ 1 Tilt Trailer (if needed) ▪ 1 Pickup ▪ ▪ ▪	
MATERIAL	**AVERAGE DAILY PRODUCTION**
▪ ▪ ▪ ▪ ▪ ▪	4 Acres/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
50	MAINTAIN ACCESS ROADS	7/95

DESCRIPTION & PURPOSE

Mechanical grading of access roads to remove minor ruts and erosion,and restore normal shape and cross slope, for access to Flood Control facilities.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

As needed prior to rainy season, or when the weather affects the road condition. Plan to re-profile access roads on a bi-annual (two year) frequency.

CREW SIZE

- 2 Equipment Operators
- 1 Maintenance Workers
-
-
- 3 TOTAL

EQUIPMENT

- 1 Grader
- 0-1 Water Truck
- 0-1 Roller
- 1 Pickup
-
-

WORK METHOD

1. Obtain from storekeeper equipment and tools necessary for the day's work.
2. Begin applicable safety procedures and/or traffic control.
3. Grade access roads:
   - Restoring X-section shape
   - Filling potholes
   - Grading out ruts
   - Restoring ditches and drainage.
4. Roll and compact regraded.

MATERIAL

- 10,000 Gal Water (if needed)
-
-
-
-
-

AVERAGE DAILY PRODUCTION

.5 Mile/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
55	CLEAN & INSPECT INLET/OUTLET STRUCTURES	7/95

DESCRIPTION & PURPOSE

Cleaning and inspection of catch basins, inlets, sumps, grates, outflow and other structures to remove silt and debris and to inspect for structural integrity and proper functioning.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan for structures to be inspected and cleaned a minimum of once per year. Annual cleaning shall be the major effort to allow thorough inspection of structure in order to schedule repairs.

CREW SIZE

- .25 Foreman
- 2 Maintenance Workers
-
-
- 2.25 TOTAL

EQUIPMENT

- 1 1-Ton Truck
- 1 Water Tanker (1500 gal)
- -or-
- 1 High Pressure Vacuum (Vactor)
- Appropriate Hand Tools

WORK METHOD

1. Perform daily vehicle P.M. check and check equipment.
2. Place signs/traffic control devices as required.
3. Locate truck in the best working position and as far off roadway as practical.
4. Remove grate. Then remove debris, trash & sediment from grate.
5. Loosen solids with spade if necessary.
6. Flush/vacuum basin.
7. Inspect structure visually to determine if further cleaning or repair is necessary.
8. Dispose of debris at designated dump site.
9. Check and clean equipment after use.

MATERIAL

- Water

AVERAGE DAILY PRODUCTION

15 Each/day

NOTES:

Structures that cannot be cleaned shall be reported to the Maintenance Supervisor for initiation of corrective action.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
60	REPAIR INLET / OUTLET STRUCTURES	7/95

DESCRIPTION & PURPOSE

Repair of catch basins, grates, inlets, control gates, outfalls, weirs, manholes, sumps, and other spot structures to restore elements to their original operational condition.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Based on detailed inspection of repair, replace components, or entire structure as conditions warrant. Plan repair of five percent (5 %) of system structures per year.

CREW SIZE

- 1 Foreman
- 2 Maintenance Workers
- 3 TOTAL

WORK METHOD

1. Obtain necessary safety equipment, tools, and materials.
2. Initiate applicable safety procedures and traffic control.
3. Remove and clean area of damage/failure.
4. Repair as necessary to original condition and test operation as appropriate.

EQUIPMENT

- 1 Pickup
- 1 Compressor w/accessories

MATERIAL

- Concrete
- Aggregates
- Miscellaneous parts, as required

AVERAGE DAILY PRODUCTION

1 Each/day

NOTES:

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
65	CLEAN STORM SEWER LINES	7/95

DESCRIPTION & PURPOSE

The removal of debris of any type from within conduits by: flushing with water; the use of a sewer cleaning machine; or by physically entering the conduit and manually removing debris, to restore full capacity.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan cleaning of storm sewer lines on an average 5-year cycle. Specific areas may require annual cleaning while others will require less than 5-year cleaning.

CREW SIZE	WORK METHOD
■ 1 Maintenance Foreman ■ 2 Maintenance Workers ■ ■ ■ 3 TOTAL	1. Obtain from storekeeper safety equipment and tools necessary for the day's work. 2. Begin applicable safety procedures and/or traffic control. 3. Remove debris from conduit. 4. Load debris and haul to designated disposal site if necessary. 5. Clean up work area as necessary.

EQUIPMENT
■ 1 Sewer Cleaner ■ ■ ■ ■ ■

MATERIAL	AVERAGE DAILY PRODUCTION
■ 0-5,000 Gallons Water ■ ■ ■ ■ ■	1500 linear feet/day

NOTES:

Work should be scheduled whenever possible, in conjunction with annual cleaning of adjacent structures.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
70	STORM SEWER LINE REPAIR	7/95

DESCRIPTION & PURPOSE

Excavation and repair of storm sewer lines to eliminate blockages and repair failed pipes.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Priority of repairs:
1. eliminate blockages and hazards to public safety;
2. remove flow restrictions and repair damaged/failed pipe sections.

CREW SIZE	WORK METHOD
■ 1 Foreman ■ 1 Equipment Operator ■ 2 Maintenance Workers ■ ■ 4 TOTAL	1. Set up warning signs and traffic control devices. 2. Take necessary measures to control flow -- providing uninterrupted service whenever possible. 3. Cut pavement and/or excavate to the extent required to determine necessary scope of repairs. 4. Remove flow restrictions, as necessary. 5. Back fill and compact in lifts to within 10 inches of surface. 6. Place select material (rock or shell) and compact to within 2 inches of surface* (See Note below.) 7. Coordinate density test and request repaving as required. 8. Clean work area. Remove signs and warning devices. 9. Record work accomplishment.
EQUIPMENT	
■ 1 Dump Truck ■ 1 Backhoe/Util Tractor ■ 1 Air Compressor w/accessories ■ Appropriate Hand Tools ■ ■	

MATERIAL	AVERAGE DAILY PRODUCTION
■ Pipe/fittings ■ Sand ■ Cement ■ Rock ■ Asphalt, as required ■	1 Repair/day

NOTES:

Verify location of other utilities prior to excavation.
*Back fill specifications apply to paved areas. In easements and other unpaved areas, back fill and compact in 2-foot lifts to grade; re-sod as necessary. Install safety fence and secure job site at end of workday as required.

PERFORMANCE STANDARD

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
75	CLEAN / FLUSH CULVERTS & BRIDGES	7/95

DESCRIPTION & PURPOSE

Cleaning/flushing of culverts and bridges to remove silt and debris, and eliminate restriction to flow.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan for all culverts to be cleaned/flushed annually.

CREW SIZE

- 1 Maintenance Supervisor
- 1 Maintenance Worker
-
-
- 2 TOTAL

EQUIPMENT

- 1 1-Ton Dump Truck
- 1 Water Tanker (1500 gal)
- -or- High Pressure/Vacuum cleaner/Vactor
- Safety Equipment
- Appropriate Hand Tools

WORK METHOD

1. Place signs and safety devices.
2. Locate truck in best working position and as far off roadway as possible.
3. Clean out ends of culvert.
4. Flush culverts until flow is unrestricted.
5. Load excess material/debris into truck for disposal at designated dump area.
6. Pick up signs and safety devices.

MATERIAL

- Water
-
-
-
-
-

AVERAGE DAILY PRODUCTION

5-7 Each/Day

NOTES:

1. Inform Maintenance Supervisor of any non-cleanable culverts or those that can only be partially cleaned.
2. Avoid damaging downstream property when flushing culverts.
3. Work should be scheduled, whenever possible, in conjunction with annual cleaning of adjacent structures.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
80	MISCELLANEOUS WORK ACTIVITIES	7/95

DESCRIPTION & PURPOSE

All work performed that is not described in previous activities. This includes, among others, activities such as catwalk repair, rodent control, pump maintenance, concrete spalled area repair, painting, building and grounds maintenance, trash pickup*, graffiti abatement, sign installation and maintenance.

AUTHORIZED BY	LIMITS ON WORK
Maintenance Supervisor	

PERFORMANCE CRITERIA

Plan 8 labor hours per channel mile per year for miscellaneous maintenance work.

CREW SIZE	WORK METHOD
▪ 1 Maintenance Worker ▪ ▪ ▪ ▪ 1 TOTAL	1. Obtain from storekeeper safety equipment, materials, and tools necessary for the day's work. 2. Begin applicable safety procedures and/or traffic control.
EQUIPMENT	
▪ 1 Pickup ▪ Hand tools ▪ ▪ ▪ ▪	
MATERIAL	**AVERAGE DAILY PRODUCTION**
▪As required ▪ ▪ ▪ ▪ ▪	8 Labor Hours

NOTES:

*Includes appliances, tires, car bodies, and other large objects dumped in channels/basins.

PERFORMANCE STANDARD

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

ACTIVITY NUMBER	NAME	DATE
85	ENGINEERING	7/95

DESCRIPTION & PURPOSE

All work that is by nature engineering. This includes, among others, surveying and preparation of plans and specifications for maintenance work.

AUTHORIZED BY	LIMITS ON WORK
Director of Public Works for designee	

PERFORMANCE CRITERIA

CREW SIZE	WORK METHOD
■ N/A ■ ■ ■ ■ TOTAL	1. As deemed most cost effective.
EQUIPMENT	
■ N/A ■ ■ ■ ■ ■	
MATERIAL	**AVERAGE DAILY PRODUCTION**
● N/A ■ ■ ■ ■ ●	8 Hours/Day

NOTES:

4.35 Reporting

Comprehensive maintenance programs include procedures for reporting and summarizing work accomplished and labor-hours used for maintenance activities. This information enables managers and supervisors to compare actual performance with the planned work program. These planned-actual comparisons -- on a regular basis -- are essential for effective management and control of the work program.

The reporting procedures provide specific information:

- What Master Plan facility required work.
- What work was done by activity.
- How much of each activity was done.
- The labor-hours used to accomplish the work.

This information is used by managers in their effort to:

- Make sure the right kinds and amounts of maintenance work are done.
- Identify the problem areas and related corrective actions.
- Develop future work programs and budgets.
- Identify opportunities for improved productivity.

The work reporting process can consist of a simple form as outlined in the following section.

Daily Work Activity Report

The Daily Work Activity Report may be used to record and summarize (1) the kinds and amounts of work performed by maintenance personnel, and (2) the number of labor-hours used to do that work. The report can be used to summarize all work activities. Each Entity may use its standard accounting/reporting procedures for the Daily Work Activity Report.

The Maintenance Supervisor or crew leader usually prepares the Daily Work Activity Report. Following are instructions for the completion of the sample report shown on **Figure 4-5**.

1. Identification Data -- Fill in all blanks: the Entity, date, name of person preparing the report, and the names and employee numbers of all persons to perform work to be reported for the day. (The form provides for several combinations of activities and employees. If additional pages are needed, number the pages accordingly).

2. Master Plan Facility Number - Enter the specific 4 digit-4 letter Master Plan Facility number (and reach, if possible). (This number directly corresponds to the specific Master Plan location as identified on current MP maps.)

3. MWP Facility Number - Enter the identifying Maintenance Work Plan facility number. (This number directly corresponds to the budget approved for the facility and will typically include a range of Master Plan facilities and reach.)

4. Activity Number -- Enter the number of each activity performed. Use the Work Activity Directory or Performance Standards to complete the blank.

5. Employee Number - Enter the employee number of the person working a specific activity at the specific facility.

6. Hours Worked by Each Employee -- Record the number of hours worked by each employee, by the appropriate activity. Record the time spent to the nearest quarter-hour. For example, record 1 hour and 45 minutes as 1.75 hours and 3 hours and 20 minutes as 3.25 hours.

7. Equipment Number -- Enter the assigned equipment number for any mechanical equipment on which work was performed for preventive and corrective maintenance only.

8. Work Performed -- Enter the location and a brief description of the work performed.

9. Accomplishment -- Measure and record the amount of work done on each activity. Use the correct measurement unit for each activity -- see the Activity Directory.

   Record the amount of work done to the nearest whole unit. Record labor-hours to the nearest hour. For activities with labor-hours as the unit of measure, the "quantity" will be exactly the same as "total hours" for the activity.

10. Notes/Comments -- Record any additional relevant information that may be of use in summarizing and analyzing work activity data.

The completed reports can be used for monthly summarization and report preparation, and serve as completion certification backup for the monthly force account reimbursement billings.

REGIONAL FLOOD CONTROL DISTRICT FACILITIES DAILY WORK ACTIVITY REPORT

ENTITY: ____________________

Date Work Performed: ____________________ 19____

Supervisor Name: ____________________

Employee Name: ____________________ No.______

Employee Name: ____________________ No.______

Employee Name: ____________________ No.______

Employee Name: ____________________ No.______

Employee Name: ____________________ No.______

Master Plan Facility Number	MWP Facility Number	Activity Number Worked	Empl. Number	Hours Worked by Activity	Equip. Number Used	Work Performance (Location, Brief Description, Materials Used, Etc.)	Accomplishment	
							Amount	Unit of Measure

NOTES/COMMENTS: ____________________

The undersigned hereby certifies that the above described maintenance was performed in accordance with the criteria/standards contained in the District's Operations and Maintenance Manual. *Further, that the information contained herein accurately reflects the time and accomplishments reported during the performance of this work.*

Supervisor's Signature ____________________ Date ____________________ Title ____________________

Page ____ of ____

Figure 4-5
Sample Daily Work Activity Report

4.40 INVENTORY PROCEDURES

4.41 Purpose

The purpose of this element of the *Operations and Maintenance Manual* is to provide a record of the existing physical flood control system that is eligible for maintenance funding assistance by the District. The physical facilities that make up the collection and conveyance system have in many instances been paid for in whole or part by the District, however, they are not "owned" or operated, let alone maintained by the District. If, however, the total flood control system does not function properly when needed, it is ultimately the responsibility of the District to determine why and to take corrective action. A critical key to assuring the system functions properly is an up-to-date inventory of the physical system.

4.42 Physical System

In 1990, each agency provided a list of measurable quantities that make up the flood control system in their jurisdiction. Facilities eligible are those identified in the Regional Flood Control District's Master Plan and any revisions, amendments, and/or changes subsequently approved. Only those facilities that exist as Master Plan facilities, or exist in the same alignment as a proposed Master Plan facility and appurtenant facilities are eligible.

<u>Schedule</u>

The inventory work sheets must be expanded to represent a true and accurate accounting of facilities on the Master Plan and tributary (drainage) systems and updated as a part of the annual certification process.

<u>Reporting</u>

The Entities should submit annual updates of the physical system inventory on the form required by the District.

4.43 Physical System Maps

Each Entity must have a map that shows the physical system for drainage and flood control. This map should reflect that portion that is on the Master Plan and also that portion that is eligible for maintenance funding by the District.

<u>Schedule</u>

The individual Entities should submit to the District updated maps annually, or more frequently as project completion dictates, reflecting the size, location and material elements of their drainage and flood control system. The update should show those systems that are eligible for Flood Control District funding under the categories shown in **Section 4.11** of this manual.

<u>Reporting</u>

The system update should be provided or maps provided by the District and be in a form that is readily reproducible.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT OPERATIONS AND MAINTENANCE MANUAL

APPENDIX A

THE DISTRICT'S STATUTORY RESPONSIBILITY FOR MAINTENANCE

Adopted: July 13, 1995

Key Statutory and Regulatory References

– Flood Control Facility Maintenance –

NEVADA REVISED STATUTE - CHAPTER 543 CONTROL OF FLOODS

543.340 Meeting; quorum; written policies and procedures.

1. In addition to the requirements of NRS 543.330, the board may meet at such time or times and at such regular meeting place within the district as it determines by resolution.

2. Special meetings may be held on notice to each member of the board as often as, and at such place or places within the district as, the needs of the district require.

3. A majority of the members of the board constitutes a quorum at any meeting.

4. The board shall adopt written policies and procedures for administering the district and for operating and maintaining its projects and improvements.

UNIFORM REGULATIONS FOR THE CONTROL OF DRAINAGE

12.050 Construction/Operation/Maintenance

Construction, operation and maintenance of Master Plan facilities shall be the responsibility of the Lead Entity as described in the most recent edition of the District's *Policy and Procedures Manual* and delineated in the interlocal contract between the District and Lead Entity. The District may also function as the Lead Entity for construction, operation and maintenance of Master Plan facilities.

The role of the District and Lead Entity in funding regular maintenance of the facility shall be established through the interlocal contract formed as part of the District's policies and procedures for facility funding. Maintenance shall be performed in compliance with the most recent edition of the *Operations and Maintenance Manual*.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
OPERATIONS AND MAINTENANCE MANUAL

APPENDIX B

SAMPLE AUTHORIZATION TO PROCEED INTERLOCAL CONTRACT

SAMPLE AUTHORIZATION-TO-PROCEED

INTERLOCAL CONTRACT
ANNUAL MAINTENANCE WORK PROGRAM

THIS CONTRACT, made and entered into this ____ day of ___________, 19____, by and between the [legal name of CITY or COUNTY], a political subdivision of the State of Nevada, hereinafter referred to as "CITY" (or "COUNTY"), and the CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT, hereinafter referred to as "DISTRICT".

W I T N E S S E T H:

WHEREAS, pursuant to Chapter 543 of the Nevada Revised Statutes, the DISTRICT may approve and fund projects to maintain flood control improvements; and

WHEREAS, the CITY (or COUNTY) desires to maintain flood control improvements within the CITY (or COUNTY) in accordance with the maintenance program set forth herein, and hereinafter referred to as "Project"; and

WHEREAS, the facilities upon which maintenance will be done are facilities described in the District's Master Plan.

NOW, THEREFORE, in consideration of the covenants, conditions, agreements, and promises of the parties hereto, the DISTRICT authorizes the Project as it is mutually understood and agreed as follows:

SECTION I - SCOPE OF PROJECT

This Interlocal Contract applies to the maintenance of flood control facilities, which are identified in the District's Master Plan facilities including updates and amendments subsequently approved. The basic maintenance to the facilities will be in accordance with performance standards set forth in the current District *Operations and Maintenance Manual.*

The Project is more specifically described in Exhibit "A" which is attached hereto and by this reference incorporated herein.

SECTION II - PROJECT COSTS

The DISTRICT agrees to provide reimbursement for Project costs within the limits specified below:

1. The Projects costs shall not exceed $.

The amounts allocated to each individual facility within the Project must be specified in **Exhibit "A"**. Any changes to said allocated amounts must be approved by the DISTRICT's Chief Engineer in accordance with **Section 4.24** of the District *Operations and Maintenance Manual.*

2. "Authorization to Proceed" is herein granted for maintenance of facilities in Exhibit "A" in an amount not to exceed __________, effective ________________.

3. A separate request for an "Authorization to Proceed" will be required for additional facility maintenance funds.

4. A written request must be made to the DISTRICT and a Supplemental Interlocal Contract approved to increase the amount noted above prior to payment of any additional funds.

5. The CITY (or COUNTY) and DISTRICT will comply with **Section 4.12** of the *Operations and Maintenance Manual.* In accordance with said manual the CITY (or COUNTY) shall submit invoices together with a detailed summary report of the maintenance service performed. The CITY (or COUNTY) shall submit an invoice voucher in the manner prescribed by the DISTRICT. The vouchers shall include such information as is necessary for the DISTRICT to determine the nature of all expenditures. Each voucher will clearly indicate that it is for services rendered in performance under this contract. Each voucher will also be accompanied by a written certification from the CITY (or COUNTY) stating that it is for performance of maintenance activities under this contract and is composed of completed elements set forth in the annual work program.

All invoices must be submitted for payment to:

Clark County Regional Flood Control District
301 E. Clark Avenue, Suite 301
Las Vegas, Nevada 89101
Attn: General Manager/Chief Engineer

Payment shall be considered timely if made by the DISTRICT within 30 days. Pursuant to **Section IV, Paragraph 6,** the DISTRICT may, in its sole discretion, withhold payments to the CITY (or COUNTY) for services rendered if the CITY (or COUNTY) fails to satisfactorily comply with any term or condition of this contract and/or the District *Operations and Maintenance Manual.*

SECTION III - PROJECT TIME

The CITY (or COUNTY) agrees to perform the Project to the satisfaction of the DISTRICT on or before June 30, 19__. The DISTRICT may grant extensions or terminate this contract and require all sums advanced to the CITY (or COUNTY) to be repaid if the CITY (or COUNTY) fails to perform by said date.

SECTION IV - GENERAL

1. The CITY (or COUNTY) will complete the Project as set forth in **Exhibit "A"**. The CITY (or COUNTY) staff personnel responsible for coordination work under this contract are as listed below:

(list names and titles of CITY or COUNTY staff)

It is understood that staff named above will be responsible for work coordination throughout the period of this contract unless the DISTRICT is informed in writing of changes in these personnel assignments.

2. In addition to the specific terms set forth in this Contract, the parties hereto shall be subject to and governed by the District *Operations and Maintenance Manual*, and any applicable portions of the *Policies and Procedures* adopted by the DISTRICT.

3. It is the intent of the DISTRICT that scheduling of maintenance and repair of drainage and flood control facilities in general and Master Plan Facilities specifically be coordinated among entities. Therefore, in those cases where Master Plan approved, and District-

funded projects have regional fund control significance impacting more than one entity, the CITY (or COUNTY) will allow all impacted entities an opportunity to review the maintenance schedule in order to coordinate maintenance efforts.

4. The Chief Engineer of the DISTRICT shall be responsible for monitoring the performance of the CITY (or COUNTY), approval for payment of billings and expenses submitted by the CITY (or COUNTY) and the acceptance of any report provided by the CITY (or COUNTY). The CITY (or COUNTY) shall be responsible for monitoring performance of CITY (or COUNTY) staff or private contractors, and the CITY (or COUNTY) shall maintain detailed records of all payments made to contractors and make such records available to the DISTRICT upon request.

5. The CITY (or COUNTY) shall provide right of access to its facilities to the DISTRICT or Chief Engineer at all reasonable times, in order to monitor and evaluate performance, compliance, and/or quality assurance under this contract.

6. In the event the CITY (or COUNTY) fails to perform the maintenance according to the standards specified in this contract and in the District *Operations and Maintenance Manual*, the DISTRICT may perform or cause to be performed the maintenance necessary to assure proper operation of the facility. Cost incurred by the DISTRICT shall be reimbursed by the CITY (or COUNTY) or be deducted from the amount authorized by this contract. The DISTRICT may not exercise this right without giving the CITY (or COUNTY) specific written notice of the maintenance required and allowing the CITY (or COUNTY) 60 days within which to perform said maintenance. The notice required by this provision must be sent to:

(insert name of City or County staff)
(insert title)
insert City or County mailing address)

7. The records of the CITY (or COUNTY) and/or private contractors pertaining to the subject matter of this contract shall at all reasonable times be subject to inspection and audit by the DISTRICT or an Agent of the DISTRICT.

8. If any provision of this contract shall be deemed in conflict with any statute or rule of law, such provision shall be deemed modified to be in conformance with said statute or rule of law.

9. All parties to this contract shall comply with applicable local, state, and federal laws.

10. Any costs found to be improperly allocated in the Project will be refunded by the CITY (or COUNTY) to the DISTRICT.

11. It is specifically understood and agreed to by and between the parties hereto that it is not intended by any of the provisions of any part of this contract to create in the public or any member thereof a third party beneficiary hereunder, or to authorize anyone not a party to this contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this contract.

12. The CITY (or COUNTY) hereby indemnifies and shall defend and hold harmless the DISTRICT, its representatives and their employees (or their authorized representatives) from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, attorney's fees, costs and expenses whatsoever of any kind or nature whether arising before or after completion of the work hereunder and in any manner directly or indirectly caused, occasioned or contributed to in whole or in part, by reason of any act, omission, fault or negligence whether active or passive of the CITY (or COUNTY), of anyone acting under its direction or control, or on its behalf in connection with or incident to

the performance of this Contract. The CITY'S (or COUNTY'S) aforesaid indemnity and hold harmless obligations, or portions or applications thereof, shall apply to the fullest extent permitted by law, but in no event shall they apply to liability caused by the sole negligence or willful misconduct of the party indemnified or held harmless.

IN WITNESS WHEREOF, the parties have caused this contract to be executed the day and year first above written.

Date of District Action: REGIONAL FLOOD CONTROL DISTRICT

BY:
Chairman

ATTEST:

Secretary to the Board

Approved as to Form:

BY:
Deputy District Attorney

****

Date of Council Action: CITY (or COUNTY) OF
(or Commission Action)

BY:
(Mayor or Board Chairman)

ATTEST:

City (or County Clerk)

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT OPERATIONS AND MAINTENANCE MANUAL

APPENDIX C
SAMPLE INTERLOCAL CONTRACT

Adopted: July 13, 1995

SAMPLE

INTERLOCAL CONTRACT
ANNUAL MAINTENANCE WORK PROGRAM

THIS CONTRACT, made and entered into this ____ day of ___________, 19____, by and between the [legal name of CITY or COUNTY], a political subdivision of the State of Nevada, hereinafter referred to as "CITY" (or "COUNTY"), and the CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT, hereinafter referred to as "DISTRICT".

W I T N E S S E T H:

WHEREAS, pursuant to Chapter 543 of the Nevada Revised Statutes, the DISTRICT may approve and fund projects to maintain flood control improvements; and

WHEREAS, the CITY (or COUNTY) desires to maintain flood control improvements within the CITY (or COUNTY) in accordance with the maintenance program set forth herein, and hereinafter referred to as "Project"; and

WHEREAS, the facilities upon which maintenance will be done are facilities described in the District's Master Plan.

NOW, THEREFORE, in consideration of the covenants, conditions, agreements, and promises of the parties hereto, the DISTRICT authorizes the Project as it is mutually understood and agreed as follows:

SECTION I - SCOPE OF PROJECT

This Interlocal Contract applies to the maintenance of flood control facilities, which are identified in the District's Master Plan facilities including updates and amendments subsequently approved. The basic maintenance to the facilities will be in accordance with performance standards set forth in the current District *Operations and Maintenance Manual.*

The Project is more specifically described in Exhibit "A" which is attached hereto and by this reference incorporated herein.

SECTION II - PROJECT COSTS

The DISTRICT agrees to provide reimbursement for Project costs within the limits specified below:

1. The Projects costs shall not exceed $______________________________.

The amounts allocated to each individual facility within the Project must be specified in **Exhibit "A"**. Any changes to said allocated amounts must be approved by the DISTRICT's Chief Engineer in accordance with **Section 4.24** of the District *Operations and Maintenance Manual..*

A written request must be made to the DISTRICT and a Supplemental Interlocal Contract approved to increase the amount noted above prior to payment of any additional funds.

2. The <u>CITY (or COUNTY)</u> and DISTRICT will comply with **Section 4.12** of the *Operations and Maintenance Manual.* In accordance with said manual the <u>CITY (or COUNTY)</u> shall submit invoices together with a detailed summary report of the maintenance service performed. The <u>CITY (or COUNTY)</u> shall submit an invoice voucher n the manner prescribed by the DISTRICT. The vouchers shall include such information as is necessary for the DISTRICT to determine the nature of all expenditures. Each voucher will clearly indicate that it is for services rendered in performance under this contract. Each voucher will also be accompanied by a written certification from the <u>CITY (or COUNTY)</u> stating that it is for

performance of maintenance activities under this contract and is composed of completed elements set forth in the annual work program.

All invoices must be submitted for payment to:

Clark County Regional Flood Control District
301 E. Clark Avenue, Suite 301
Las Vegas, Nevada 89101
Attn: General Manager/Chief Engineer

Payment shall be considered timely if made by the DISTRICT within 30 days. Pursuant to **Section IV, Paragraph 6**, the DISTRICT may, in its sole discretion, withhold payments to the CITY (or COUNTY) for services rendered if the CITY (or COUNTY) fails to satisfactorily comply with any term or condition of this contract and/or the District *Operations and Maintenance Manual.*

SECTION III - PROJECT TIME

The CITY (or COUNTY) agrees to perform the Project to the satisfaction of the DISTRICT on or before June 30, 19__. The DISTRICT may grant extensions or terminate this contract and require all sums advanced to the CITY (or COUNTY) to be repaid if the CITY (or COUNTY)fails to perform by said date.

SECTION IV - GENERAL

1. The CITY (or COUNTY) will complete the Project as set forth in **Exhibit "A"**. The CITY (or COUNTY) staff personnel responsible for coordination work under this contract are as listed below:

(list names and titles of CITY or COUNTY staff)

It is understood that staff named above will be responsible for work coordination throughout the period of this contract unless the DISTRICT is informed in writing of changes in these personnel assignments.

2. In addition to the specific terms set forth in this Contract, the parties hereto shall be subject to and governed by the District *Operations and Maintenance Manual*, and any applicable portions of the *Policies and Procedures* adopted by the DISTRICT.

3. It is the intent of the DISTRICT that scheduling of maintenance and repair of drainage and flood control facilities in general and Master Plan Facilities specifically be coordinated among entities. Therefore, in those cases where Master Plan approved, and District-funded projects have regional fund control significance impacting more than one entity, the CITY (or COUNTY) will allow all impacted entities an opportunity to review the maintenance schedule in order to coordinate maintenance efforts.

4. The Chief Engineer of the DISTRICT shall be responsible for monitoring the performance of the CITY (or COUNTY), approval for payment of billings and expenses submitted by the CITY (or COUNTY) and the acceptance of any report provided by the CITY (or COUNTY). The CITY (or COUNTY) shall be responsible for monitoring performance of CITY (or COUNTY) staff or private contractors, and the CITY (or COUNTY) shall maintain detailed records of all payments made to contractors and make such records available to the DISTRICT upon request.

5. The CITY (or COUNTY) shall provide right of access to its facilities to the DISTRICT or Chief Engineer at all reasonable times, in order to monitor and evaluate performance, compliance, and/or quality assurance under this contract.

6. In the event the CITY (or COUNTY) fails to perform the maintenance according to the standards specified in this contract and in the District *Operations and Maintenance Manual,* the DISTRICT may perform or cause to be performed the maintenance necessary to assure proper operation of the facility. Cost incurred by the DISTRICT shall be reimbursed by the CITY (or COUNTY) or be deducted from the amount authorized by this contract. The DISTRICT may not exercise this right without giving the CITY (or COUNTY) specific written notice of the maintenance required and allowing the CITY (or COUNTY) 60 days within which to perform said maintenance. The notice required by this provision must be sent to:

(insert name of City or County staff)
(insert title)
insert City or County mailing address)
____

7. The records of the CITY (or COUNTY) and/or private contractors pertaining to the subject matter of this contract shall at all reasonable times be subject to inspection and audit by the DISTRICT or an Agent of the DISTRICT.

8. If any provision of this contract shall be deemed in conflict with any statute or rule of law, such provision shall be deemed modified to be in conformance with said statute or rule of law.

9. All parties to this contract shall comply with applicable local, state, and federal laws.

10. Any costs found to be improperly allocated in the Project will be refunded by the CITY (or COUNTY) to the DISTRICT.

11. It is specifically understood and agreed to by and between the parties hereto that it is not intended by any of the provisions of any part of this contract to create in the public or any member thereof a third party beneficiary hereunder, or to authorize anyone not a party to this contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this contract.

12. The CITY (or COUNTY) hereby indemnifies and shall defend and hold harmless the DISTRICT, its representatives and their employees (or their authorized representatives) from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, attorney's fees, costs and expenses whatsoever of any kind or nature whether arising before or after completion of the work hereunder and in any manner directly or indirectly caused, occasioned or contributed to in whole or in part, by reason of any act, omission, fault or negligence whether active or passive of the CITY (or COUNTY), of anyone acting under its direction or control, or on its behalf in connection with or incident to the performance of this Contract. The CITY'S (or COUNTY'S) aforesaid indemnity and hold harmless obligations, or portions or applications thereof, shall apply to the fullest extent permitted by law, but in no event shall they apply to liability caused by the sole negligence or willful misconduct of the party indemnified or held harmless.

IN WITNESS WHEREOF, the parties have caused this contract to be executed the day and year first above written.

Date of District Action: REGIONAL FLOOD CONTROL DISTRICT

_______________________________ BY: _______________________________

ATTEST: Chairman

____

Secretary to the Board

Approved as to Form:

BY: _______________________________

Deputy District Attorney

****

Date of Council Action: CITY (or COUNTY) OF ________
(or Commission Action)

_______________________________ BY: _______________________________

ATTEST: (Mayor or Board Chairman)

____

City (or County Clerk)

SAMPLE

Exhibit A

ANNUAL MAINTENANCE WORK PLAN SUMMARY

PART I

Summary of overall work plan listing specific projects and associated costs attributable to each.

PART II

Facility map(s) which identify location of planned maintenance work by project.

PART III

Summary of work plan broken into maintenance activities to be completed, with associated costs, for all projects identified in Part I.

KLEINFELDER

FINAL DESIGN GEOTECHNICAL INVESTIGATION
PROPOSED HIKO SPRINGS WASH
DETENTION BASIN
LAUGHLIN, NEVADA
31-128118

August 31, 1994

REGISTERED PROFESSIONAL ENGINEER
WALTER E.
VANDERPOOL
CIVIL
No.

9/2/94

Prepared For: Black & Veatch Engineers, Inc.
1900 East Flamingo Road, Suite 295
Las Vegas, Nevada 89119

Attention: Mr. Steve Canney, P.E.

Walter E. Vanderpool, P.E.
Senior Engineer

Alan E. Money, P.E.
Geotechnical Engineering Manager

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THIS DOCUMENT WAS PREPARED FOR USE ONLY BY THE CLIENT, ONLY FOR THE PURPOSES STATED, AND WITHIN A REASONABLE TIME FROM ITS ISSUANCE. PLEASE READ THE "LIMITATIONS" SECTION OF THIS REPORT.

TABLE OF CONTENTS

		Page No.
1.0	**INTRODUCTION**	1-1
1.1	GENERAL	1-1
1.2	PROJECT DESCRIPTION	1-1
2.0	**FIELD EXPLORATION**	2-1
2.1	DRILLING EXPLORATION	2-1
2.2	TRENCH EXPLORATION	2-1
2.3	IN SITU INFILTRATION TESTS	2-4
2.4	SUPPLEMENTAL TRENCH SAMPLING (MAY 1994)	2-5
3.0	**LABORATORY TESTING**	3-1
3.1	GENERAL	3-1
3.2	GRAIN SIZE ANALYSES	3-1
3.3	DIRECT SHEAR TESTS	3-2
3.4	PERMEABILITY TESTS	3-2
3.5	OPTIMUM MOISTURE/MAXIMUM DENSITY TESTS	3-3
3.6	SOIL CEMENT DURABILITY TESTS	3-3
3.7	SPECIFIC GRAVITY TEST	3-5
3.8	CORROSION TEST	3-5
4.0	**GENERAL SITE CONDITIONS**	4-1
4.1	SURFACE CONDITIONS	4-1
4.2	SUBSURFACE CONDITIONS	4-2
5.0	**GEOLOGIC CONDITIONS**	5-1
5.1	GEOLOGIC SETTING	5-1
5.2	SEISMICITY	5-1
5.3	TECTONIC FAULTS	5-1
6.0	**ENGINEERING ANALYSES AND RECOMMENDATIONS**	6-1
6.1	GENERAL	6-1
6.2	SITE PREPARATION AND GRADING	6-1
6.3	EMBANKMENT	6-2
	6.3.1 Strength Parameters	6-2
	6.3.2 Seepage	6-3
	6.3.3 Fill Placement	6-3
	6.3.4 Settlement	6-4

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1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical investigation, materials testing and final design review for the Hiko Springs Wash Detention Basin. The site is located in the town of Laughlin in Clark County, Nevada The purposes of this field exploration, laboratory testing program and engineering analyses were to:

- Evaluate geologic characteristics of the site;
- Explore the subsurface soil conditions of the site;
- Obtain representative soil samples from the explorations;
- Perform field tests to characterize the subsurface conditions;
- Perform laboratory tests to verify field observations and evaluate engineering characteristics of the soils sampled;
- Provide geotechnical engineering analysis and recommendations for use in design and construction of the detention basin and discharge channel.
- Evaluate the quality of on-site and locally available materials for use in soil cement and roller compacted concrete.

The recommendations contained in this report are subject to the limitations presented herein. Attention is directed to the limitations section of this report. In addition, a brochure prepared by ASFE (The Association of Firms Practicing in the Geosciences) has been included following this report. We recommend that all individuals reading this report also read the attached document.

1.2 PROJECT DESCRIPTION

The proposed detention basin is located in Sections 16, 17, 20 and 21; Range 66 East; Township 32 South; Clark County, Nevada. The proposed construction will consist of a large

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earth fill embankment, overflow spillway structure and controlled drawdown system through the embankment.

The detention basin embankment will consist of a compacted earth fill with a maximum fill height of 82 feet above existing site grade. The embankment design, based on hydraulic considerations, consists of an earth fill with a spillway crest elevation of 1077.5 feet above mean sea level (MSL) and a spillway crest length of approximately 550 feet. An embankment with a crest at elevation 1086 feet MSL is planned at each abutment to prevent overtopping during a PMF and provide freeboard against wave action.

An inlet structure, sealed conduit and outlet structure will be constructed through the embankment at approximately existing site grade in the basin (approximately 1000 feet MSL). It is our understanding that the detention basin will be designed to drain from the spillway crest pool elevation to the controlled drawdown inlet elevation in a 48-hour period.

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2.0 FIELD EXPLORATION

2.1 DRILLING EXPLORATION

Subsurface conditions of the site were explored by drilling a total of 17 borings to depths ranging from 21 to 71 feet below existing site grade. Four of the borings were located in the detention basin up-stream from the proposed embankment. Ten of the borings were located at approximately 250 foot centers along the proposed embankment axis. Three borings were located down stream from the embankment axis in the area of the overflow spillway. The borings were located so as to obtain a profile of the subsurface soils at the site. The borings were drilled during the period from January 12, 1991 to February 1, 1991.

Drilling was accomplished with a truck mounted drill equipped for soil sampling. The borings were advanced by rotary-air and rotary-wash methods. Soil samples were obtained from the borings using a 2.6 inch (I.D.) thick walled sampler driven by a 350 pound hammer free falling through a distance of 30 inches and by bulk methods. Sampler driving resistance, expressed as "blows per foot of penetration", is presented on the boring logs at the sampling point. The soil samples were visually classified by our field geologist during sampling. Representative portions of each sample were packaged and transported to our laboratory for testing. Logs of the subsurface conditions as encountered in the borings, were recorded at the time of drilling. Logs of the borings, penetration test results, natural moisture content test results, dry density test results, and a summary of laboratory tests performed are presented on Plates A-1 through A-17. Elevations shown on the boring logs represent the ground surface elevation in feet above mean sea level based upon interpolation of topographic maps.

2.2 TRENCH EXPLORATION

Subsurface conditions at the site were explored by excavating a total of 17 trenches in addition to the borings. One of the trenches (T-7) was located at west end of the detention basin embankment center line. Six of the trenches were located up-stream from the embankment

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alignment in an area of possible borrow material. The remaining ten trench explorations were located at approximately 1000 foot intervals along the proposed channel alignment from the detention basin embankment to the Colorado River. The trench explorations were excavated to depths of 8 to 12 feet below existing site grade. The trenches were located to obtain a profile of the subsurface conditions across the site and to obtain large representative samples for laboratory testing. The trench explorations were excavated on January 11 and 14, 1991 using a rubber-tired backhoe with a 2 foot wide bucket. Representative soil samples were obtained from the trench explorations by bulk methods. The soils encountered were visually classified by the field geologist during excavation. Representative soil samples obtained from the trenches were packaged and transported to our laboratory for testing.

Logs of the subsurface conditions encountered during trenching and a summary of the tests performed are presented on the trench logs, Plates A-18 through A-34, following the text of this report. Natural moisture content test results for samples from the trench explorations are presented on Table No. 2.2-1, below.

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Table 2.2-1: Trench Exploration Moisture Test Results (1991 Data) (ASTM D-2216)

Location	Depth (feet)	Moisture Content Percent (%) by Weight
T-1	1.0	0.7
T-1	11.0	0.3
T-2	0.0	1.6
T-2	1.5	0.2
T-2	9.5	0.8
T-3	0.0	0.4
T-3	3.0	0.3
T-3	8.0	0.3
T-5	4.0	0.8
T-5	9.0	0.6
T-6	0.0	1.5
T-6	1.5	0.3
T-6	7.5	0.3
T-6	10.5	0.3
T-7	0.0	3.4
T-7	9.0	0.6
T-8	6.5	0.2
T-8	9.0	0.6
T-9	5.0	0.1
T-10	5.0	0.3
T-10	9.0	0.3
T-11	6.0	0.1
T-11	9.0	0.2
T-12	3.0	0.4
T-12	9.0	0.7
T-13	0.0	1.7
T-13	8.0	0.2
T-14	8.5	0.2

The elevations shown on the trench logs represent the ground surface elevation at the exploration location based on interpolation of topographic maps.

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2.3 IN SITU INFILTRATION TESTS

Five in situ infiltration tests were performed in the soil profile beneath the proposed embankment. The test location and depth was selected to provide a profile of seepage characteristics in the area of the proposed embankment.

Each test location was prepared by drilling a 6-inch diameter hole to the depth of the proposed test zone. Where possible the boring was drilled by rotary-air methods or rotary wash methods utilizing clear water as the drilling fluids. Due to caving soils it was necessary to utilize polymer drilling fluids, to hold the boring open at some locations.

The borings were prepared for testing by installing a 2-inch diameter PVC pipe with a five foot slotted well screen section at the test depth. The annular region around the slotted section of pipe was back filled with gap graded sand to the top of the slotted section. A two foot low permeability Bentonite seal was constructed above the sand layer. The remainder of each boring was backfilled with cuttings from the borings.

The infiltration test procedure consisted of filling the two inch diameter pipe until full, then adjusting the flow rate to maintain the pipe full throughout the test period. The addition of water at each test location was continued until the infiltration rate was relatively constant after a minimum one hour test period. Results from the field infiltration tests are presented on table No. 2.3-1, below.

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Table 2.3-1: In Situ Infiltration Rate Tests Results (1991 Data)				
Location	Depth to Bottom of Screen (feet)	Screen Length (feet)	Test Head (feet)	Infiltration Rate (gal./ft.^{2} min.)
B-5	40	5	42.5	3.8
B-7	25	5	27	1.15
B-9	70	5	74	0.08
B-14	15	5	17.7	1.15
B-15	15	5	18	0.38

2.4 SUPPLEMENTAL TRENCH SAMPLING (MAY 1994)

The detention basin site was revisited on May 27, 1994 to obtain representative large bulk samples for testing and analyses in soil cement and Roller Compacted Concrete (RCC) mix designs. Representative soil samples were obtained with a backhoe at: three locations in the detention basin area, one location on the alluvial fan above the basin at the southeast corner of the site and from one stockpile of processed aggregate at the South Point Properties, Inc. (Bilbray Pit) site. The 1994 trench sampling points were located approximately as shown on Black & Veatch Plan, Sheet 3. The samples were collected from one to five feet below existing grade at the detention basin site and from a processed stockpile at the Bilbray Pit.

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3.0 LABORATORY TESTING

3.1 GENERAL

Representative soil samples from the borings and trenches were tested in our laboratory to evaluate pertinent engineering properties. The laboratory testing program was directed toward; soil classification by gradation and Atterberg limits, evaluation of "undisturbed" and remolded shear strength characteristics, permeability characteristics of remolded representative soil samples, evaluating natural moisture content and dry density of "undisturbed" soil samples and optimum moisture content/maximum dry density relationship for compacted soil. The corrosion characteristics of representative soils were evaluated by laboratory tests performed by Atlas Chemical Testing Laboratories. These 1991 laboratory test results are presented in Appendix B.

The soil samples collected in May 1994 were tested for: grainsize distribution, Atterberg Limits, optimum moisture content/maximum dry density and durability in RCC and soil cement mix designs. The test results from the supplemental sampling and testing are presented in Appendix C.

The laboratory testing program and test results are described in the following sections.

3.2 GRAIN SIZE ANALYSES

Thirty-eight sieve analyses tests were performed on representative soil samples from the 1991 explorations. The sieve analyses were performed in accordance with American Society for Testing and Materials, Test Method ASTM D-2487. All of the soil samples tested were found to be non-plastic by ASTM Test Method 4318. The sieve analyses test results are presented on Plates B-1 through B-13. Grainsize analyses tests were performed on the four samples from the site and one sample of processed rock obtained in May 1994. These supplemental test results are presented on Plates C-1 through C-3 in Appendix C.

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3.3 DIRECT SHEAR TESTS

Twelve direct shear tests were performed on "undisturbed" and remolded soil samples from the explorations. The seven soil samples from trench explorations were remolded prior to testing. The five soil samples from boring explorations were tested in an "undisturbed" condition. One sample was saturated prior to testing (B-8 at 25.0 feet). The remolded samples were tested at a moisture content near or slightly below optimum moisture content for compaction. The four remaining soils samples were tested at the natural moisture content. The shearing rate was selected based on sieve analyses test results so that drained conditions were maintained during testing. The tests were performed in accordance with ASTM Test Method D-3080. The test results are presented on Plates B-15 through B-19.

3.4 PERMEABILITY TESTS

Four remolded permeability tests were performed on representative soil samples from trench explorations in the anticipated borrow area. The soil samples were compacted to 88 to 92 percent of their respective maximum dry density (ASTM D-1557) at a moisture content near the optimum for compaction. The permeability test results are presented on Table No. 3.4-1, below.

Table 3.4-1: Laboratory Permeability Test Results (1991 Data)

Density Location	Depth (feet)	Soil Description	Permeability (cm/sec)	Dry (pcf)
T-2	1-1/2	Well Graded Sand (SW), some gravel, light brown	2.6×10^{-3}	110.0
T-3	8	Well Graded Silty Sand (SW-SM), trace gravel, trace silt, light brown	1.8×10^{-3}	107.0
T-5	4	Well Graded Sand (SW), some gravel, light brown	1.7×10^{-3}	106.2
T-6	1-1/2	Well Graded Sand (SW), some gravel, light brown	2.0×10^{-4}	107.2

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3.5 OPTIMUM MOISTURE/MAXIMUM DENSITY TESTS

Optimum moisture content/maximum dry density tests were performed on three soil samples representative of the soil types encountered in the explorations. The test was performed in accordance with ASTM Test Method D-1557. Test results are presented in Table No. 3.5-1, below.

Table 3.5-1: Moisture/Density Relationship (1991 Data)
Test Results (ASTM D-1557)

Location	Depth (feet)	Soil Description	Optimum Moisture Percent (%)	Maximum Dry Density (pcf)
T-1	0	Well Graded Silty Sand (SW-SM), some gravel, some silt, light brown	8.7	123.8
T-3	3	Well Graded Silty Sand (SW-SM), trace gravel, trace silt, light brown	11.8	121.0
T-4	9	Well Graded Sand (SW), light brown	10.0	117.0

Compaction tests to evaluate maximum compacted density and optimum moisture content for soil cement and roller compacted concrete mix designs were performed. The compaction test results are presented on Plates C-4 through C-9. The soil cement samples were prepared in accordance with ASTM Test Method D-558.

3.6 SOIL CEMENT DURABILITY TESTS

Soil cement samples were tested for freeze-thaw durability and wet-dry stability by ASTM Test Methods D-560 and D-559, respectively. The tests were performed on soil cement samples formulated with four percent, six percent and eight percent by weight cementatious material. The cementatious material consisted of 85 percent Type V Portland Cement and 15

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percent Type "F" flyash. The durability test results are presented on Plate C-8 in Appendix C and summarized in the following table:

TABLE NO. 3.6-1 12-CYCLE PERCENT LOSS BY WEIGHT			
Source	Cementatious Material	Wet-Dry Stability	Freeze-Thaw Durability
SW-BSN	4	14	23
	6	3	6
	8	1	2
SE-Bank	4	34	57
	6	7	14
	8	1	1

The roller compacted concrete samples were compacted using six inch diameter by 12 inch tall molds in four-three inch lifts with a uniform compaction energy of 32.6 lbs-ft. per cubic inch of sample. The laboratory test results are presented in Appendix B, following the text of this report. The compressive strength test results are also summarized in the following table:

Table No. 3.6-2			
Material	Cementatious Material	Average 28-day Compressive Strength	Source
RCC 1	6% PCC 2.5% Flyash	3460 psi	BB-Pit-50% NE-C-BSN-50%
RCC 2	7% PCC 3% Flyash	3600 psi	BB-Pit-50% NW-BSN-50%
Soil Cement	5.1% PCC 0.9% Flyash	860 psi	SE-Bank
Soil Cement	6.8% PCC 1.2% Flyash	1280 psi	SE-Bank
Soil Cement	5.1% PCC 0.9% Flyash	1110 psi	SW-BSN
Soil Cement	6.8% PCC 1.2% Flyash	1440 psi	SW-BSN

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3.7 SPECIFIC GRAVITY TEST

Specific gravity tests were performed on two soil samples from the explorations. The tests were performed in accordance with ASTM Test Method D-584. Test results are presented on Table No. 3.7-1, below.

Table 3.7-1: Specific Gravity Test Results (1991 Data) (ASTM D-854)

Location	Depth (feet)	Soil Description	Specific Gravity
B-3	5	Well Graded Sand (SW), trace gravel, light brown	2.62
B-4	5	Well Graded Sand (SW), trace gravel, light brown	2.64

3.8 CORROSION TEST

Corrosion analyses tests were performed on five representative soil samples from the site. The corrosion analyses tests were performed by Atlas Chemical Testing Laboratories. The test results are presented in Appendix A.

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4.0 GENERAL SITE CONDITIONS

4.1 SURFACE CONDITIONS

The site of the proposed Hiko Springs Detention Basin and drainage channel was undeveloped desert at the time of our field exploration. Natural Vegetation was very sparse. Vegetation consisting of creosote bush and white bursage covered approximately 10 percent of the surface in the wash. Organic top soil was very thin to nonexistent.

The wash is a relatively broad uniformly sloping surface approximately 700 feet wide at the embankment site. The wash slopes down toward the south, southeast at a gradient of approximately 4 percent. Hiko Springs Wash is confined by a relatively uniform slope on the east. This slope is typically 50 to 70 feet in height with a gradient of approximately 2:1 (horizontal to vertical). The slopes confining the wash on the west are cut by several small erosion features which feed the wash.

There was no surface flow in the wash during our field exploration. Several low depositional benches and islands of deposition 1 to 4 feet in height occur across the wash. Frequent channel jumping, stream meander and scour have maintained a relatively stable erosional surface in the channel.

South of the detention basin embankment site, the wash becomes broader and the confining slopes are less uniform with more erosion channels feeding the wash. However, the bed slope remains relatively uniform at approximately 4 percent all the way to the Colorado River which is located slightly over two miles from the embankment site.

The surficial soils in the wash consisted of course sand and fine gravel with occasional cobble size rocks and a few boulders. The rock was predominantly decomposed granitic material with

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very little sorting or change in gradation from the area of the detention basin to the south end of the wash.

The slopes confining the wash also consisted of sand to gravel size alluvium derived from granitic rocks. Intact bedrock does not outcrop in the wash. the confining slopes or within several hundred feet of the wash.

4.2 SUBSURFACE CONDITIONS

The subsurface soil conditions were quite uniform both laterally and with depth throughout the site. The native soils consisted of loose to very dense, well graded silty sand, well graded sand, poorly graded silty sand, silty sand, well graded gravel and poorly graded gravel. The more gravelly soils were typically encountered in the central portion of the wash at depths of 10 to 30 feet below existing site grade. None of the soils encountered contained significant amounts of clay size material. Combined silt and clay content was typically less than five percent of the material sampled. Soil samples containing more than 9 percent fines were typically recovered from borings at depths of 40 to 70 feet below the bottom of the wash.

Natural moisture content was low throughout the soil profile. Free water was not encountered in any of the explorations to the depths drilled.

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5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

The site of the Hiko Springs Wash detention basin is located in the northern portion of the town of Laughlin, Nevada. The Hiko Springs Wash originates in the Newberry Mountains approximately three miles northwest of the detention basin site. The Newberry Mountains are part of a broad uplift along a northwesterly trending axis. The mountains are composed of dark colored Precambrian granitic rocks exposed in rock out crops northwest of the site.

Hiko Springs Wash is one of four primary drainages from the Newberry Mountains which have produced a very large combined alluvial fan. The fan spreads from Davis Dam on the north to the western edge of the town of Laughlin. The apex of the fan is located approximately one mile north, northwest of the proposed detention basin embankment at an elevation of approximately 1250 feet above mean sea level (MSL). Large historic flows have cut the existing wash in to the fan.

5.2 SEISMICITY

The proposed detention basin site is located in seismic Zone 2-B as defined by the 1988 edition of the Uniform Building Code. Zone 2-B represents an area presumed to be subject to moderate earthquake damage such as resulting from a magnitude VII event as described by the Modified Mercalli Scale. Tectonic shocks having epicenters within the Southern Nevada area have been minimal.

5.3 TECTONIC FAULTS

Numerous north-south trending faults which generally follow the axis of the Newberry Mountains are mapped northwest of the site. However, none of these tectonic faults appear to cross the proposed Hiko Springs Wash Detention Basin or lower channel.

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6.0 ENGINEERING ANALYSES AND RECOMMENDATIONS

6.1 GENERAL

As previously discussed, the subsurface soils throughout the site consist of alluvial deposits ranging from course to fine sand with some gravel, occasional cobbles and minor amounts of silt. These granular soils were encountered in a medium dense to very dense condition within 5 to 10 feet of the existing site grade. Loose soils within the upper 5 feet of the soil profile would be moderately compressible and could experience localized shear failure beneath the proposed fill up to 82 feet in height. Some over excavation is recommended to remove loose soils and properly prepare the base for the embankment fill.

The granular soils encountered along the discharge channel alignment will provide good foundation support for the proposed concrete channel. No special foundation preparation will be necessary.

The soils encountered during exploration were found to be quite permeable with virtually no cohesion. These soils will provide only limited resistance to seepage and could be easily eroded by flowing water.

6.2 SITE PREPARATION AND GRADING

Prior to placing fill for embankments, organic material, debris, vegetation and loose soils should be removed from areas to receive fill or foundations. We recommend that the base for the detention basin embankment should be over excavated to a depth of five feet to remove loose surface soils and pockets of loose soil which could be subject to localized shear failure beneath deep fill. Additional overexcavation may be necessary if loose or low density soils are encountered at subgrade elevation.

Areas to receive fill which are steeper than 5:1 (horizontal:vertical) should be excavated to provide a horizontal bench prior to placing fill. The embankment abutments at the east and

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west ends should be excavated in horizontal benches into the existing slopes. Each bench should extend a minimum of 10 feet into the slope. A maximum bench height of five feet is recommended, however the series of benches cut into the existing channel side slopes should maintain an over all slope no steeper than 3:1 (horizontal:vertical) from the bottom of the wash to the rim of the wash.

Existing channel side slopes up-stream from the embankment which are steeper than 2.5:1 (horizontal:vertical) should be laid back for stability.

Following clearing, grubbing and excavation to remove unsuitable soils, the subgrade should be moistened to about the optimum moisture content and compacted to at least 95 percent of the maximum dry density established by ASTM Test Method D-1557.

6.3 EMBANKMENT

Based upon results from our field exploration and laboratory testing the following paragraphs present our recommendations for use in design of the proposed earth embankment.

6.3.1 Strength Parameters: Test results from seven remolded soil samples obtained from the proposed detention basin were found to exhibit an angle of internal friction ranging from 29.9 to 38.1 degrees. The measured apparent cohesion was found to range from 115 to 270 pounds per square foot. Test results from five "undisturbed" samples were found to exhibit an angle of internal friction of 34.2 to 42.0 degrees with a measured apparent cohesion ranging from approximately 7 to 295 psf. The remolded samples were tested at a compacted dry density of 90 to 95 percent of the maximum dry density (ASTM D-1557). The "undisturbed" samples were found to have a dry density ranging from 95 to 100 percent of the ASTM D-1557 dry density. Based on an average remolded angle of internal friction of 35.0 degrees, we

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believe use of an internal friction angle of 34 degrees in combination with a 0.0 psf cohesion value are appropriate for use in design.

We have reviewed the slope stability analyses performed by Black and Veatch Engineers and note no exception to their method of analyses, soil properties applied or conclusions. Their analyses are consistent with findings from our preliminary analyses for a similar embankment.

6.3.2 Seepage: The results from field infiltration tests and remolded laboratory permeability tests indicate that horizontal permeability in the native soil deposits will be on the order of 2 to 60 times faster than remolded soils in the embankment.

We have reviewed the seepage analyses performed by Black and Veatch Engineers and note no exception to their method of analyses or the soil properties applied in their analyses. The analyses are consistent with our previous preliminary analyses for a similar embankment.

Although the analyses suggests that a toe drain system would not be necessary to protect the structure we concur with the Black and Veatch recommendations and design which includes a toe drain to provide protection for the structure.

6.3.3 Fill Placement: Following site preparation as previously described, the native soils from the detention basin area and material developed during flattening of the channel side slopes could be used to construct the detention basin embankment. Fill used in the embankment should consist of on site granular material cleaned of debris and organic material and processed as necessary to remove rocks larger than 4 inches in diameter.

Embankment fill should be placed in horizontal loose lifts a maximum of 12 inches in thickness. Backfill placed in confined areas and material compacted by hand operated equipment should be placed in horizontal lifts a maximum of eight inches thick. Each lift

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should be moistened or dried as appropriate to achieve the optimum moisture content for compaction ($\pm 2\%$). Each lift should be fully compacted to at least 92 percent of the maximum dry density as established by ASTM Test Method D-1557.

Care should be taken to limit sloughing of fill material onto the face of the embankment. To the extent possible, construction of the soil cement facing should closely follow embankment fill placement. Alternatively the embankment face should be trimmed during placement of soil cement to avoid creating a layer of poorly compacted or low density fill between the soil cement facing and the embankment core.

6.3.4 Settlement: Some settlement within a compacted fill and in the foundation soils must be anticipated with a fill of up to 82 feet in height. Settlement of the granular fill and subgrade soils will be quite rapid. Most of the settlement in a properly compacted granular fill will occur during construction. Settlement of the granular embankment fill compacted to at least 92 percent of maximum dry density should be on the order of 0.10 to 0.25 percent of the fill height.

Based on the gradation of the subgrade soils and dry density test results for samples from the borings, properly prepared subgrade soils should be expected to settle on the order of 1 to 3 inches beneath the maximum fill section of 82 feet. We anticipate that 2/3 to 3/4 of this settlement would be complete by the end of a 120 to 180 day construction period.

6.4 FOUNDATIONS

Foundations for outlet control structures, spillway overflow training walls, energy dissipation structures and retaining walls may be proportioned for a net allowable bearing pressure of 3,000 psf where footings are placed on properly placed and compacted fill, soil cement or undisturbed native soils. Footings for shallow foundations should be embedded a minimum of two feet below the lowest adjacent final compacted subgrade or as necessary to control scour

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and erosion. Erosion potential analysis was beyond the scope of work for this project, therefore, we are unable to provide specific recommendations for foundation erosion protection at this site. Settlement of foundations placed and compacted fill should be less than one inch at the above referenced net bearing pressure.

6.5 RETAINING WALL LATERAL EARTH PRESSURES

Earth retaining structures should be designed to resist the appropriate lateral earth pressures. Retaining walls free to deflect at the top may be designed for a fluid having an equivalent unit weight of 34 pcf in the active case. An allowable lateral earth pressure of 420 pcf could be used for design in the passive case. Earth retaining structures designed to be rigid should be designed to resist lateral earth pressures in the at-rest case. An equivalent fluid pressure of 52 pcf would be appropriate for use in design of structures in the at-rest case.

The above referenced equivalent fluid pressures assume the backfill is placed and compacted in accordance with recommendations previously provided, backfill behind the walls is level and backfill is maintained in a drained condition. If drained conditions cannot be maintained, the hydrostatic pressures must be considered in the design.

Frictional resistance to sliding acting along the base of footings founded on native soil or properly placed and compacted fill may be computed using a coefficient of friction of 0.4 times the normal dead load.

6.6 DISCHARGE STRUCTURES

Prior to placing forms or pouring concrete for the spillway apron or outlet structures, any debris, vegetation and loose soil should be removed. The subgrade soils should be moistened to the optimum moisture content and compacted to at least 90 percent of maximum dry density as determined by ASTM Test Method D-1557. Fill required to raise the existing site grade or

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fill excavations to remove unsuitable material should be placed and compacted in accordance with recommendations previously provided for fill placement.

Foundations for the discharge channel may be proportional for a net allowable bearing pressure of 3,000 psf where footings and channel slabs are placed on undisturbed soil or properly placed and compacted fill.

Foundations for the discharge channel should be located a minimum of 1 foot below the lowest adjacent final compacted subgrade or as necessary to control scour and erosion. A turned-down edge may be required along the edge of slabs to control scour.

Horizontal loads acting on channel slab foundations and confining walls will be resisted by friction acting along the base of the channel slab and by passive earth pressures acting against keyways and channel walls. The friction acting along the base of footings and slabs-on-grade may be computed using an allowable coefficient of friction of 0.40 with the normal dead load. An allowable lateral passive earth pressure may be computed using an equivalent fluid density of 420 pounds per cubic foot for the sides of the channel placed against undisturbed soil or properly placed and compacted fill. The maximum design passive pressure for channel walls should be limited to 1200 pounds per lineal foot. Passive pressure capacity in the upper one foot should be ignored unless the material is confined by concrete slab-on-grade or otherwise protected from erosion. The above referenced lateral resistance design values may be increased by one-third for transient wind or seismic loads.

6.7 SEISMIC CONDITIONS

As previously noted, the site is located in seismic Zone 2-B as categorized by the Uniform Building Code. The soil profile may be represented as an S-2 soil type. A coefficient of 1.2

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would be appropriate for seismic design purposes. A maximum horizontal acceleration of 0.13 g and maximum vertical acceleration of 0.07 could be used for design.

The granular foundation soil at depths greater than 10 feet below the present ground surface were encountered in a dense to very dense condition. Therefore, liquefaction potential is not considered to be a significant risk to the proposed structure.

6.8 SOIL CEMENT

As previously noted, the proposed granular embankment soils are non-cohesive and easily eroded by flowing water. Some armoring of the up-stream embankment will be necessary to maintain stable slopes. Some protection will also be necessary to prevent excessive wave action erosion. The overflow spillway would be especially susceptible to erosion. Slope protection could be provided by asphalt paving or cast-in-place concrete, however, a soil cement facing utilizing on-site material would provide adequate protection on the up-stream slopes. ~~A soil cement facing on the spillway slope would not provide adequate~~ reliable protection against erosion at high flow velocities. Roller Compacted Concrete (RCC) is recommended to armor to spillway and discharge structures. The laboratory test results verify the suitability of on-site and local processed source materials for use in RCC mix designs. The mix designs for soil cement also verify the suitability of on-site soil for use in soil cement. A soil cement with a minimum cementatious material content of eight percent is recommended for durability.

Soil-cement should be batched in an approved continuous flow central plant or batch-type pugmill mixer. The plant should be equipped with metering and feeding devices that will supply the soil, cement and water into the mixer in the specified quantities. If the actual quantities in the mix deviate more than 3% by weight from the specified quantities, the

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engineer may require such changes in the plant operation as will provide the required accuracy.

The mixing time should be that which is required to secure an intimate uniform mixture of the soil, cement and water.

The contractor should protect the soil-cement mixture whenever it is transported during unfavorable weather.

The total elapsed time between the addition of water to the soil and cement and the start of compaction should not exceed 60 minutes.

The contractor should take all necessary precautions to avoid damage to completed soil-cement by equipment. Immediately prior to placement of the soil-cement, the receiving surface should be in a moist condition. The mixture should be placed with spreading equipment that will produce layers of such widths and thicknesses as are necessary for compaction to the specified dimensions of the completed soil-cement.

Optimum moisture and maximum density for the section being placed and compacted should be established during construction by moisture-density test ASTM D-558 on representative samples of soil-cement mixture obtained from the area being processed at the time compaction begins. At time of compaction, the moisture content should not be below optimum or less than that quantity which will cause the soil-cement to become unstable during compaction and finishing operations and should not be more than 2 percentage points above optimum.

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Soil-cement should be placed in horizontal lifts no more than 8 inches in loose thickness and uniformly compacted to at least 96% of maximum density as established by ASTM Test Method D-558.

At the start of compaction. the soil-cement mixture should be in a loose condition for its full depth. No section should be left undisturbed for longer than 30 minutes during compaction operations.

As compaction nears completion, the surface of the soil-cement should be shaped to the specified lines, grades and cross sections. As necessary or as required by the engineer, the surface should be lightly scarified to remove imprints left by equipment or to prevent compaction planes. During the finishing process, the surface should be kept moist by means of fog-type sprays.

Compaction and finishing should be done in such a manner as to produce, in not longer than 2 hours, a smooth, dense surface free of compaction planes, cracks, ridges or loose material.

After completion of final finishing the surface should be cured by application of a bituminous or other approved sealing membrane, or by being kept continuously moist for a period of 7 days with a fog-type water spray that will not erode the surface of the soil-cement.

At the end of each day's work, or whenever construction operations are interrupted for more than 3 hours, a formed construction joint should be made. Such joints should be full-depth vertical joints full width across the fill lift.

The engineer, with the assistance of and in cooperation with the contractor, should make such inspections and tests as he deems necessary to ensure the conformance of the work to the contract plans and specifications. These inspections and tests may include, but should not be

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limited to (1) the close observation of the operation of all equipment used on the work, and (2) the taking of test samples of the soil-cement and its individual components at all stages of processing and after compaction and curing.

All testing of soil-cement or its individual components, should be in accordance with the latest applicable ASTM or AASHTO specifications.

6.9 CONSTRUCTION CONSIDERATIONS

No unusual difficulty is anticipated during excavation of the on-site soils. Some sloughing should be anticipated due to the loose non-cohesive nature of the native soils. Excavations more than 5 feet deep should be laid back at a minimum slope of 1.5:1 for stability.

The loose surficial soils will be subject to minor amounts of shrinkage during excavation placement and compaction. We do not anticipate that shrinkage will exceed 5 to 15 percent based upon the density tests performed.

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7.0 CLOSURE

7.1 LIMITATIONS

The recommendations contained in this report are based on our field explorations, laboratory tests and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the 17 borings advanced and 17 trenches excavated for this investigation. Recommendations for soil cement and roller compacted concrete mix design and durability analyses are based on sampling at four locations on-site and one sample of processed aggregate from a local source. The strength and durability of the mix designs by the contractor should be verified prior to construction. Test sections are recommended to qualify the construction methods to be used. It is possible and likely that variation in the soil and ground water conditions could exist between the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site which are different from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, our firm should also be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No warranty, expressed or implied, is made.

It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

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7.2 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during the construction to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation and earthwork, including preparation of subgrade and fill placement.
- Observation and testing during soil cement mixing, placement and compaction.
- Consultation as may be required during construction.

The review of the embankment design and seepage analyses provided herein are based on preliminary plans and analyses supplied by Black and Veatch Engineers at the time the report was prepared. Changes in the plans provided should be reviewed by Kleinfelder, Inc. so that necessary changes in the recommendations, if any, can be made. Additional information concerning the scope and fees for these services can be obtained from our office.

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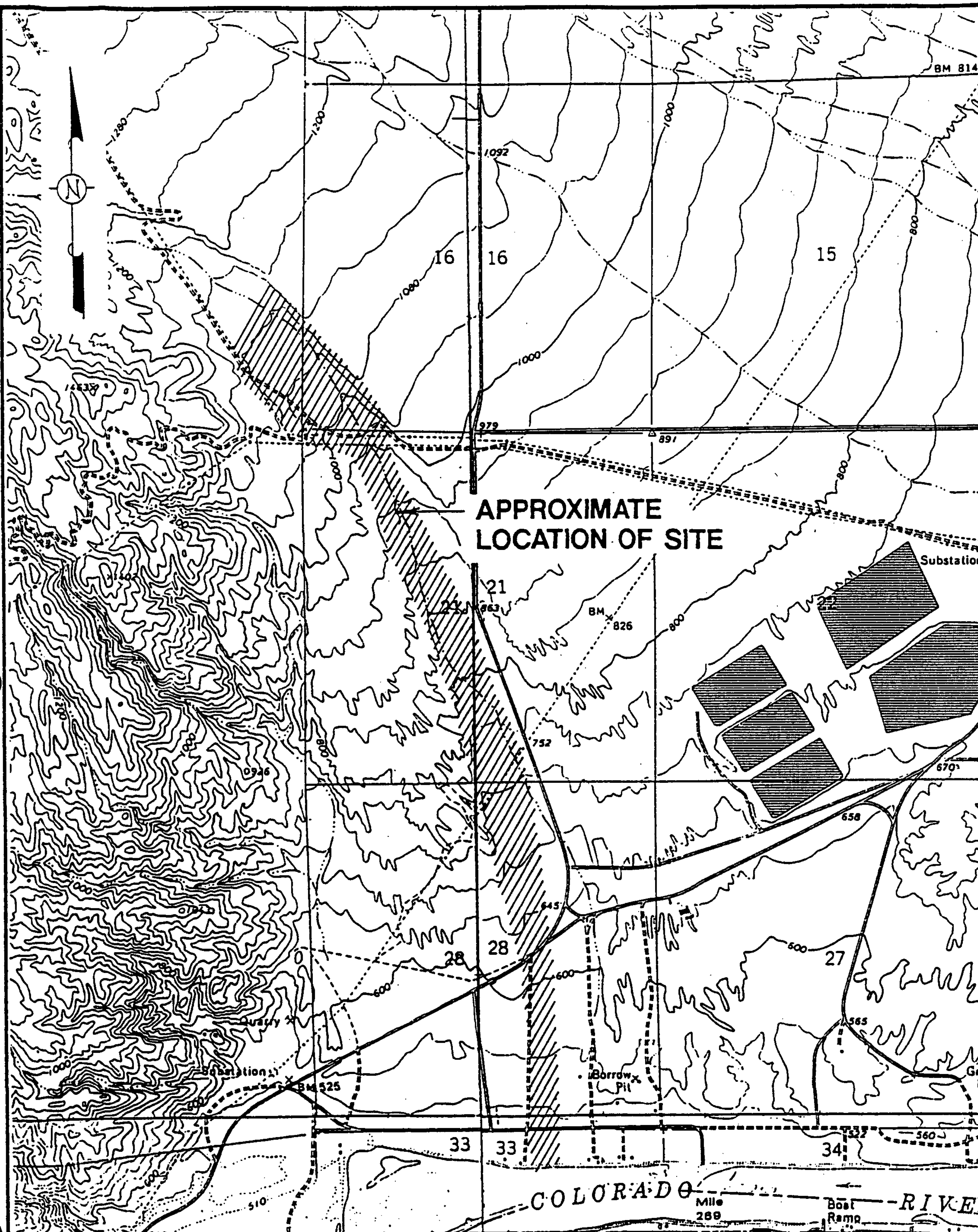

APPROXIMATE
LOCATION OF SITE
BM 814
1092
1200
1280
1000
800
16
16
15
1080
979
891
21
21
22
863
BM
826
752
Substation
670
658
645
28
28
27
600
565
Quarry
Substation
BM 525
Borrow Pit
33
33
34
560
COLORADO
RIVE
Mile 289
Boat Ramp
510

Appendix A

DATE DRILLED: 1/30/91
LOCATION: See Plate 1

BORING NO. B- 1

ELEVATION: Approx. 1064 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							WELL GRADED SILTY SAND (SW-SM) - trace gravel, light brown	dry to slightly moist	loose / medium dense
5	2	120	G	13					
							- occasional gravel		
							- occasional gravel		
10	2	113		17				slightly moist	
15	2			19					
							- occasional gravel		dense
20	2			26					

Bottom at 21 feet.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-1

DATE DRILLED: 1/30/91
LOCATION: See Plate 1

BORING NO. B- 3

ELEVATION: approx. 1043 feet
** HAMMER WEIGHT: 350 lb.

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	Northing - Easting - SOIL DESCRIPTION	MOISTURE	CONSIST.
0							SAND (SW) - trace gravel, light brown	dry to slightly moist	loose
									medium dense
							- occasional gravel		
5	1		Sg.	13					
							- occasional gravel		
10	1			23				slightly moist	
									dense
15	2		G	35					
20	2			30					

Bottom at 21 feet.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. Shelby Tube Bulk Ca. S.S. Sample 1.925" I. D. SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-3

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 1/29/91
LOCATION: See Plate 1

BORING NO. B- 5

ELEVATION: approx. 1033 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							SAND (SW) - trace gravel, light brown	dry to slightly moist	loose
									medium dense
5	2	122		15					
10	3		G	15				slightly moist	
							- occasional gravel		dense
							- occasional gravel		
15	3	114		33					
20	3	110		50					very dense
							SILTY SAND (SM) - some gravel, light brown		
							- occasional gravel		
25	3	112	G	50					
30	4	128		50/10					
							- some gravel		
35									
40	4		Infiltration test	50					
							Bottom at 41 feet.		

APPROV:

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. Shelby Tube Bulk Ca. S.S. Sample 1.925" I. D. SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-5

DATE DRILLED: 1/12/91
LOCATION: See Plate 1

BORING NO. B- 6

ELEVATION: approx. 1009 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							SAND (SW) - some gravel, trace silt, light brown	moist	loose to medium dense
								slightly moist	
5	10	124	G	9					
10				10					
15				21					med. dense
				9					l.to m.den.
20				13					medium dense
									dense
25	11	105		31					
30	8	124	G	50/9			WELL GRADED SILTY SAND (SW-SM) - trace to some gravel, light brown		very dense
									dense
35									very dense
									dense
40				50/3					very dense
45									

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-6a

DATE DRILLED: 1/12/91
LOCATION: See Plate 1

BORING NO. B- 6

ELEVATION: approx. 1009 feet
** HAMMER WEIGHT: 350 lb.

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	Northing - Easting - SOIL DESCRIPTION	MOISTURE	CONSIST.
45									
50	15	114		50/4					
55									hard
60	5	124	G	50/9					very dense
65									
70				50/6					

Bottom at 71.0 feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. Shelby Tube Bulk Ca. S.S. Sample 1.925" I. D. SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-6b

DATE DRILLED: 1/28/91
LOCATION: See Plate 1

BORING NO. B- 8

ELEVATION: approx. 997 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SOIL DESCRIPTION	MOISTURE	CONSIST.
0					GRAVELLY SAND (SW-SM) - trace silt, light brown	dry to slightly moist	loose
					SAND (SW) - trace gravel, light brown		dense
5	2	115		34			
10				29			
					- occasional gravel	slightly moist	
15	3	116		44			
20	2			40			
							very dense
25	3		S	50/11			
					- occasional gravel		
					- occasional gravel		
30	3			50/10			
					- occasional gravel		
					- occasional gravel		
35							
					- occasional gravel		
40	3	116	G	50/9			

Bottom at 41 feet.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-8

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 1/12/91
LOCATION: See Plate 1

BORING NO. B- 9

ELEVATION: approx. 1002 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SOIL DESCRIPTION	MOISTURE	CONSIST.
0					**WELL GRADED SILTY SAND (SW-SM)** - trace gravel, light brown	moist	medium dense
						slightly moist	
5	4	118		31			~~very dense~~ dense
10	3	121		40			
15	4	126		50			
20				40			
25	12	127		50			
30	8	115		41			
35							very dense
40	6	120	G	50/11			
45							

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. Shelby Tube Bulk Ca. S.S. Sample 1.925" I. D. SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-9a

DATE DRILLED: 1/12/91
LOCATION: See Plate 1

BORING NO. B- 9

ELEVATION: approx. 1002 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
45									
50	9	119	G	50/8					
55									
60	7	124		50/6					
65									
70	9	124	G, Infiltration test	50/9					

Bottom at 71.0 feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-9b

DATE DRILLED: 1/29/91
LOCATION: See Plate 1

BORING NO. B-10

ELEVATION: approx. 1060 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SOIL DESCRIPTION	MOISTURE	CONSIST.
0					GRAVELLY SAND (SW) - trace cobbles at surface, light brown	dry to slightly moist	loose
							medium dense
					- some gravel		
5	2	118		29	SAND (SW)		
					- occasional gravel		
10				23			
					- occasional gravel		
					- trace silt		dense
15				35	- occasional gravel		
					- occasional gravel		
					- occasional gravel		
					- occasional gravel		
20	2	117	S	35			
25	2	117		35			
							very dense
30	3	112	G	40			
					- occasional gravel		
35							
					- occasional gravel		
40	2	119		50			

Bottom at 41 feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

NOTES: Ground water not encountered during drilling.

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-10

DATE DRILLED: 1/31/91
LOCATION: See Plate 1

BORING NO. B-11

ELEVATION: approx. 1064 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							WELL GRADED SILTY SAND (SW-SM) - trace silt, brown	dry to slightly moist	loose
									medium dense
5	1	126		27					
							- occasional gravel		dense
10	1	119		33					
15	2	123		40					
							- occasional gravel		
20	2			35					
25	2	123	S	34					
									very dense
30	3	121		41			- trace silt		
35									
							- occasional gravel		
							- occasional gravel		
40	2	122	G	50					

Bottom at 41 feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

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PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-11

DATE DRILLED: 1/31/91
LOCATION: See Plate 1

BORING NO. B-12

ELEVATION: approx. 1074 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							**WELL GRADED SILTY SAND (SW-SM)** - occasional cobbles on surface, light brown	dry to slightly moist	loose
									medium dense
							- some gravel		
5	1	116		23					
							- some gravel		dense
10	2	108		30					
									very dense
15	2	113		45					
20	2	117		45					
									dense
25	3	123		35			- trace silt - occasional gravel		
30	3	130	G	33					
35									
							- trace silt		
40	2	120		35					

Bottom at 41 feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-12

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 1/28/91
LOCATION: See Plate 1

BORING NO. B-13

ELEVATION: approx. 991 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							WELL GRADED SILTY SAND (SW-SM) - trace gravel, light brown	dry to slightly moist	loose
									medium dense
5	1	104	S	23					
							- occasional gravel		
							- occasional gravel		very dense
10				50/1				slightly moist	
							- occasional gravel		dense
15	2		G	30					
							- occasional gravel		
20	4			23					
							- occasional gravel		
							- occasional gravel		
25	1			25					
30				30			- occasional gravel		
35							- trace clay		
40	3	121		35					
									very dense
45									

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. Shelby Tube Bulk Ca. S.S. Sample 1.925" I. D. SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-13a

DATE DRILLED: 1/28/91
LOCATION: See Plate 1

BORING NO. B-13

ELEVATION: approx. 991 feet
** HAMMER WEIGHT: 350 lb.

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	Northing - Easting - SOIL DESCRIPTION	MOISTURE	CONSIST.
45									
50				50/11					
							Bottom at 51 feet		

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-13b

DATE DRILLED: 1/13/91
LOCATION: See Plate 1

BORING NO. B-14

ELEVATION: approx. 987 feet
** HAMMER WEIGHT: 350 lb.

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	Northing - Easting - SOIL DESCRIPTION	MOISTURE	CONSIST.
0							WELL GRADED GRAVEL (GW) - some sand, trace silt, light brown	moist	loose
								slightly moist	
5				6					
									medium dense
10	8	129	G	30					dense
							WELL GRADED SILTY SAND (SW-SM) - some gravel, light brown		medium dense
15	17	103	Infiltration test	22					
20	9	119	G	22					
25				13					
30				50/4					very dense
35									
40				50/5					
45									

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

NOTES: Ground water not encountered during drilling.

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

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PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-14a

BY: APPROV:

DATE DRILLED: 1/28/91
LOCATION: See Plate 1

BORING NO. B-15

ELEVATION: approx. 981 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							**POORLY GRADED GRAVEL (GP)** - trace sand, trace silt, brown	dry to slightly moist	loose / medium dense
5	1	108		19					
10	1	117	S	16				slightly moist	
							- occasional gravel		dense / medium dense
15			Infiltration test	17					
							- occasional gravel		
20	2		G	19					
25	2			28					dense
30	3	108		50					very dense
							- occasional gravel		
35							- occasional gravel		
							- occasional gravel		
40	4	124		50/8			- occasional gravel		
							- occasional gravel		
45									

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

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PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-15a

DATE DRILLED: 1/28/91
LOCATION: See Plate 1

BORING NO. B-15

ELEVATION: approx. 981 feet
** HAMMER WEIGHT: 350 lb.

ELEV: MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	Northing - Easting - SOIL DESCRIPTION	MOISTURE	CONSIST.
45									
							- occasional gravel		
50	4	114		50					

Bottom at 51 feet.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-15b

DATE DRILLED: 2/1/91
LOCATION: See Plate 1

BORING NO. B-16

ELEVATION: approx. 1083 feet
** HAMMER WEIGHT: 350 lb.

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							**SAND (SW)** - trace silt, light brown	dry to slightly moist	loose
									medium dense
							- occasional gravel - brown		
5	2	104		30	Drive				
							- light brown		
10	2	120		29	Drive				
									dense
15	3	118		41	Drive				
									medium dense
20	3	119		23	Drive				
25				29					
30				14					
35							- occasional gravel		
40	4			15					
							Bottom at 41 feet		

* LAB TESTS:

NOTES: Ground water not encountered during drilling.

+SAMPLER TYPE: Drive Sample 2.625" I.D. | Shelby Tube | Bulk | Ca. S.S. Sample 1.925" I. D. | SPT Sample 1.375" I.D.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-16

DATE DRILLED: 2/1/91
LOCATION: See Plate 1

BORING NO. B-17

ELEVATION: approx. 1095 feet
** HAMMER WEIGHT: 350 lb.

Northing -
Easting -

ELEV. MSL / DEPTH IN FEET	FIELD MOISTURE (%)	DRY DENSITY (pcf)	LAB TESTS *	BLOWS/ INCHES **	SAMPLER +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.
0							GRAVELLY SAND (SW) - light brown	dry to slightly moist	loose
5	1	111		15			- occasional gravel		medium dense
							- occasional gravel		dense
10	1	120		29					
15	2	111	G	30					
20	2	123		40					
25	2	118		41					
30	2	116		33					
35							- occasional gravel		
40				40			- trace silt - occasional gravel		

Bottom at 41 feet

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

* LAB TESTS:

+SAMPLER TYPE: Drive Sample 2.625" I.D.; Shelby Tube; Bulk; Ca. S.S. Sample 1.925" I. D.; SPT Sample 1.375" I.D.

NOTES: Ground water not encountered during drilling.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

BORING LOG AND TEST SUMMARY

PLATE A-17

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 1

ELEVATION: approx. 1067 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0	Bulk		SAND (SW-SM) - some gravel, some silt, light brown	moist	medium dense	G,ASTM D-1557
				dry to slightly moist		
5						
					dense	
			SAND (SW) - some gravel			
10					very dense to moderately hard	
	Bulk					G,S
			Bottom at 12 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-18

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 2

ELEVATION: approx. 1049 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - some gravel, light brown	moist	medium dense	
				slightly moist		S,Permeability
					dense	G
					medium dense to dense	
5						
10						
			Bottom at 10.5 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

APPROV:

BY:

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-19

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 3

ELEVATION: approx. 1030 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0	Bulk		SAND (SW-SM) - trace gravel, trace silt, light brown	moist	medium dense	S
	Bulk			slightly moist	dense	ASTM D-1557
5						
	Bulk					G,Permeability
					very dense	
10			Bottom at 10 feet			
15						

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

NOTES: Ground water not encoutered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

APPROV:

BY:

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-20

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 4

ELEVATION: approx. 1022 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - light brown	very moist	loose	
				moist		S
				slightly moist		
					medium dense	
5						
	Bulk				moderately hard	G,ASTM D-1557
10			Bottom at 10 feet			
15						

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. / Bulk

APPROV:

BY:

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-21

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 5

ELEVATION: approx. 1017 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - some gravel, light brown	very moist	loose to medium dense	
				slightly moist to moist		
				slightly moist	medium dense	
	Bulk					G,S,Permeability
5						
	Bulk					
10			Bottom at 10 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-22

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 6

ELEVATION: approx. 1012 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			SAND (SW) - some gravel, light brown	moist to very moist	medium dense	
				moist		G,S,Permeability
				slightly moist		
5			SAND (SP-SM) - some silt, some gravel, light brown			
					dense	
			WELL GRADED SILTY SAND (SW-SM) - some gravel, light brown			
10					moderately hard	G
			Bottom at 11 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-23

DATE EXCAVATED:
LOCATION: See Plate 1

TRENCH NO. T- 7

ELEVATION:
EQUIPMENT:

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - trace silt, light brown	moist to very moist	very loose	
				dry to slightly moist	loose	G,S
					medium dense	
5						
					dense	
					loose	
					dense	
			Bottom at 9.5 feet			
10						
15						

NOTES:

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

APPROV:

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-24

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 8

ELEVATION: approx. 958 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW-SM)** - some gravel, some silt, light brown	very moist	loose to medium dense	
				slightly moist		
					medium dense	
5						
						G
10						
			Bottom at 10.5 feet			
15						

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

APPROV:

BY:

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-25

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T- 9

ELEVATION: approx. 919 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - some gravel, light brown	moist	loose	
				slightly moist		
5	Bulk				medium dense	G
10	Bulk		Bottom at 10 feet			
15						

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

APPROV:

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-26

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T-10

ELEVATION: approx. 873 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			SAND (SW-SM) - some gravel, trace silt, light brown	moist to very moist	loose	
				slightly moist		
					medium dense	
5	Bulk					
					dense	
					very dense	
	Bulk					G
10			Bottom at 10 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

APPROV:

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-27

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T-11

ELEVATION: approx. 833 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - some gravel, light brown	moist to very moist	loose	
					medium dense	
				slightly moist to moist		
				slightly moist		
5						
	Bulk					G
					dense	
	Bulk					
10			Bottom at 10 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-28

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T-12

ELEVATION: approx. 790 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			SAND (SW-SM) - some silt, some gravel, light brown	moist to very moist	loose	
				slightly moist	medium dense	
	Bulk					G
5						
					dense	
	Bulk					
10			Bottom at 10 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-29

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T-13

ELEVATION: approx. 747 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0	Bulk		**SAND (SW-SM)** - some silt, trace gravel, light brown	moist to very moist	loose	
				dry to slightly moist		
					medium dense	
5						
					dense	
	Bulk					G
10			Bottom at 10 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-30

DATE EXCAVATED: 1/11/91
LOCATION: See Plate 1

TRENCH NO. T-14

ELEVATION: approx. 703 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW-SM)** - some silt, trace gravel, light brown	moist to very moist	loose	
				dry to slightly moist		
5					medium dense	
	Bulk					G
10			Bottom at 10 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-31

DATE EXCAVATED: 1/14/91
LOCATION: See Plate 1

TRENCH NO. T-15

ELEVATION: approx. 663 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - trace silt, trace gravel, light brown	very moist	loose	
				dry to slightly moist	medium dense	
5					dense	
				moist	loose	
	Bulk					
			Bottom at 9 feet			
10						
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-32

DATE EXCAVATED: 1/14/91
LOCATION: See Plate 1

TRENCH NO. T-16

ELEVATION: approx. 616 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - trace silt, trace gravel, light brown	moist to very moist	loose	
				dry to slightly moist		
					medium dense to dense	
5						
	Bulk					
10			Bottom at 10 feet			
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-33

DATE EXCAVATED: 1/14/91
LOCATION: See Plate 1

TRENCH NO. T-17

ELEVATION: approx. 572 feet
EQUIPMENT: Backhoe

ELEV. MSL / DEPTH IN FEET	SAMPLES +	SYMBOL	SOIL DESCRIPTION	MOISTURE	CONSIST.	OTHER TESTS
0			**SAND (SW)** - trace silt, trace gravel, light brown	moist to very moist	loose	
				slightly moist to moist	medium dense	
					dense	
5				moist		
	Bulk					
			Bottom at 9 feet			
10						
15						

NOTES: Ground water not encountered during trenching.

+ SAMPLER TYPE: Drive Sample 2.625" I.D. Bulk

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

APPROV:

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PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

TRENCH LOG

PLATE A-34

THE UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			Group Symbols	TYPICAL NAMES
COARSE GRAINED SOIL More than 50% of the material is LARGER than the No. 200 Sieve.	**GRAVELS** More than 50% of coarse part is LARGER than the No. 4 Sieve.	**CLEAN GRAVELS** Less than 5% finer than No. 200 Sieve.	GW	Well graded gravels, gravel - sand mixtures, little or no fines, $Cu>4$ & $1<Cc>3$
			GP	Poorly graded gravels or gravel - sand mixtures, little or no fines $Cu<4$ or $1>Cc<3$
		GRAVEL with fines More than 12% Finer than No. 200 Sieve. PI <4	GM	Silty gravels, gravel - sand - silt mixtures
		PI >7	GC	Clayey gravels, gravel - sand - clay mixtures
	SANDS More than 50 % of coarse part is SMALLER than the No. 4 Sieve.	**CLEAN SANDS** Less than 5% Finer than No. 200 Sieve.	SW	Well graded sands, gravelly sands, little or no fines. $Cu>6$ & $1<Cc>3$
			SP	Poorly graded sands or gravelly sands, little or no fines. $Cu<6$ or $1>Cc<3$
		SAND with fines More than 12% Finer than No. 200 Sieve. PI <5	SM	Silty sands, sand - silt mixtures
		PI >7	SC	Clayey sands, sand - clay mixtures
FINE GRAINED SOIL More than 50 % of the material is SMALLER than the No. 200 Sieve	**SILTS & CLAYS** Liquid Limit LESS than 50	PI - Below A - Line	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with low plasticity
		PI - Above A - Line	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic clays of low plasticity
	SILTS & CLAYS Liquid Limit GREATER than 50	PI - Below A - line	MH	Inorganic silts, Micaceous or diatomaceous fine sands or silty soils, elastic silts
		PI - Above A - Line	CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

CLAY	SILT	SAND			GRAVEL		COBBLES	BOULDERS
		Fine	Medium	Coarse	Fine	Coarse		

0.002 mm | #200 | #40 | #10 | #4 | 3/4" | 3" | 12"

U. S. Standard Sieve Size

Descriptive Terms Used With Soils

CONSISTANCY			Moisture Content	
	SILTS & CLAYS	SANDS & GRAVELS		
Strongest	Very Stiff	Very Dense	Wettest	Wet
	Stiff	Dense		Very Moist
	Medium Stiff	Medium Dense		Moist
				Slightly Moist
Weakest	Soft	Loose	Driest	Dry

	CALICHE	Cemented Sand & Gravel	
Strongest	Very Hard	Very Hard	Difficult to scratch or break
	Hard	Hard	Scratches leave only dust, Requires many hammer blows to break
	Moderately Hard	Moderately Hard	Readily cut by knife, Crumbles with several hammer blows
Weakest	Partially cemented	Partially cemented	Gouges easily with knife, Crumbles readily with few hammer blows

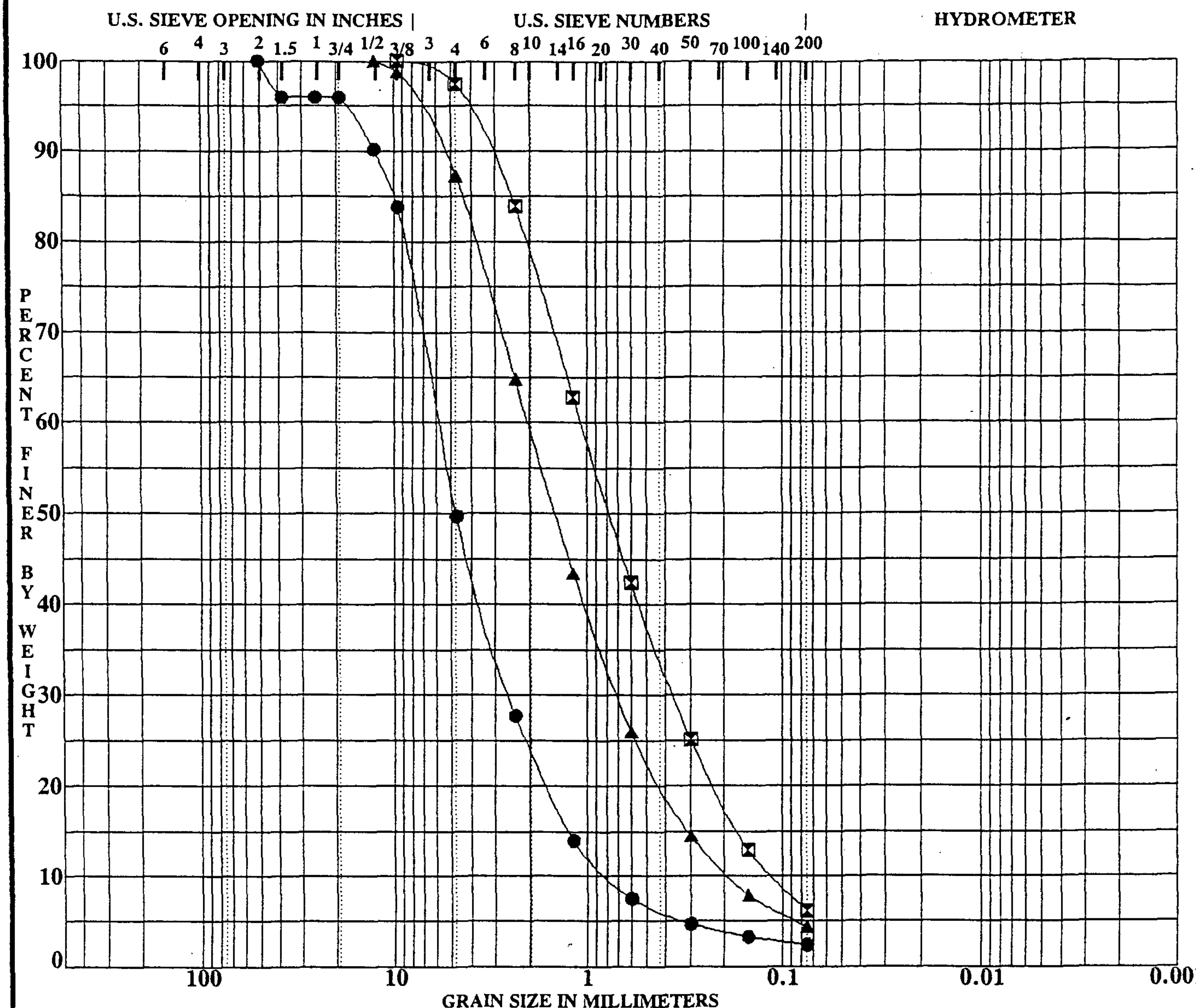
KEY TO SOIL SYMBOLS AND TERMS

PROJECT : Hiko Springs Detention Basin

PLATE NO: A-35

PROJECT NO: 31-128118

Appendix B



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	3.	8.0	WELL GRADED GRAVEL with SAND (GW)	NP	NP	NP	1.41	7.5
⊠	B- 1	5.0	WELL GRADED SAND with SILT (SW-SM)	NP	NP	NP	1.12	9.7
▲	B- 2	10.0	WELL GRADED SAND (SW)	NP	NP	NP	1.31	10.8

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	3.	8.0	50.80	5.86	2.539	0.7783	50.3	47.3	2.4	
⊠	B- 1	5.0	9.53	1.08	0.365	0.1111	2.6	91.2	6.2	
▲	B- 2	10.0	12.70	2.02	0.703	0.1870	12.8	82.8	4.4	

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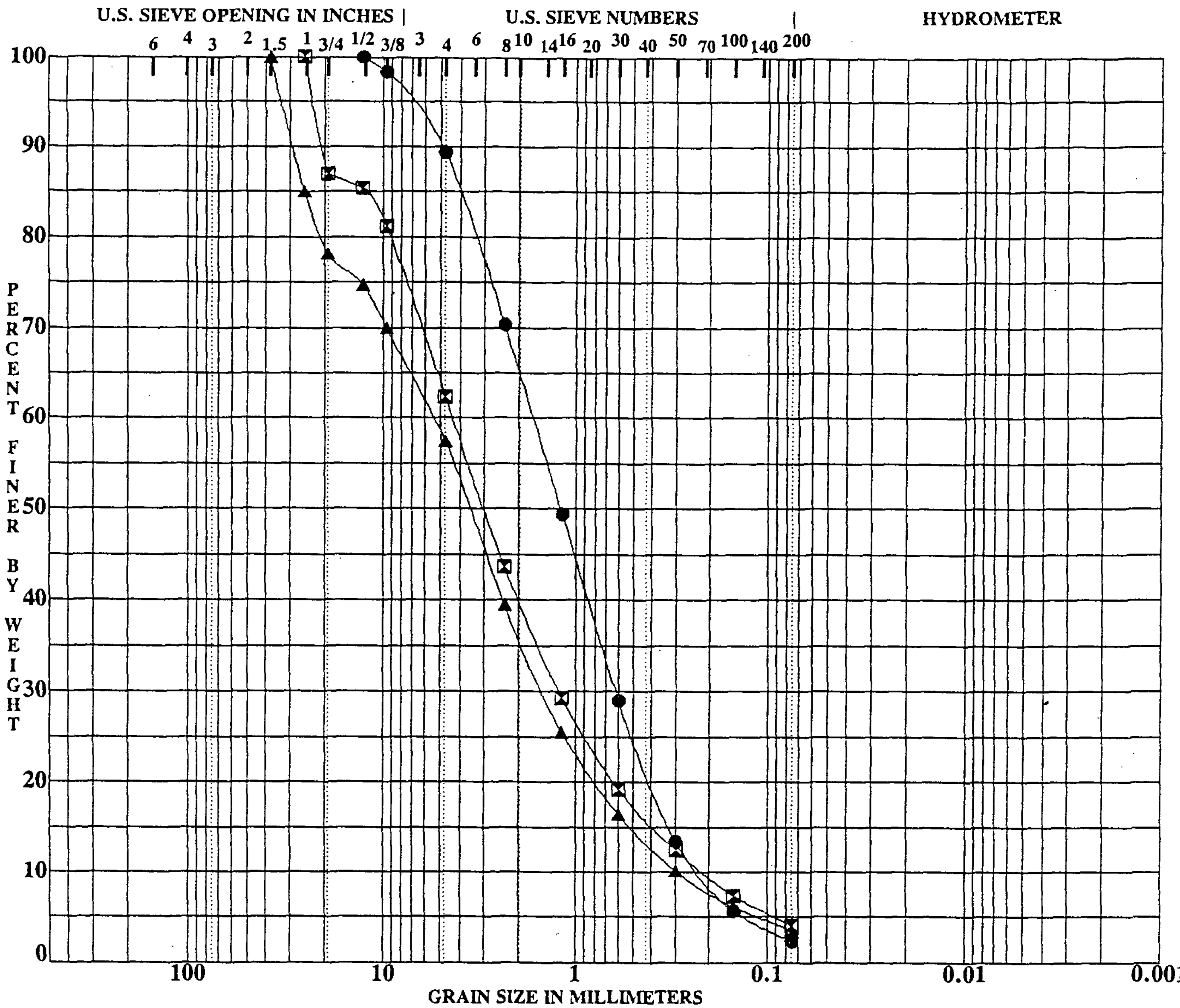
PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-1

PROJECT NO. 31-109706



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	B- 3	15.0	WELL GRADED SAND (SW)	NP	NP	NP	1.04	7.6
⊠	B- 4	5.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.59	20.3
▲	B- 5	10.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.34	18.6

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	B- 3	15.0	12.70	1.68	0.620	0.2209	10.7	86.9	2.4	
⊠	B- 4	5.0	25.40	4.36	1.220	0.2151	37.7	58.2	4.1	
▲	B- 5	10.0	38.10	5.49	1.474	0.2948	42.6	53.8	3.6	

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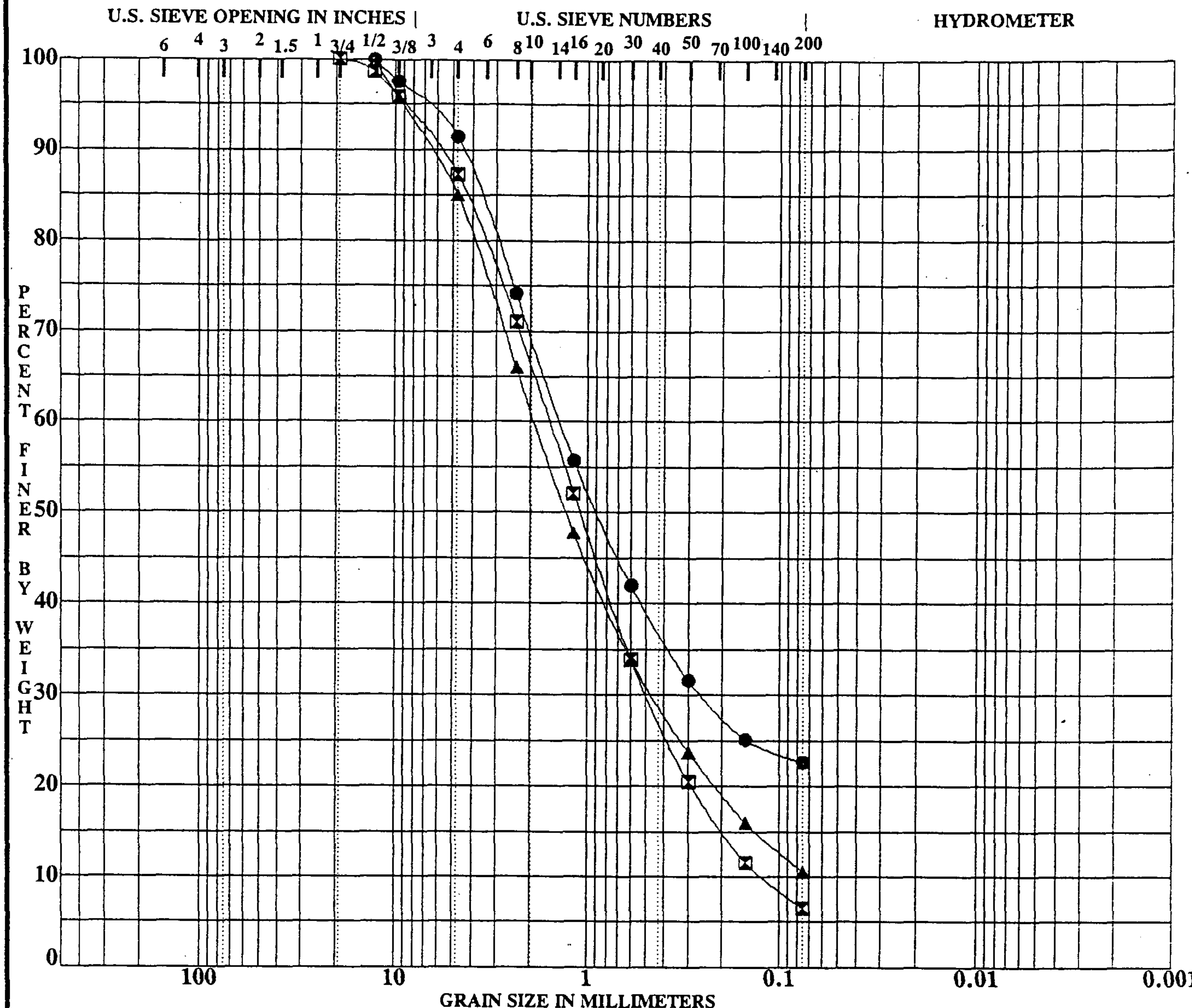
PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	B- 5	25.0	SILTY SAND (SM)	NP	NP	NP		
⊠	B- 6	30.0	WELL GRADED SAND with SILT (SW-SM)	NP	NP	NP	1.26	13.1
▲	B- 6	60.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.61	26.9

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	B- 5	25.0	12.70	1.39	0.253		8.6	68.8	22.6	
⊠	B- 6	30.0	19.10	1.58	0.490	0.1207	12.7	80.8	6.5	
▲	B- 6	60.0	12.70	1.88	0.460		15.0	74.5	10.5	

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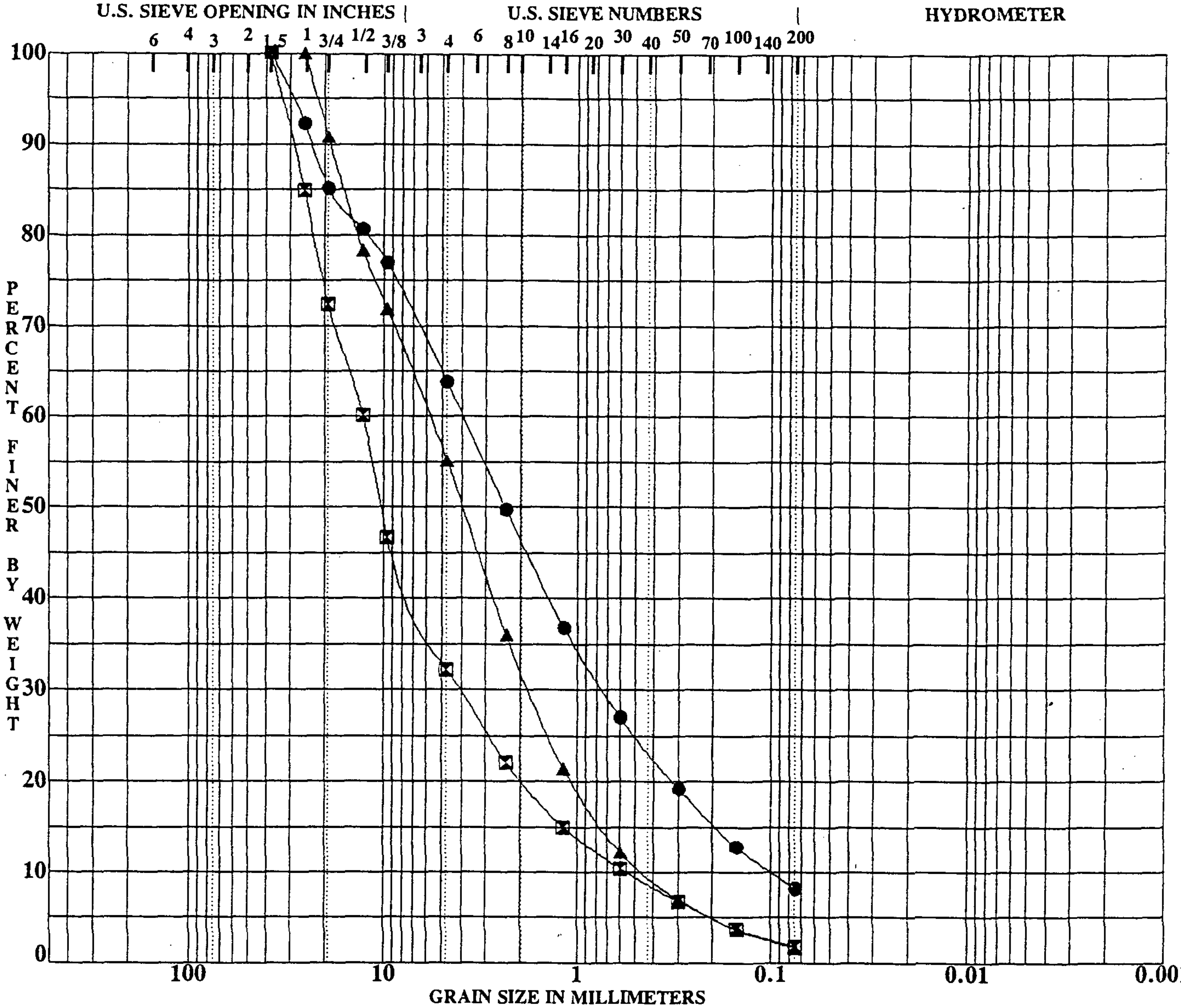
PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	B- 7	10.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.41	40.0
⊠	B- 7	30.0	WELL GRADED GRAVEL with SAND (GW)	NP	NP	NP	2.36	22.8
▲	B- 8	40.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.21	13.0

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	B- 7	10.0	38.10	3.93	0.738	0.0984	36.2	55.6	8.2	
⊠	B- 7	30.0	38.10	12.67	4.079	0.5555	67.8	30.4	1.8	
▲	B- 8	40.0	25.40	5.83	1.775	0.4475	44.9	53.5	1.6	

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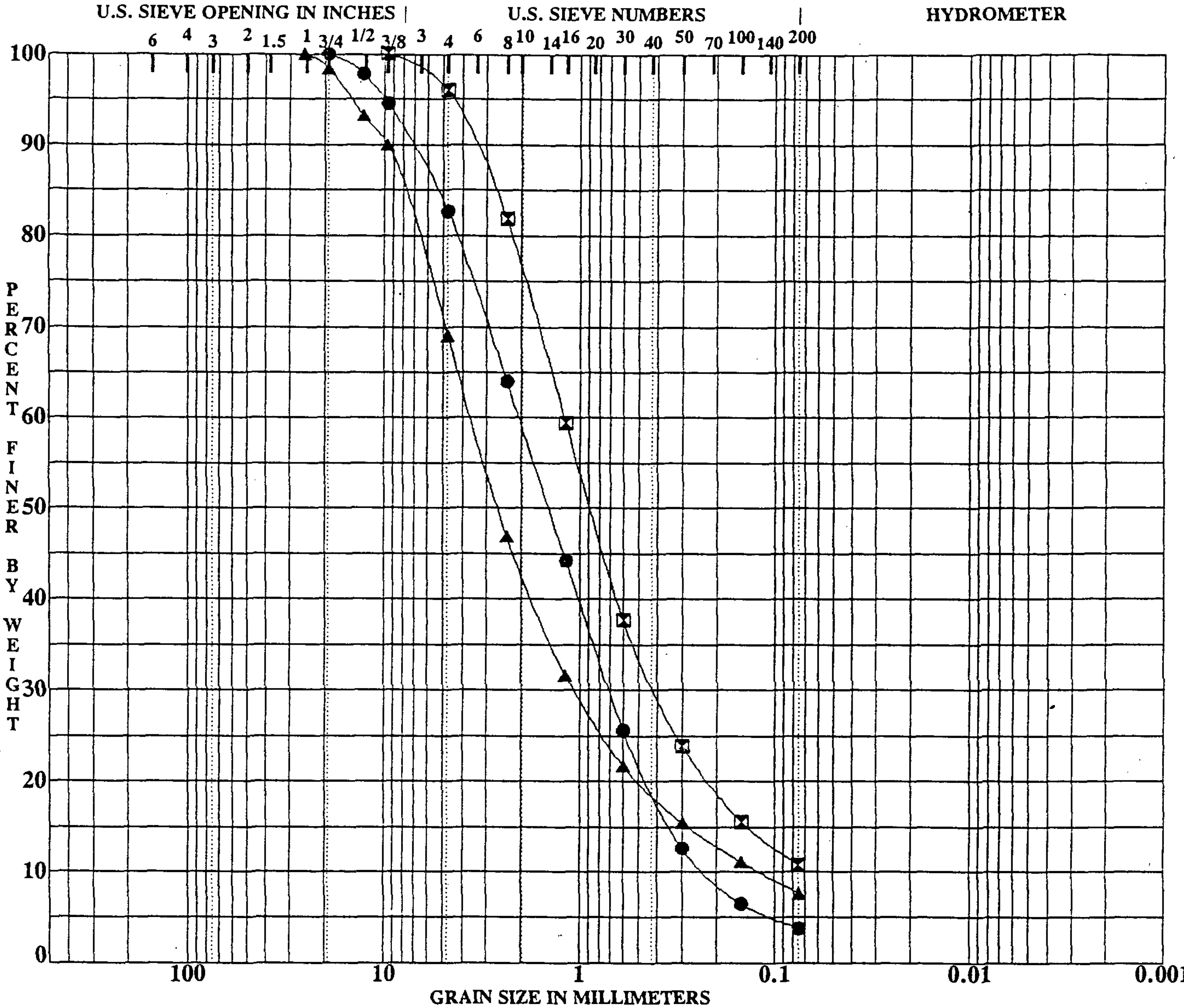
PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	B-10	30.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.08	9.2
⊠	B-11	40.0	WELL GRADED SAND with SILT (SW-SM)	NP	NP	NP	1.97	17.2
▲	B-12	30.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	2.60	29.6

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	B-10	30.0	19.10	2.05	0.704	0.2233	17.4	78.8	3.8	
⊠	B-11	40.0	9.53	1.20	0.408		4.1	85.2	10.7	
▲	B-12	30.0	25.40	3.57	1.058	0.1206	31.0	61.4	7.6	

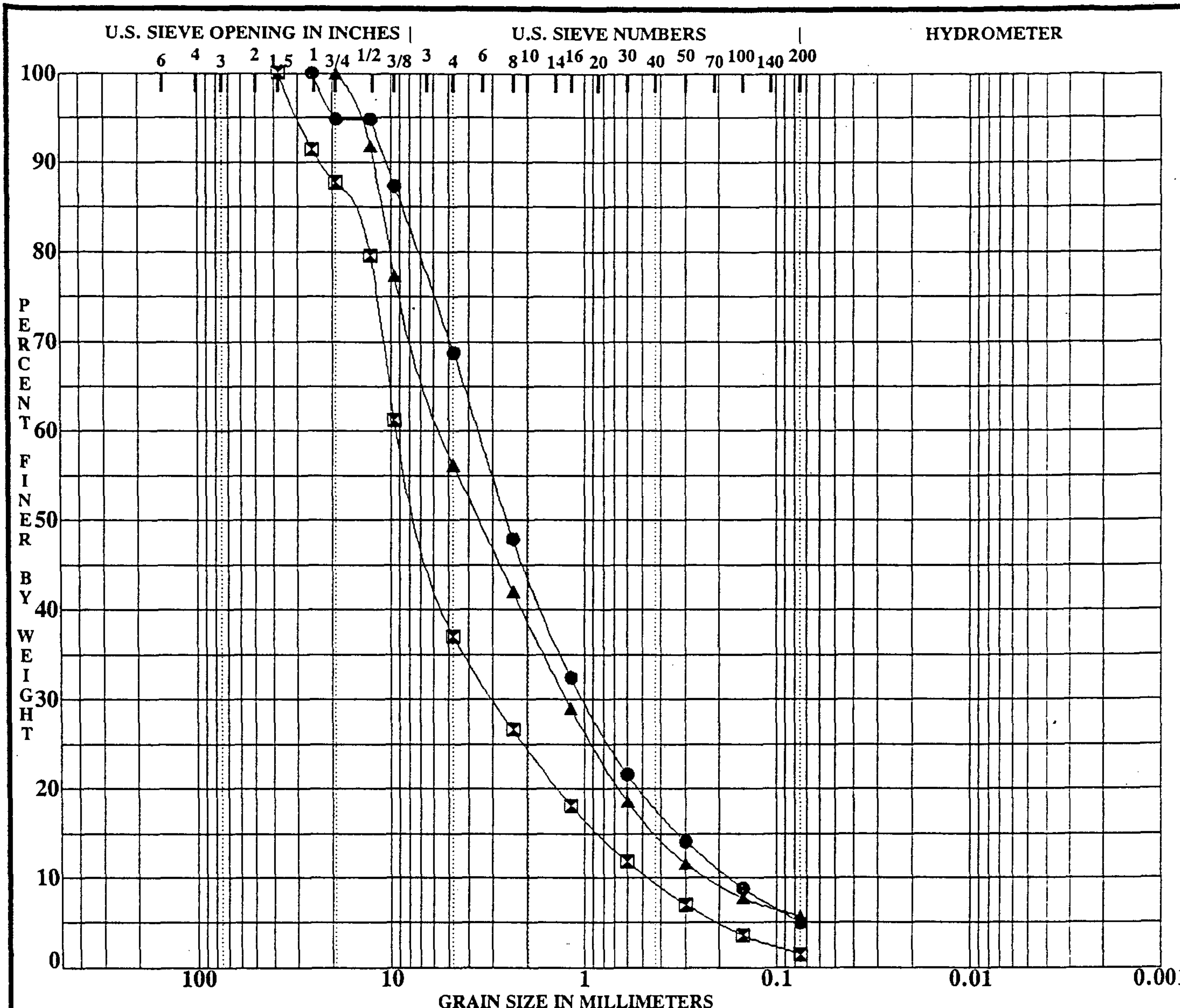
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	B-13	15.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.66	20.2
⊠	B-14	10.0	WELL GRADED GRAVEL with SAND (GW)	NP	NP	NP	2.07	19.9
▲	B-14	20.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.27	23.9

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	B-13	15.0	25.40	3.55	1.015	0.1755	31.3	63.7	5.0	
⊠	B-14	10.0	38.10	9.21	2.966	0.4627	63.0	35.5	1.5	
▲	B-14	20.0	19.10	5.40	1.245	0.2257	43.9	50.4	5.7	

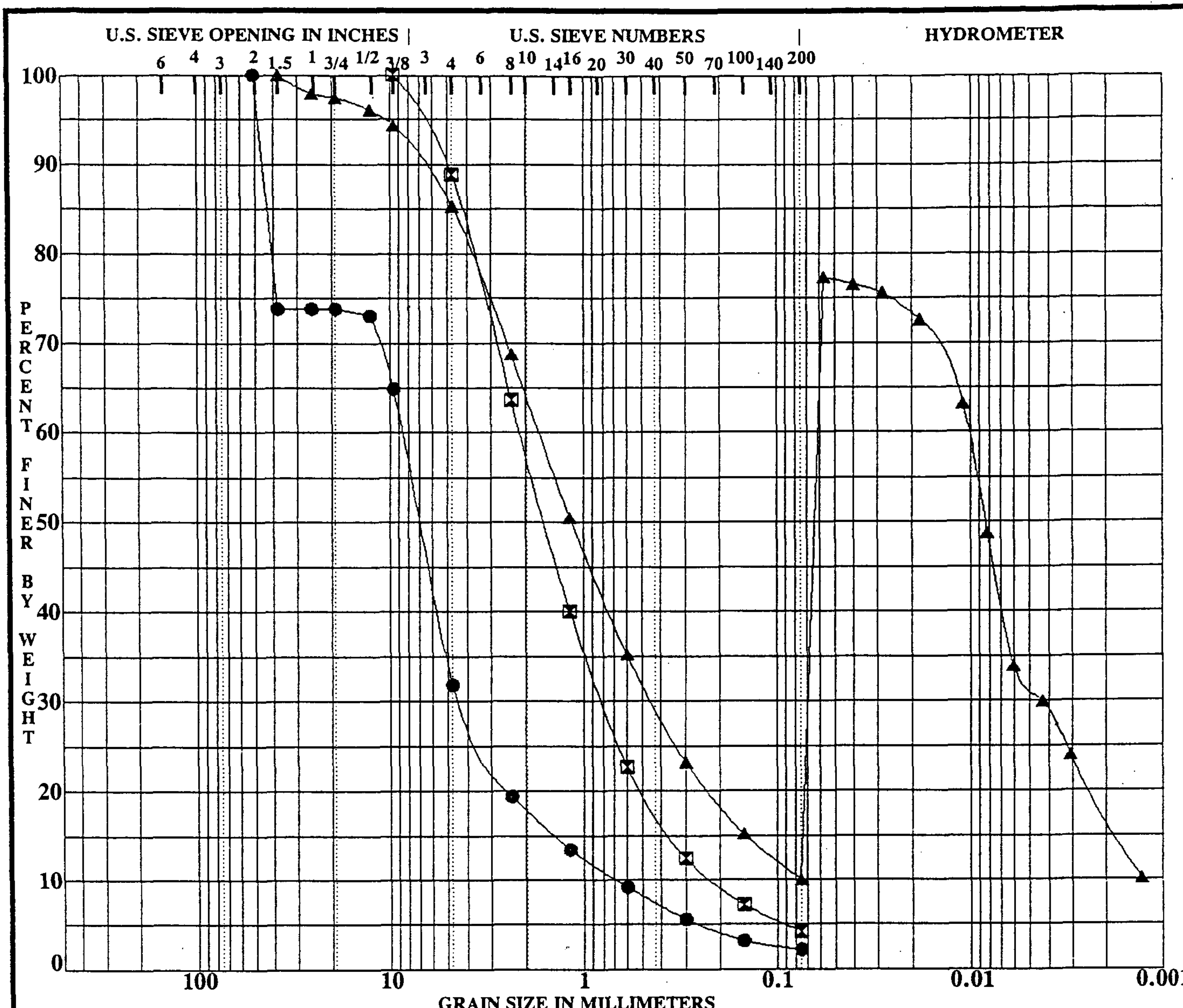
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-7



<table>
<tr><td rowspan="2">COBBLES</td><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>coarse</td><td>fine</td><td>coarse</td><td>medium</td><td>fine</td></tr>
</table>

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	B-15	20.0	POORLY GRADED GRAVEL with SAND (GP)	NP	NP	NP	3.14	12.6
⊠	B-17	15.0	WELL GRADED SAND (SW)	NP	NP	NP	1.38	9.7
▲	T-1	0.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.55	22.6

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	B-15	20.0	50.80	8.60	4.291	0.6825	68.2	29.6	2.2	
⊠	B-17	15.0	9.53	2.12	0.798	0.2179	11.2	84.6	4.2	
▲	T-1	0.0	38.10	0.01	0.004		14.7	75.3	-21.0	31.6

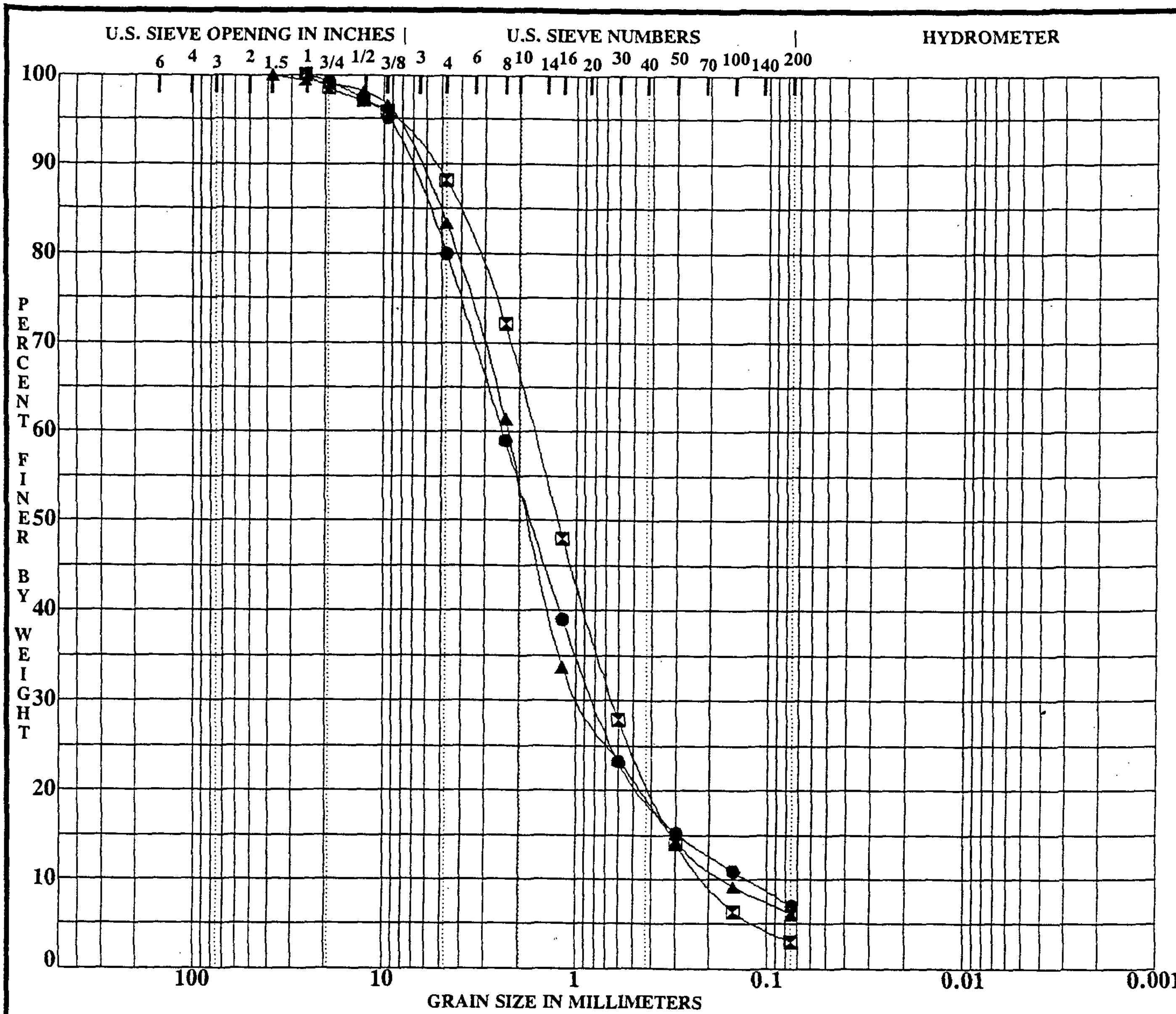
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	T-6	10.5	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	2.07	19.1
⊠	T-7	1.5	WELL GRADED SAND (SW)	NP	NP	NP	1.19	8.0
▲	T-8	6.5	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	2.25	13.6

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	T-6	10.5	25.40	2.44	0.803	0.1278	20.1	72.9	7.0	
⊠	T-7	1.5	25.40	1.67	0.644	0.2083	11.9	85.1	3.0	
▲	T-8	6.5	38.10	2.28	0.926	0.1672	16.7	77.2	6.1	

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

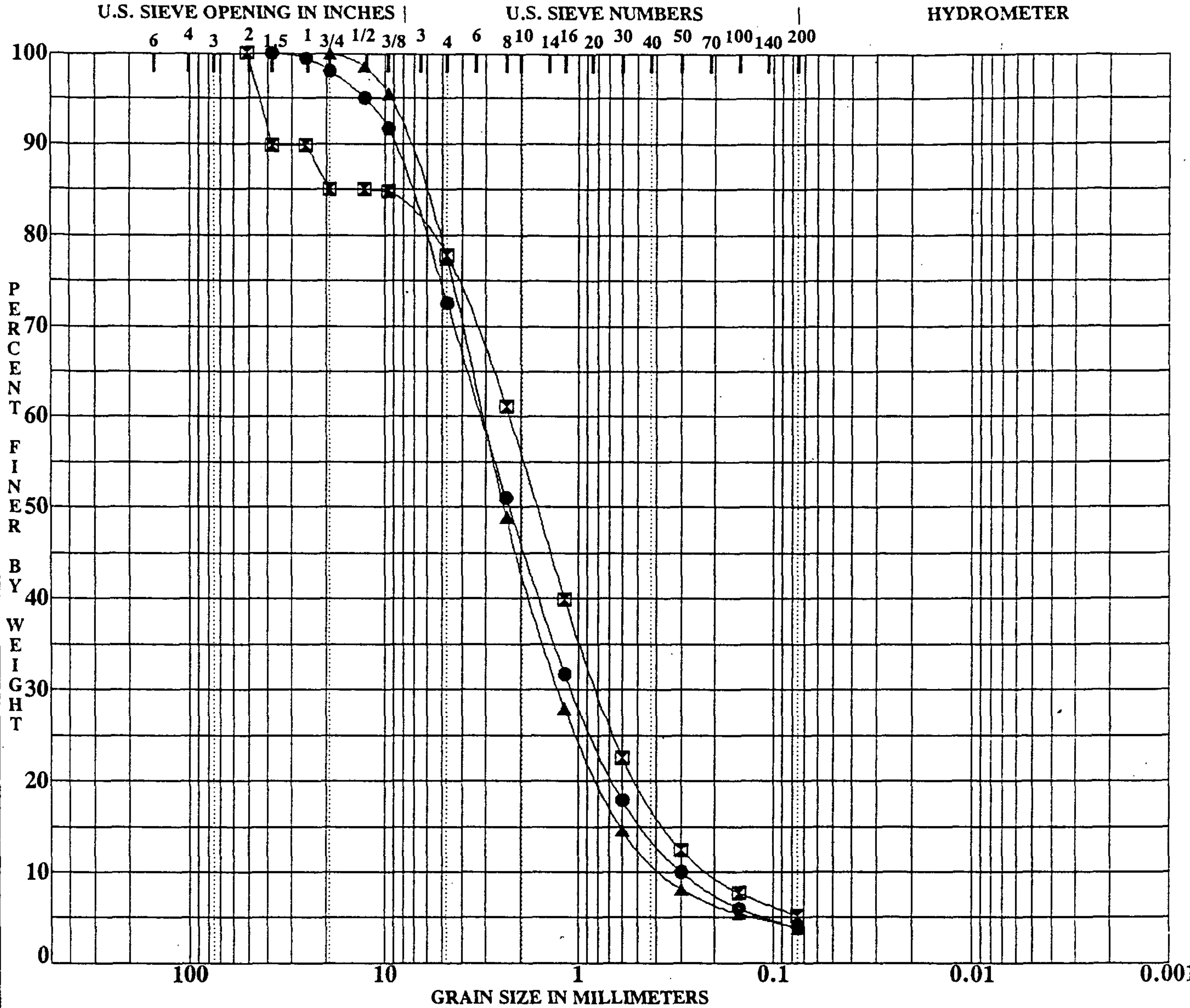
PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE

B-11



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	T- 9	5.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.24	10.5
⊠	T-10	9.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.34	10.8
▲	T-11	6.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.40	8.4

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	T- 9	5.0	38.10	3.16	1.086	0.3000	27.5	68.7	3.8	
⊠	T-10	9.0	50.80	2.28	0.801	0.2106	22.3	72.5	5.2	
▲	T-11	6.0	19.05	3.10	1.265	0.3674	22.7	73.4	3.9	

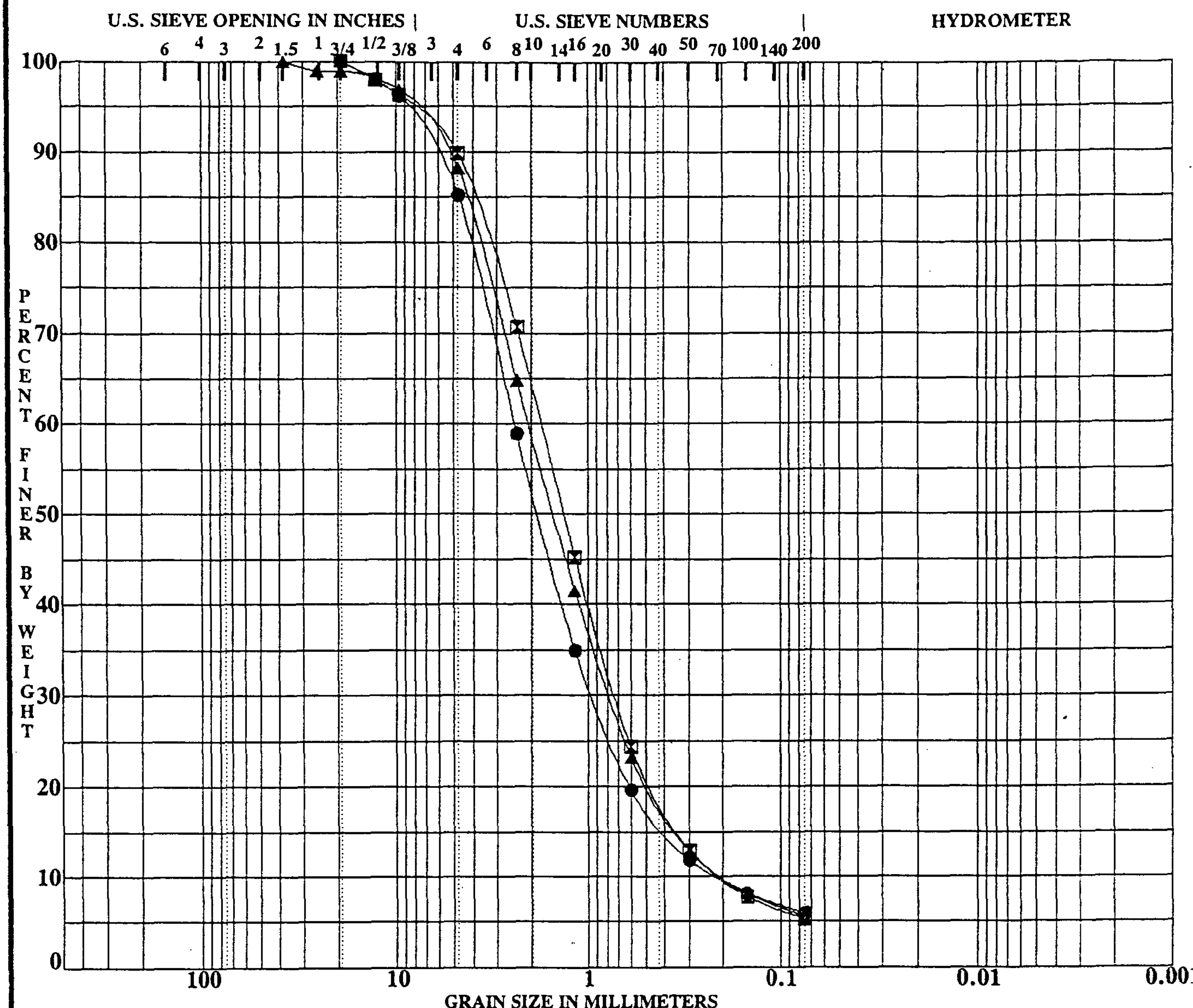
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE B-12



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	T-12	3.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.74	11.3
⊠	T-13	8.0	WELL GRADED SAND with SILT (SW-SM)	NP	NP	NP	1.45	8.7
▲	T-14	8.0	WELL GRADED SAND with SILT (SW-SM)	NP	NP	NP	1.47	10.3

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	T-12	3.0	19.10	2.43	0.950	0.2141	14.8	79.3	5.9	
⊠	T-13	8.0	19.10	1.76	0.722	0.2038	10.2	84.5	5.3	
▲	T-14	8.0	38.10	2.05	0.771	0.1985	11.8	82.7	5.5	

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

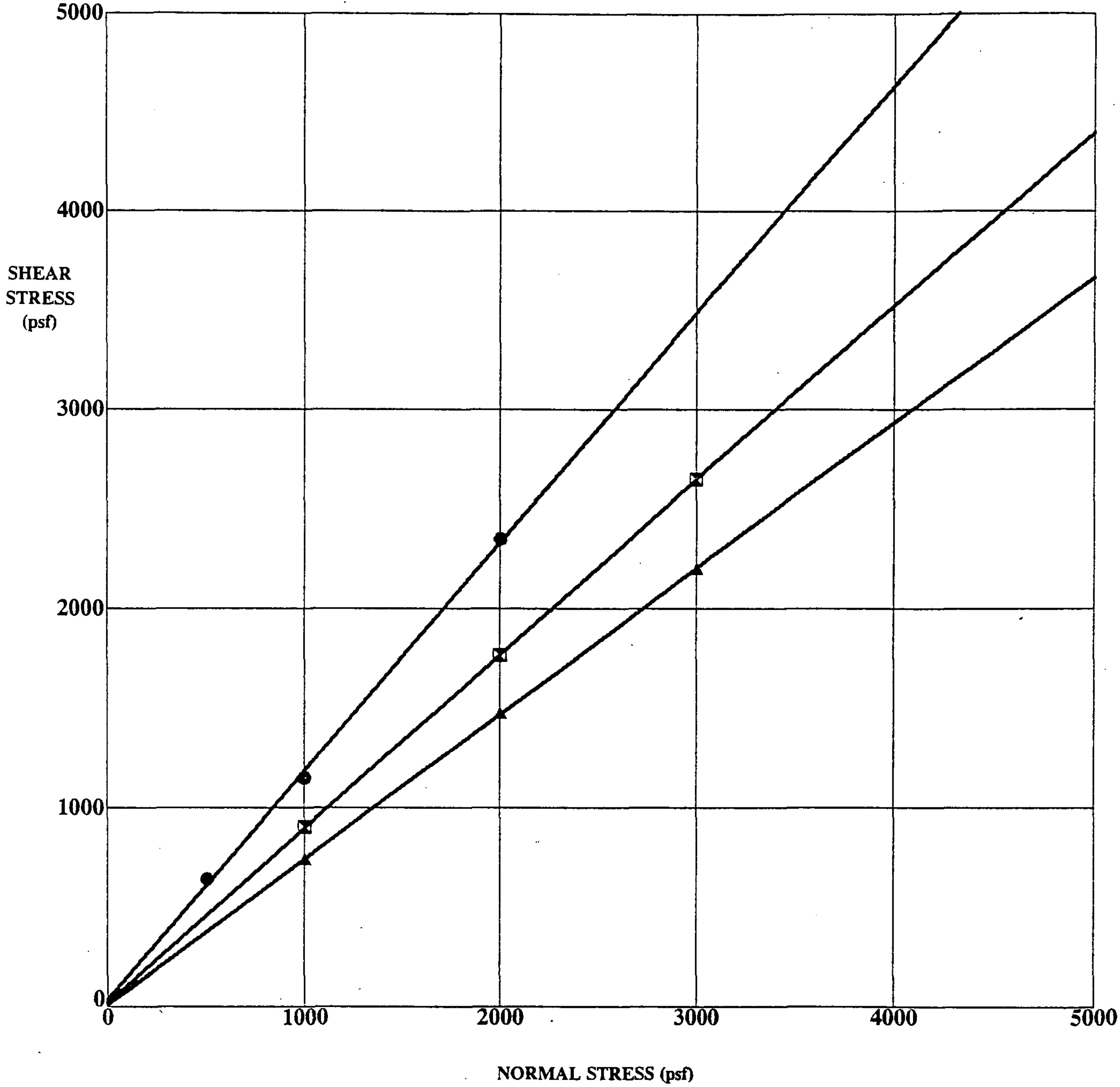
PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

GRAIN SIZE ANALYSES

PLATE

B-13



Exploration No.	Depth (ft.)	Soil Description	PHI Angle Degrees	Cohesion (psf)
● 99	75.0		49	40
⊠ B- 8	25.0	WELL GRADED SAND with gravel SW	41	23
▲ B-10	20.0	WELL GRADED SAND with gravel SW	36	13

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

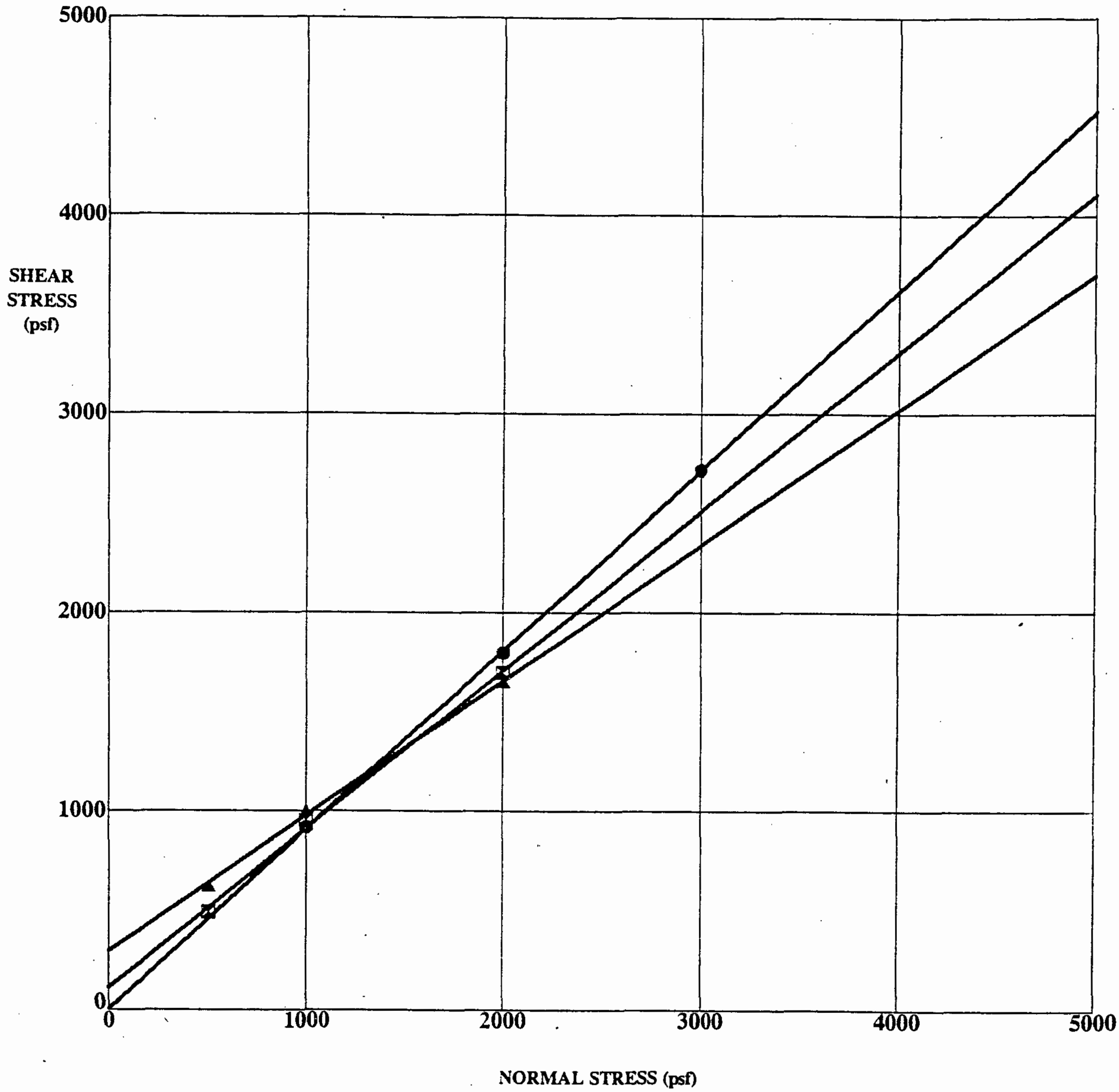
PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

DIRECT SHEAR TEST RESULTS

PLATE

B-14



Exploration No.	Depth (ft.)	Soil Description	PHI Angle Degrees	Cohesion (psf)
● B-11	25.0	WELL GRADED SILTY SAND SW-SM	42	7
⊠ B-13	5.0	WELL GRADED SILTY SAND SW-SM	39	115
▲ B-15	10.0	POORLY GRADED GRAVEL with sand GP	34	295

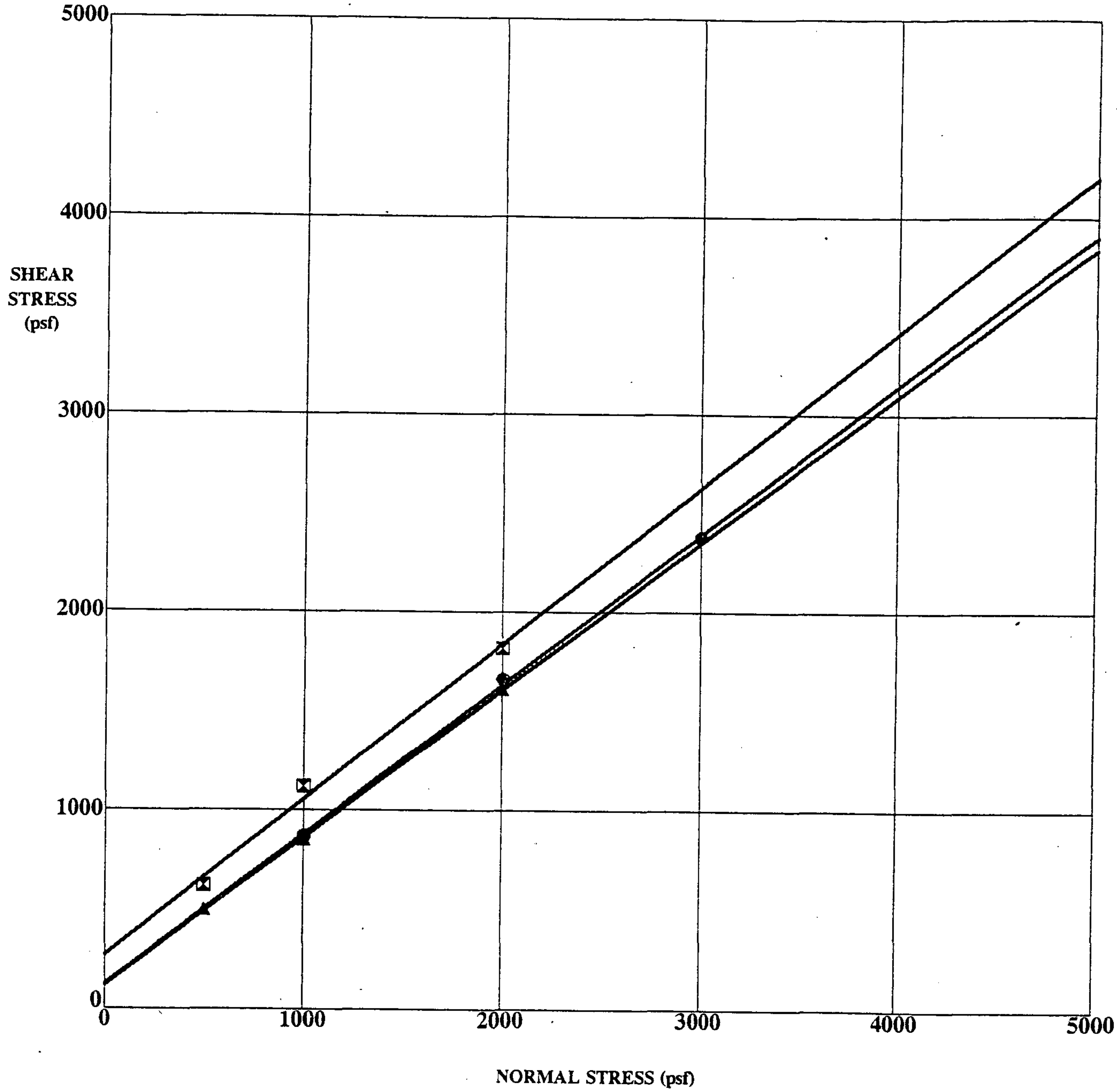
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

DIRECT SHEAR TEST RESULTS

PLATE B-15



Exploration No.	Depth (ft.)	Soil Description	PHI Angle Degrees	Cohesion (psf)
● T-1	11.0		37	127
☒ T-2	1.5		38	270
▲ T-3	0.0	WELL GRADED SILTY SAND SW-SM	37	119

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SOILS AND MATERIALS TESTING

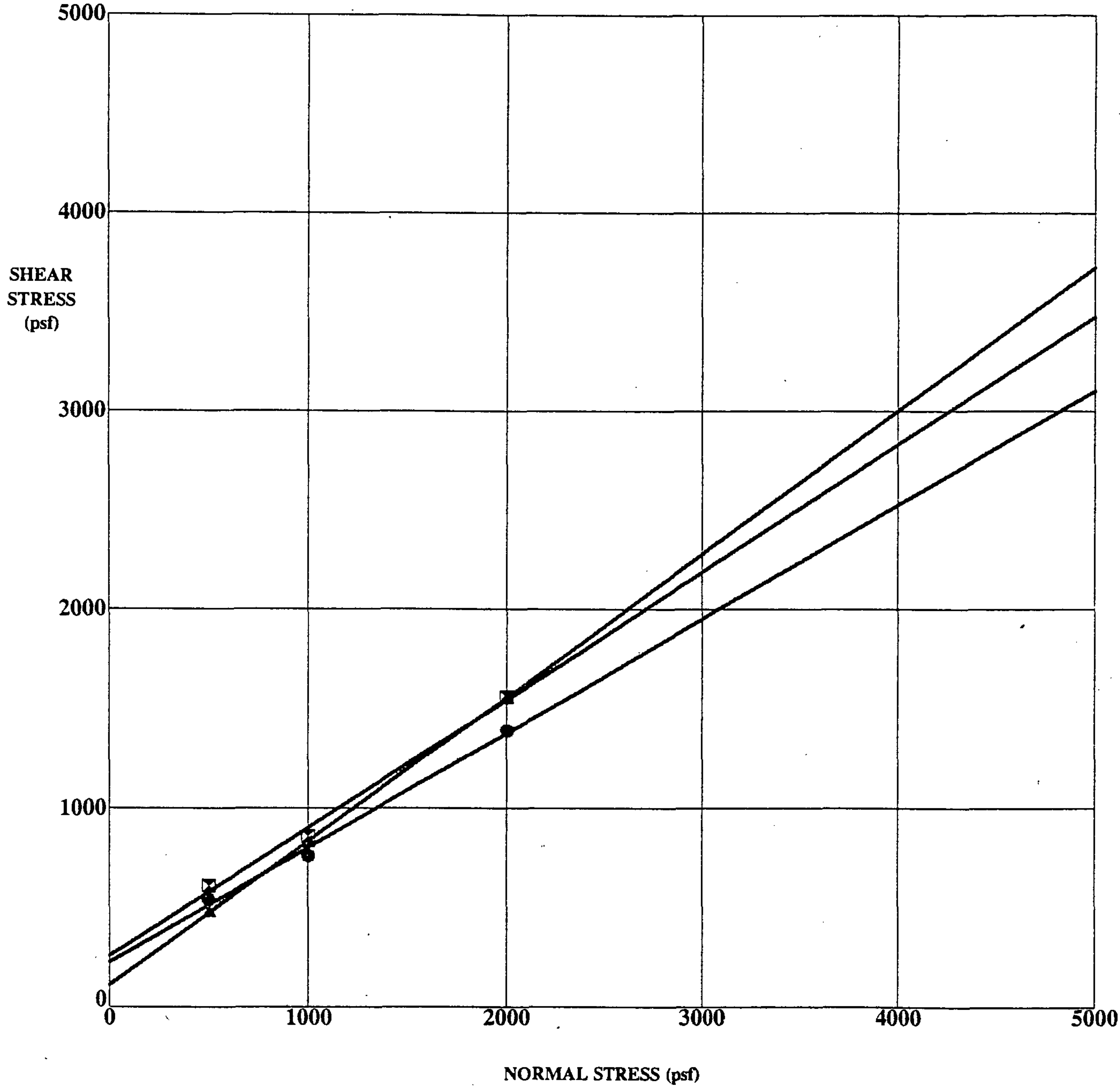
PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

DIRECT SHEAR TEST RESULTS

PLATE

B-16



Exploration No.	Depth (ft.)	Soil Description	PHI Angle Degrees	Cohesion (psf)
● T- 4	9.0		30	225
⊠ T- 5	4.0		33	260
▲ T- 6	1.5		36	115

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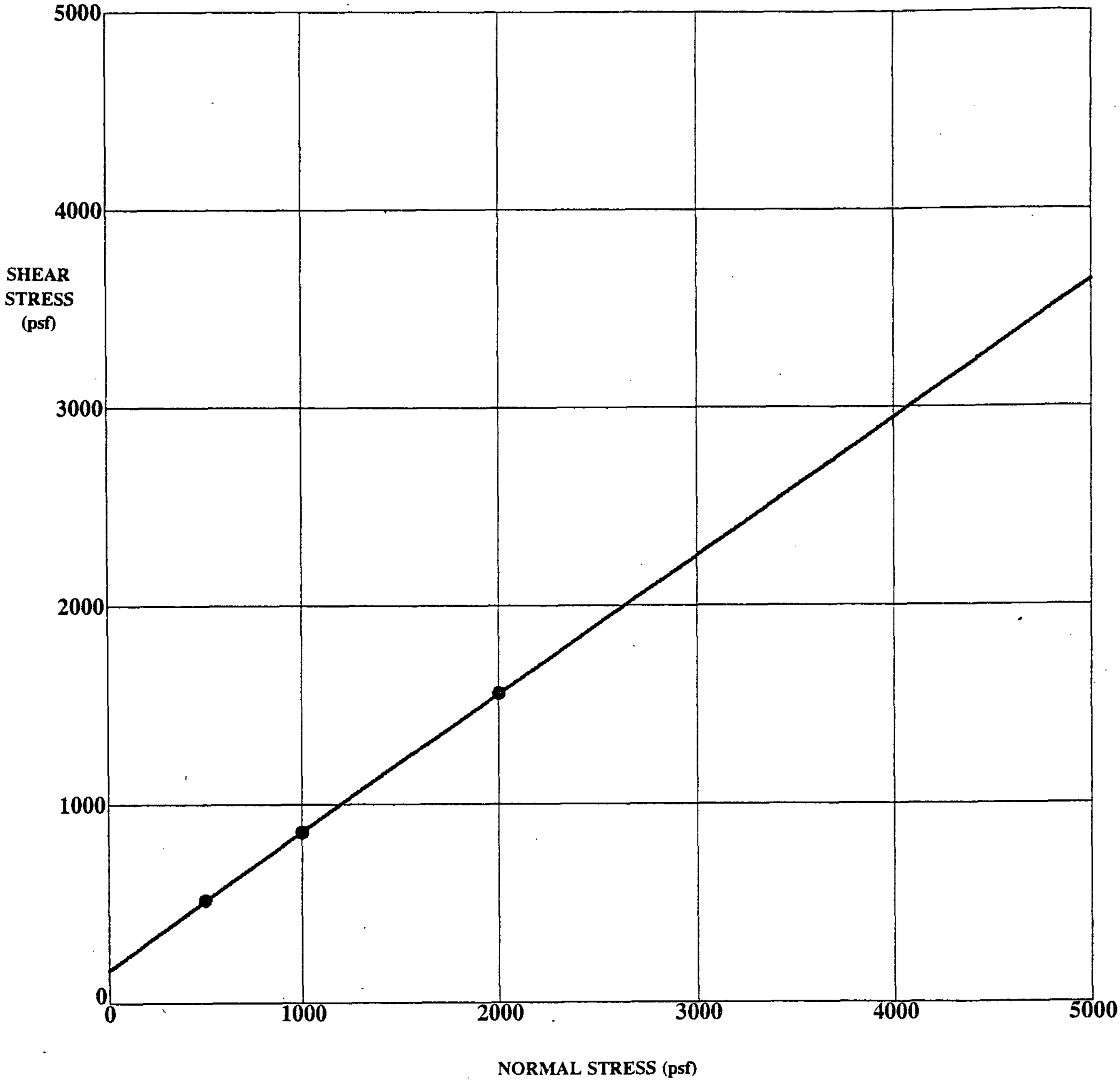
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

DIRECT SHEAR TEST RESULTS

PLATE B-17



Exploration No.	Depth (ft.)	Soil Description	PHI Angle Degrees	Cohesion (psf)
● T- 7	1.5		35	170

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-109706

PROJECT: Hiko Wash Detention Basin

DIRECT SHEAR TEST RESULTS

PLATE

B-18

Atlas Chemical Testing Laboratories, Inc.

2120 WESTERN AVE., SUITE C-6 - (702)383-3000 - LAS VEGAS, NEVADA 89102

CHEMICAL
PHYSICAL
FORENSIC

member of
AMERICAN SOCIETY FOR
TESTING MATERIALS

LABORATORY NO: 4094 DATE: 3/1/91

SAMPLE: Soil (5 samples)

MARKED: 109706

DATE RECEIVED: 2/28/91

SUBMITTED BY: Kleinfelder, Inc.
6850 South Paradise Road
Las Vegas, NV 89119

REPORT OF DETERMINATION

SOIL CORROSIVITY ANALYSIS

The soil sample(s) that you submitted to our laboratory were analyzed for the standard corrosivity parameters. A 30.00 gram portion of each sample was agitated to equilibrium with 150.0 mL of ASTM Type I water. The resulting solution(s) were then filtered and analyzed by American Society for Testing Materials (ASTM) and Standard Methods for the Examination of Water and Wastewater, 15th Edition (Std. Meth.) procedures. The results that appear on the report page are for those SOLUTION(S). To convert a solution ppm (or mg/L) to a SOIL ppm (or mg/kg) for this extraction ratio multiply by five(5). To convert a soil ppm to a weight percent divide by ten thousand(10,000). The standard methods used for the determinations are as follows:

pH Value: glass electrode/silver-silver chloride reference/Std. Meth. 423. Oxidation-Reduction Potential: platinum electrode/silver-silver chloride reference/results reported refered to the standard hydrogen electrode/ASTM D 1498. Sulfate: Turbidimetric/Std. Meth. 426C. Sulfide: solutions - Methylene Blue/Std. Meth. 427C soils - sodium azide-potassium iodide detection prior to solution quantitation. Total Salts: Electrical Conductivity, factor empirically determined/Std. Meth. 205. Chloride: Argentometric/Std. Meth. 407A.

Respectfully submitted,
ATLAS CHEMICAL TESTING LABORATORIES, INC.

Robert L. Summers

Robert L. Summers
Chemist

Atlas Chemical Testing Laboratories

2120 Western Avenue, Suite C-6 • Las Vegas, Nevada 89102
(702) 383-1199 • Fax (702) 383-4983

CHEMICAL
PHYSICAL
FORENSIC

member of
AMERICAN SOCIETY FOR
TESTING MATERIALS

ACT LAB NO: 4001

DATE: 1/22/91

PROJECT NO: 109706

ANALYZED BY: Robert L. [illegible]

WATER SOLUBLE SALT ANALYSIS IN SOIL
1:5 (soil:water) Aqueous Extraction

ASTM D 1428, D 516

Sample No.	Location	Depth (Feet)	Sodium (Percent)	Sulfate (Percent)	Total Available Water Soluble Sodium Sulfate (Percent)
	T-2	0-1	<0.01	0.01	<0.01
	T-5	4	<0.01	0.01	<0.01
	T-9	5	<0.01	0.01	<0.01

Notes: The results for each constituent denote the percentage of that analyte, soluble in water at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

ACT LAB NO:	4094	Kleinfelder, Inc.
PROJECT NO:	109706	6850 South Paradise Road
DATE:	3/1/91	Las Vegas, NV 89119

BORING NUMBER	DEPTH (FEET)	pH VALUE	RED-OX (MV)	SULFATE CONCENTRATION (ppm)	SULFIDE CONCENTRATION (ppm)	TOTAL SALTS CONCENTRATION (ppm)	CHLORIDE CONCENTRATION (ppm)
T-1	0	8.94	+605	40	nil	58	5
T-3	3	9.11	+644	25	nil	32	5
T-4	9	9.30	+634	25	nil	55	20
T-5	4	9.18	+619	20	nil	39	10
T-6	1½	8.73	+624	68	nil	98	5

Respectfully submitted,

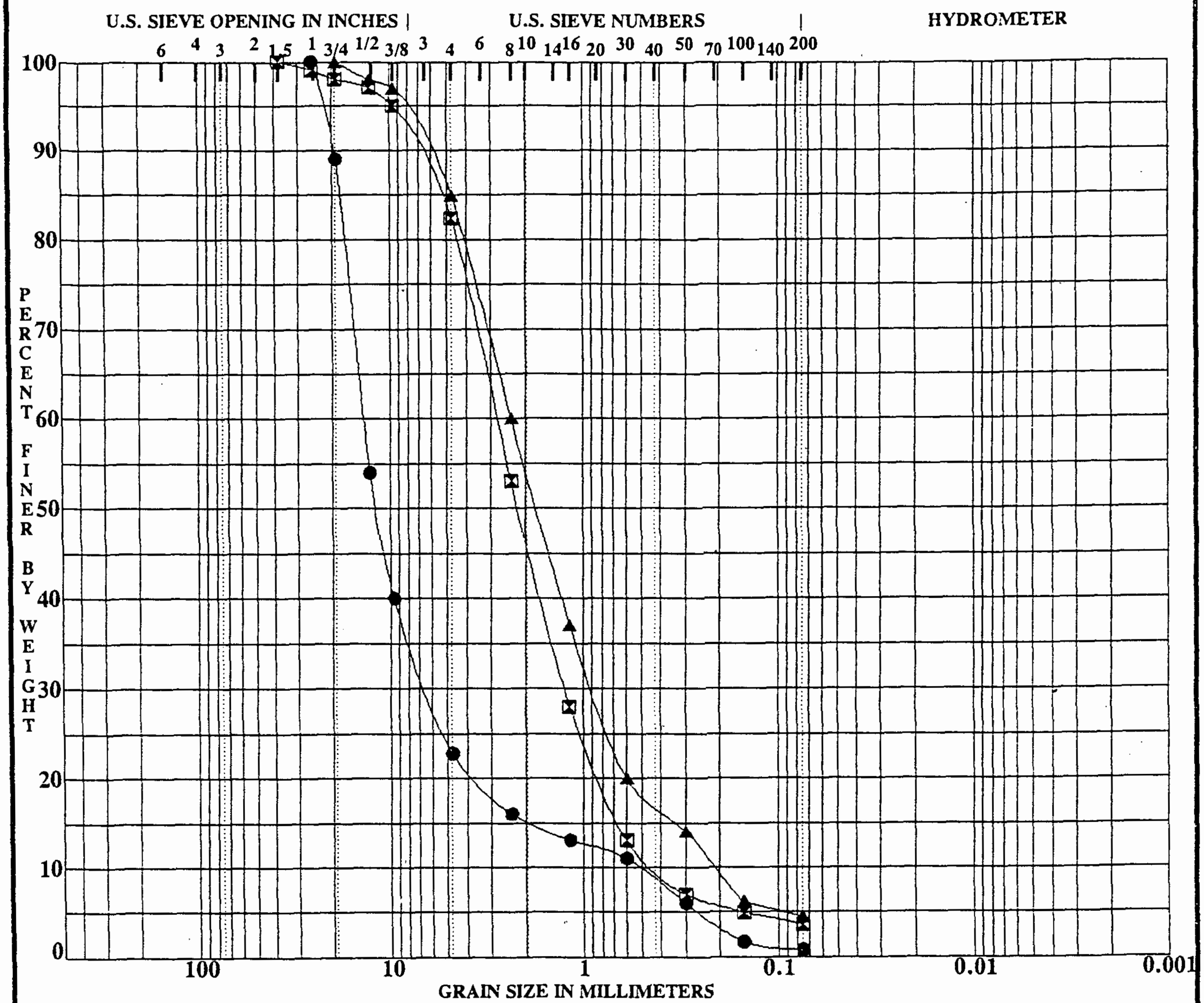
ATLAS CHEMICAL TESTING LABORATORIES, INC.

Robert L. Summers

Robert L. Summers

Chemist

Appendix C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	BB-PIT	1.0	POORLY GRADED GRAVEL with SAND (GP)	NP	NP	NP	5.68	26.1
⊠	NE-C-BSN	1.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.31	6.6
▲	NW-BSN	1.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.61	11.2

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	BB-PIT	1.0	25.40	13.62	6.357	0.5223	77.2	22.0	0.8	
⊠	NE-C-BSN	1.0	38.10	2.79	1.247	0.4243	17.7	78.7	3.6	
▲	NW-BSN	1.0	19.10	2.36	0.893	0.2103	15.1	80.4	4.5	

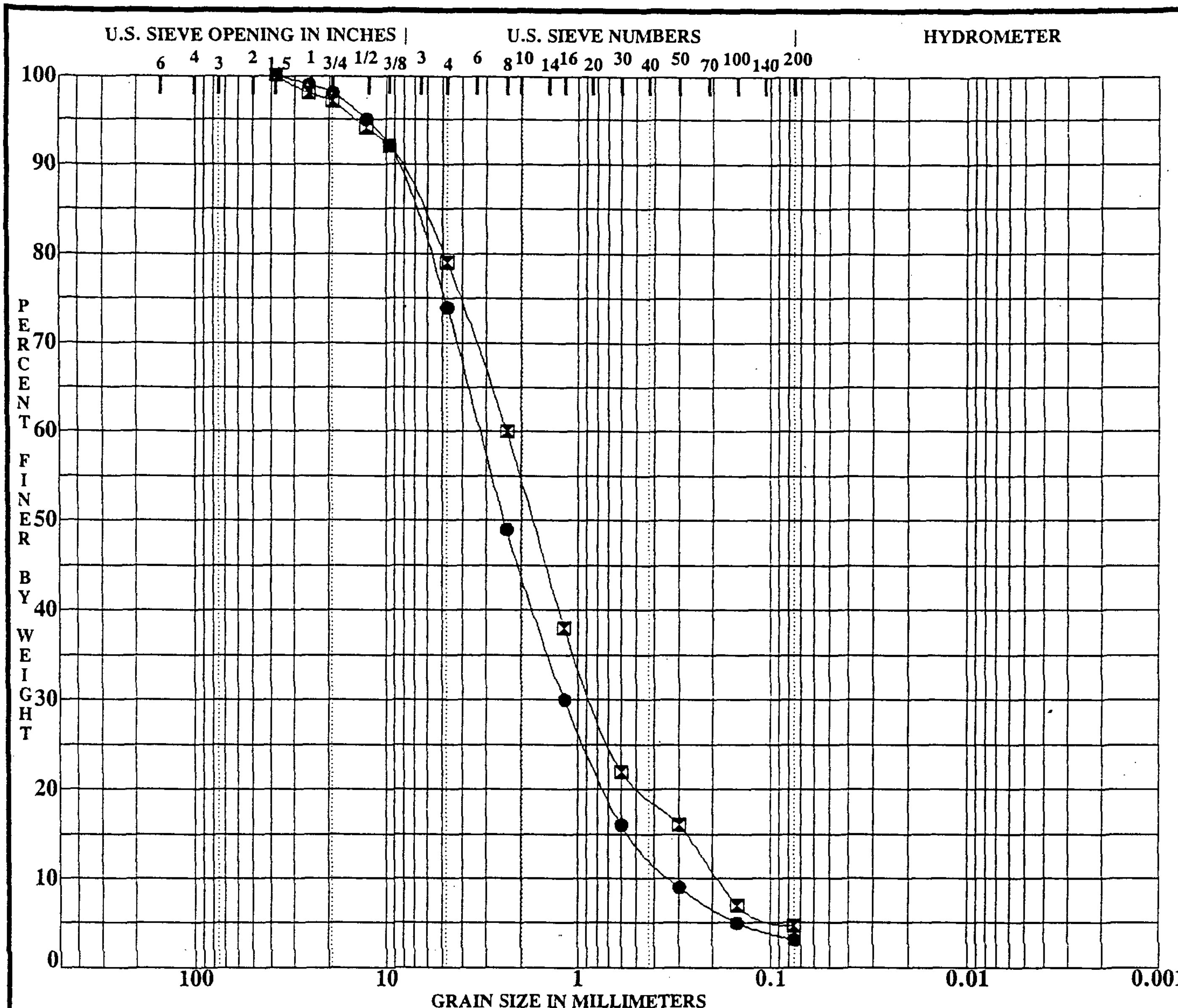
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

GRAIN SIZE ANALYSES

PLATE C-1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Exploration No.	Depth(ft)	Classification	LL	PL	PI	Cc	Cu
●	SE-BANK	1.0	WELL GRADED SAND with GRAVEL (SW)	NP	NP	NP	1.31	9.7
⊠	SW-BSN	1.0	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	NP	NP	NP	1.59	12.5

	Exploration No.	Depth(ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Silt	%Clay
●	SE-BANK	1.0	38.10	3.21	1.180	0.3312	26.1	70.8	3.1	
⊠	SW-BSN	1.0	38.10	2.36	0.841	0.1890	21.1	74.2	4.7	

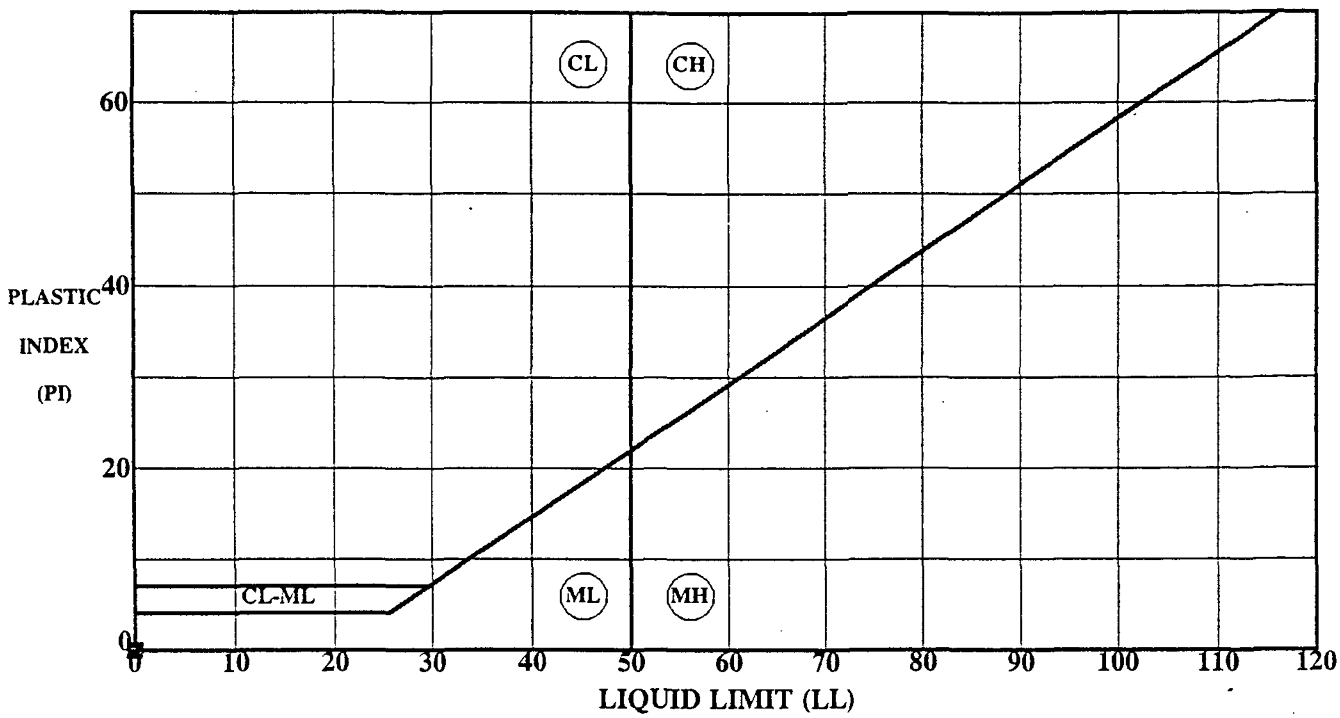
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

GRAIN SIZE ANALYSES

PLATE
C-2



	Exploration No.	Depth(ft)	LL	PL	PI	Fines	Classification
●	BB-PIT	1.0	NP	NP	NP	0.8	POORLY GRADED GRAVEL with SAND (GP)
⊠	NE-C-BSN	1.0	NP	NP	NP	3.6	WELL GRADED SAND with GRAVEL (SW)
▲	NW-BSN	1.0	NP	NP	NP	4.5	WELL GRADED SAND with SILT and GRAVEL (SW-SM)
★	SE-BANK	1.0	NP	NP	NP	3.1	WELL GRADED SAND with GRAVEL (SW)
✕	SW-BSN	1.0	NP	NP	NP	4.7	WELL GRADED SAND with SILT and GRAVEL (SW-SM)

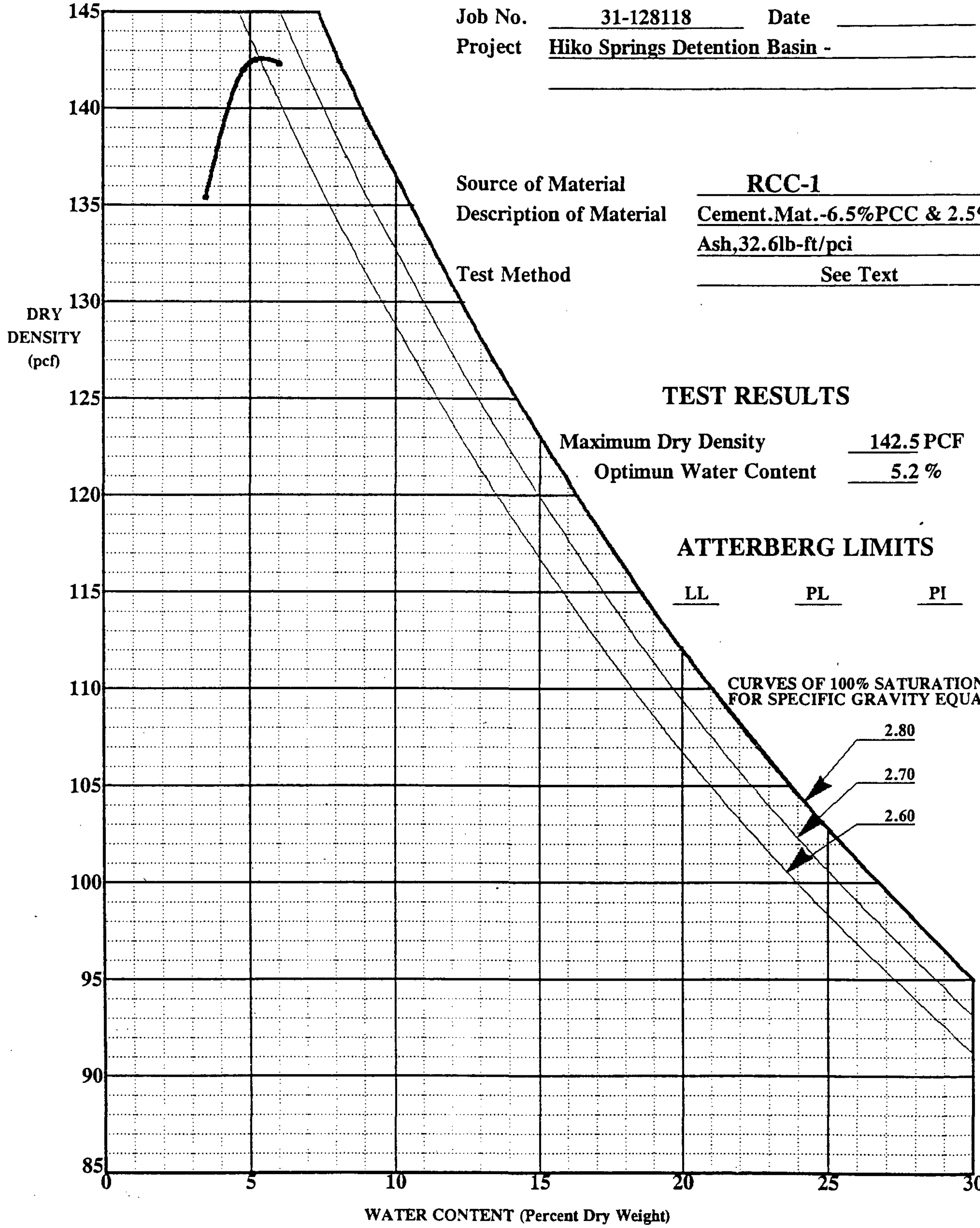
KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

ATTERBERG LIMITS TEST RESULTS

PLATE C-3



Job No. 31-128118 Date ____________

Project Hiko Springs Detention Basin -

Source of Material RCC-1

Description of Material Cement.Mat.-6.5%PCC & 2.5%Fly Ash,32.6lb-ft/pci

Test Method See Text

TEST RESULTS

Maximum Dry Density 142.5 PCF

Optimun Water Content 5.2 %

ATTERBERG LIMITS

LL PL PI

KLEINFELDER

GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

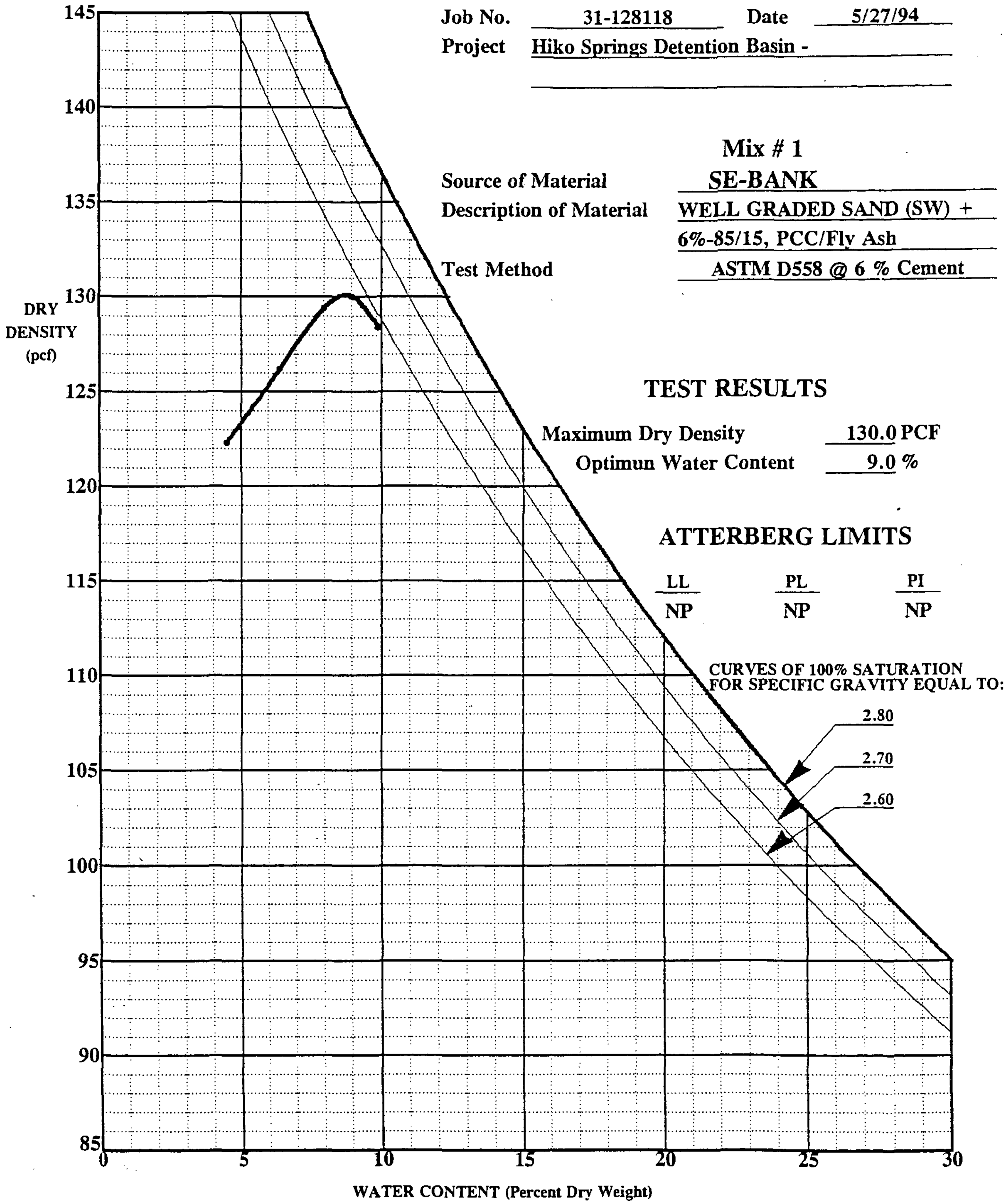
MOISTURE-DENSITY RELATIONSHIP

PLATE C-4

Job No. 31-128118 Date 5/27/94
Project Hiko Springs Detention Basin -

Mix # 1

Source of Material SE-BANK
Description of Material WELL GRADED SAND (SW) + 6%-85/15, PCC/Fly Ash
Test Method ASTM D558 @ 6 % Cement



TEST RESULTS

Maximum Dry Density 130.0 PCF
Optimun Water Content 9.0 %

ATTERBERG LIMITS

LL	PL	PI
NP	NP	NP

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

MOISTURE-DENSITY RELATIONSHIP

PLATE C-6

Job No. 31-128118 Date 5/27/94

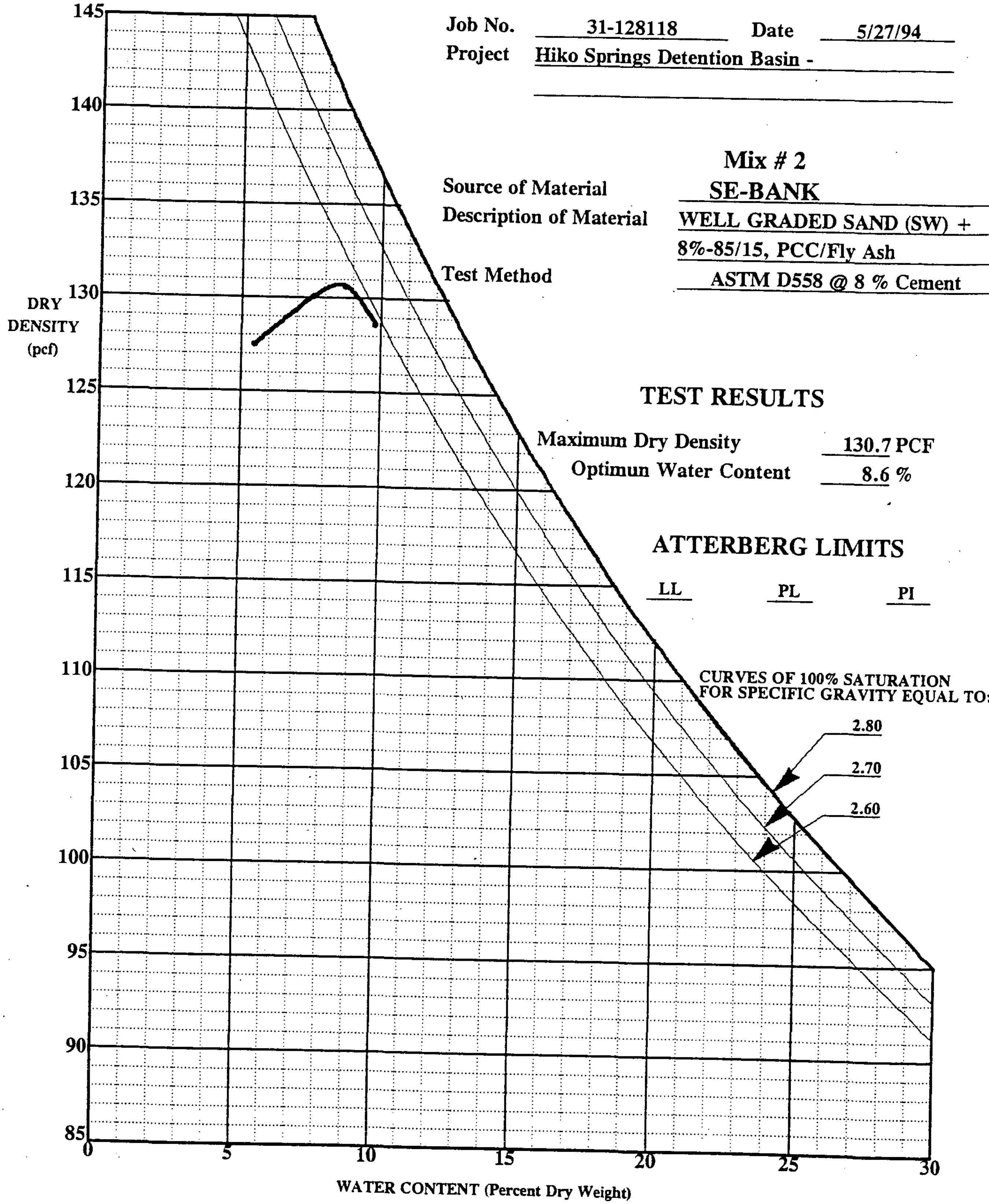
Project Hiko Springs Detention Basin -

Mix # 2

Source of Material SE-BANK

Description of Material WELL GRADED SAND (SW) + 8%-85/15, PCC/Fly Ash

Test Method ASTM D558 @ 8 % Cement



TEST RESULTS

Maximum Dry Density 130.7 PCF

Optimun Water Content 8.6 %

ATTERBERG LIMITS

LL	PL	PI

KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

MOISTURE-DENSITY RELATIONSHIP

PLATE C-7

Job No. 31-128118 Date 5/27/94

Project Hiko Springs Detention Basin -

Mix # 3

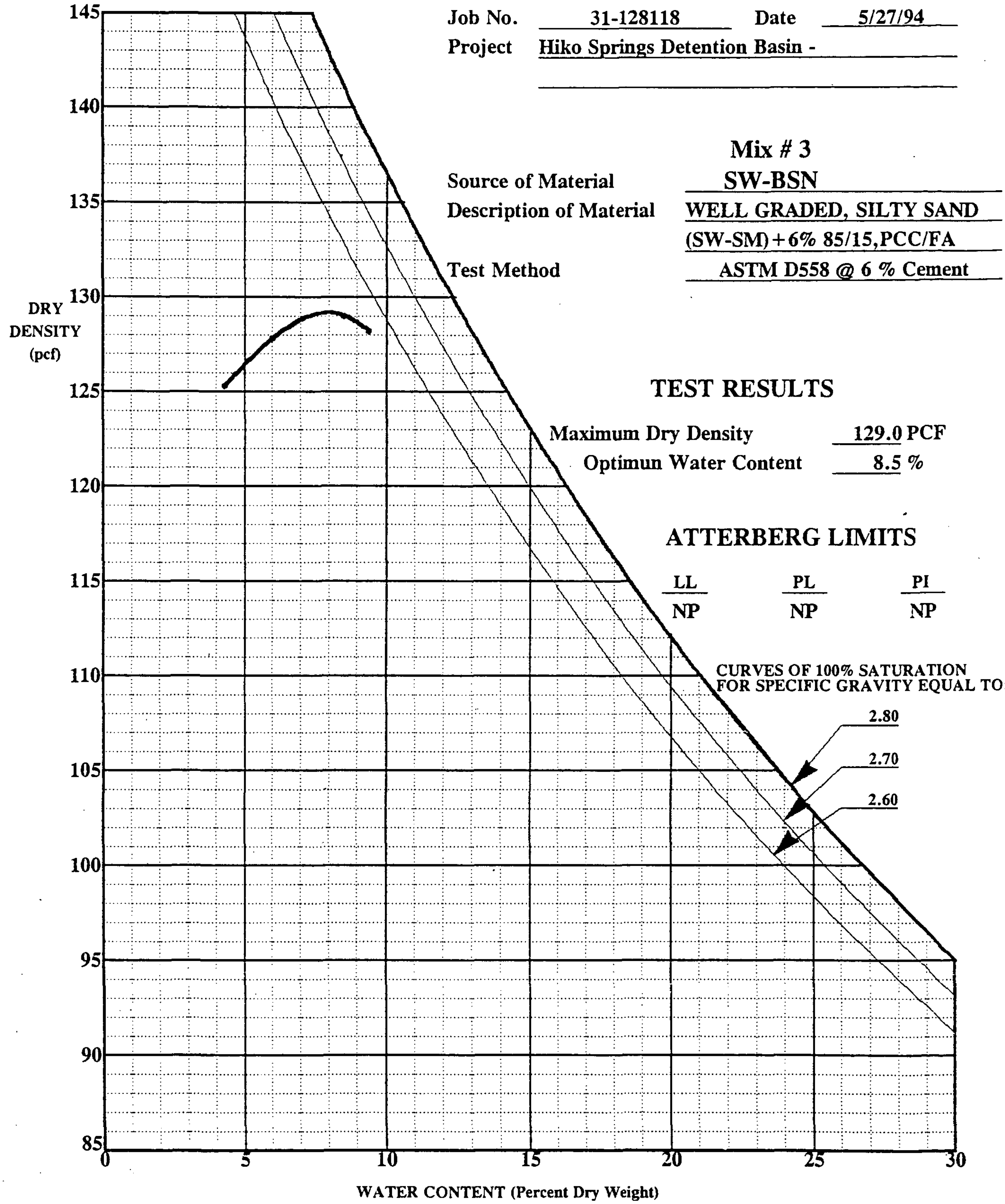
Source of Material	SW-BSN
Description of Material	WELL GRADED, SILTY SAND (SW-SM)+6% 85/15,PCC/FA
Test Method	ASTM D558 @ 6 % Cement

TEST RESULTS

Maximum Dry Density	129.0 PCF
Optimun Water Content	8.5 %

ATTERBERG LIMITS

LL	PL	PI
NP	NP	NP



KLEINFELDER

GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

MOISTURE-DENSITY RELATIONSHIP

PLATE C-8

Job No. 31-128118 Date 5/27/94

Project Hiko Springs Detention Basin -

Mix # 4

Source of Material: SW-BSN

Description of Material: WELL GRADED, SILTY SAND (SW-SM)+8% 85/15,PCC/FA

Test Method: ASTM D558 @ 8 % Cement

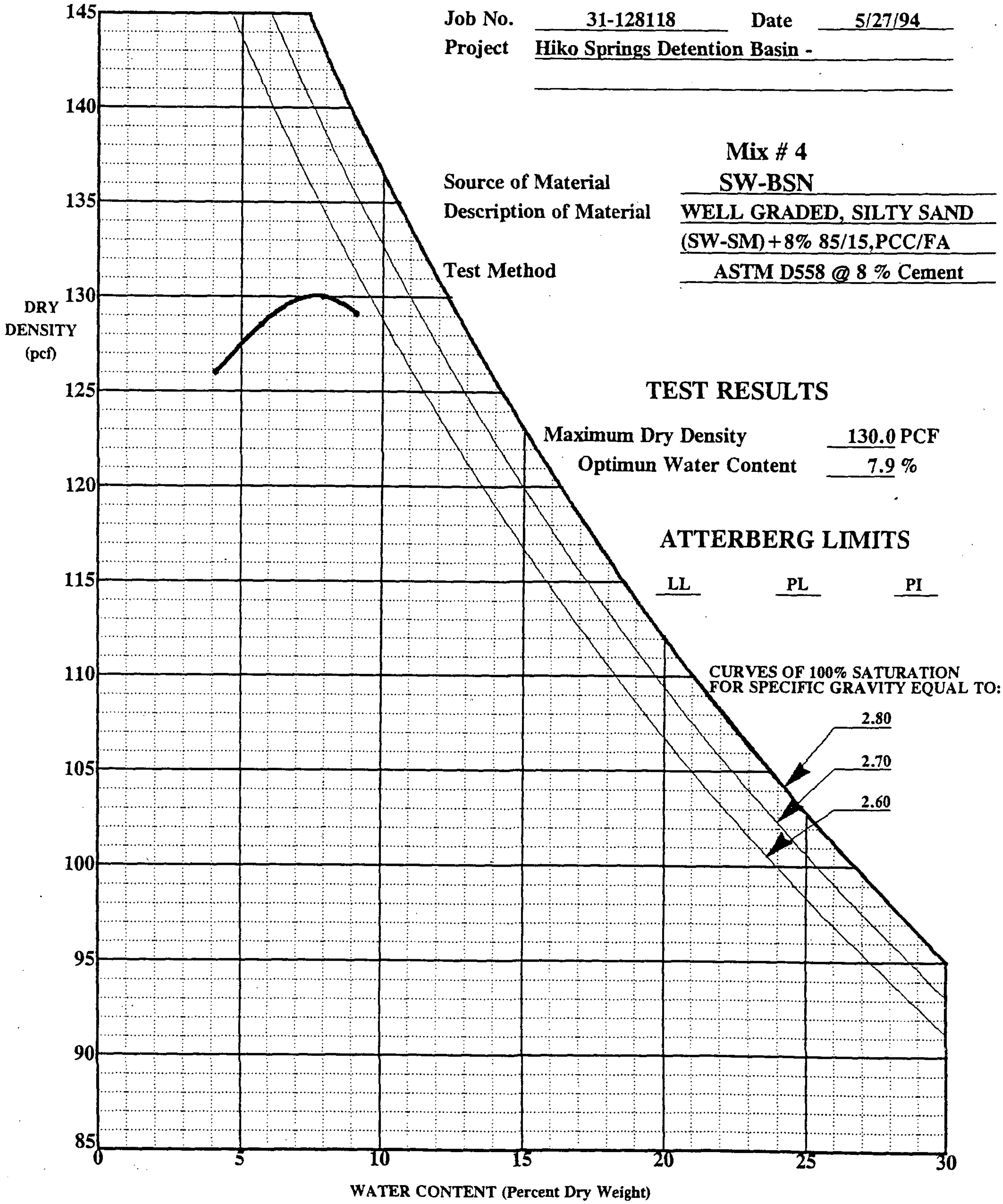
TEST RESULTS

Maximum Dry Density 130.0 PCF

Optimun Water Content 7.9 %

ATTERBERG LIMITS

LL	PL	PI



KLEINFELDER
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
SOILS AND MATERIALS TESTING

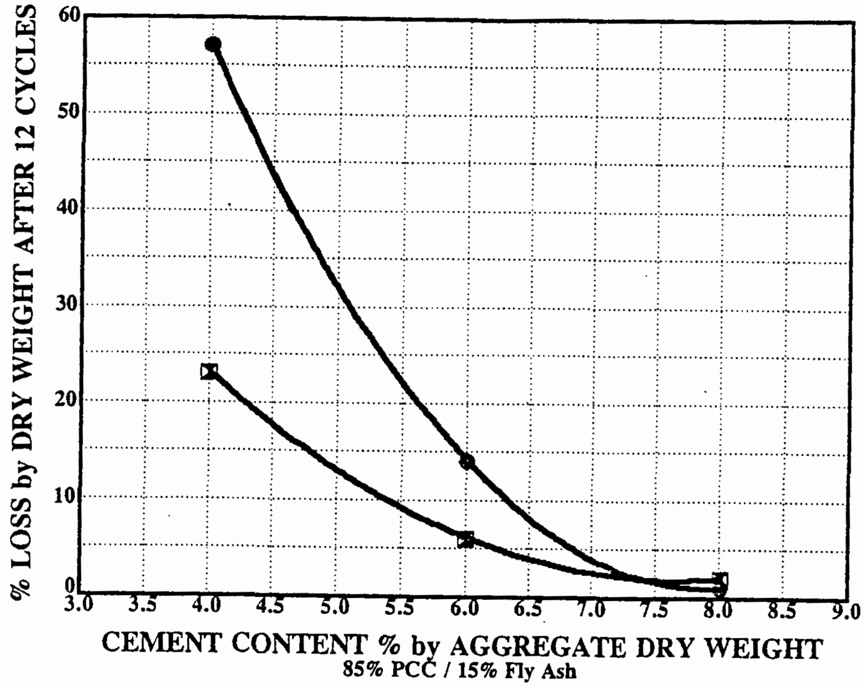
PROJECT NO. 31-128118

PROJECT: Hiko Springs Detention Basin

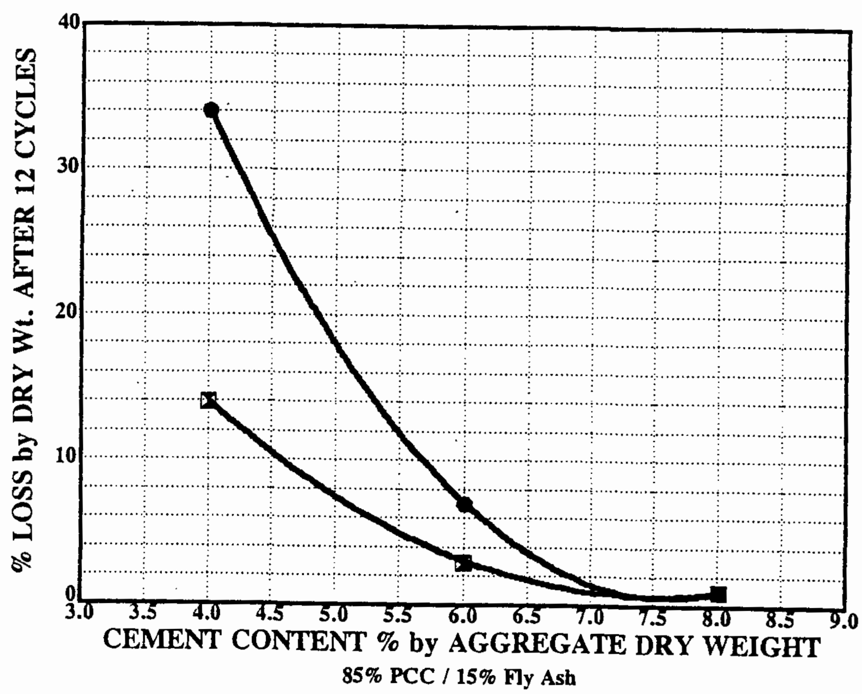
MOISTURE-DENSITY RELATIONSHIP

PLATE C-9

SOIL CEMENT
12 CYCLE FREEZE - THAW Test Results
ASTM test method D560



SOIL CEMENT
12 CYCLE WET - DRY Test Results
ASTM test method D559



KLEINFELDER GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS SOILS AND MATERIALS TESTING	PROJECT: Hiko Springs Detention Basin	PLATE
PROJECT NO. 31-128118	SOIL CEMENT TEST RESULTS	C-10

Kleinfelder, Inc.
6850 South Paradise Road
Las Vegas, NV 89119-3735

Phone:(702) 736-2936

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No:31-128118 Phase: Date: 8/31/94
Project :Hiko Springs Detention Basin
Location :

Permit No:

Black and Veatch Engineers-Architects
Attn:Mr. Steve Canney

Phone: (000) 000-0000

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	80
Contractor	N/A	Slump (in)	N/R	Concrete Temperature (°F)	75
Mix Number	RCC-1	Max. Size Agg. (in)	2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	8.5	Water Added (gal)	5.
Truck/Ticket	N/R / N/R	Design Strength at 0 days	N/R psi	Batch Size (cubic yards)	0.1
Source of Sample	50% NE Center Basin, 50% Bilbary Pit (+3/8")			Time Batched	1:30
	6% Cement (Type V)			Time Sampled	1:45
	2 1/2% Class "F" Fly Ash			Time in Truck	0:15
Sampled by	Troy Carpenter			Date Sampled	June 3, 1994
Submitted by	Weston Hallum			Date Submitted	June 4, 1994

Cylinder Number	Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in²)	Ultimate Load (lb)	Compressive Strength (psi)
13600 A	June 10, 1994	7	6.02" X 12.0"	28.46	52,200	1830
13600 B	June 10, 1994	7	6.02" X 12.0"	28.46	53,800	1890
13600 C	June 17, 1994	14	6.02" X 12.0"	28.46	66,800	2350
13600 D	July 1, 1994	28	6.03" X 12.0"	28.56	97,500	3410
13600 E	July 1, 1994	28	6.03" X 12.0"	28.56	99,900	3500
13600 F	September 1, 1994	90	" X "	0.00		
					Average 28 Day Strength (psi) »»>	3460

Remarks:Water Added = % Moisture, 0.2% Over Optimum
Unit Weight at 7 and 14 days = 143.8 pcf, as cured condition.

Unless prior arrangements are made, HOLD samples will be discarded if design strength is attained.

Reviewed by:

Date:

As a mutual protection to our clients, the public and ourselves, all reports are submitted as the confidential property of our clients, and authorization for publication of statements, conclusions, or extracts from or regarding our reports is reserved pending our written approval. Samples will be disposed of after testing is completed unless prior arrangements are agreed to in writing. Tests by our personnel are performed in general accordance with ASTM, C172, C143, C138, C231, C173, C31 and C1064 standards unless otherwise noted. Copyright 1994.

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Phone: (702) 736-2936

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No: 31-128118 Phase:

Date: 8/31/94

Project : Hiko Springs Detention Basin

Location :

Permit No:

Black and Veatch Engineers-Architects
Attn: Mr. Steve Canney

Phone: (000) 000-0000

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	82
Contractor	N/A	Slump (in)	N/R	Concrete Temperature (°F)	79
Mix Number	RCC-2	Max. Size Agg. (in)	2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	10%	Water Added (gal)	5.
Truck/Ticket	N/R / N/R	Design Strength at 0 days	N/R psi	Batch Size (cubic yards)	0.1
Source of Sample	50% NW Basin, 50% Bilbary Pit (+3/8") 7% Cement (Type V), 3% Class "F" Fly Ash			Time Batched	2:00
				Time Sampled	2:15
				Time in Truck	0:15
Sampled by	Troy Carpenter			Date Sampled	June 3, 1994
Submitted by	Weston Hallum			Date Submitted	June 4, 1994

Cylinder Number		Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in²)	Ultimate Load (lb)	Compressive Strength (psi)
13601	A	June 10, 1994	7	6.02" X 12.0"	28.46	57,800	2030
13601	B	June 10, 1994	7	6.02" X 12.0"	28.46	58,600	2060
13601	C	June 17, 1994	14	6.02" X 12.0"	28.46	67,700	2380
13601	D	July 1, 1994	28	6.03" X 12.0"	28.56	102,900	3600
13601	E	July 1, 1994	28	6.03" X 12.0"	28.56	102,900	3600
13601	F	September 1, 1994	90	" X "	0.00		
						Average 28 Day Strength (psi) »»>	3600

Remarks: Water Added = % Moisture, 0.2 Over Optimum
Unit Weight at 7 and 14 days = 149.2 pcf as cured condition

Unless prior arrangements are made, HOLD samples will be discarded if design strength is attained.

Reviewed by: ____________________

Date: ____________________

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Las Vegas, NV 89119-3735
Phone:(702) 736-2936

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No:31-128118 Phase: Date: 8/31/94
Project :Hiko Springs Detention Basin
Location :
Permit No:

Black and Veatch Engineers-Architects
Attn:Mr. Steve Canney
Phone: (000) 000-0000

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	78
Contractor	N/A	Slump (in)	N/R	Concrete Temperature (°F)	N/R
Mix Number	Mix #2 with 6% Cement	Max. Size Agg. (in)	1 1/2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	N/R	Water Added (gal)	N/R
Truck/Ticket	N/R / N/R	Design Strength at 28 days	N/R psi	Batch Size (cubic yards)	N/R
Source of Sample	Soil-Cement Lab Trial Batch for SW Basin Material, Sample B-3. 8% Cementitious Material Added per Dry Weight of Soil (85% Cement, 15% "F" Fly Ash)			Time Batched	N/R
				Time Sampled	N/R
				Time in Truck	N/R
Sampled by	Weston Hallum			Date Sampled	June 6, 1994
Submitted by	Weston Hallum			Date Submitted	June 13, 1994

Cylinder Number	Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in^2)	Ultimate Load (lb)	Compressive Strength (psi)
13660 A	June 13, 1994	7	4.02" X 4.56"	12.69	12,910	1020
13660 B	June 13, 1994	7	4.02" X 4.56"	12.69	12,230	960
13660 C	June 20, 1994	14	4.02" X 4.65"	12.69	15,320	1210
13660 D	July 4, 1994	28	4.02" X 4.56"	12.69	18,320	1440
					Average 28 Day Strength (psi) »»>	1440

Remarks:Fabricated in Accordance with ASTM D559 and Tested in Accordance with ASTM D1633

Unless prior arrangements are made, HOLD samples will be discarded if design strength is attained.

Reviewed by:

Date:

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Las Vegas, NV 89119-3735
Phone: (702) 736-2936

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No: 31-128118 Phase: Date: 8/31/94
Project : Hiko Springs Detention Basin
Location :

Permit No:

Black and Veatch Engineers-Architects
Attn: Mr. Steve Canney Phone: (000) 000-0000

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	78
Contractor	N/A	Slump (in)	N/R	Concrete Temperature (°F)	N/R
Mix Number	Mix #2 with 6% Cement	Max. Size Agg. (in)	1 1/2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	N/R	Water Added (gal)	N/R
Truck/Ticket	N/R / N/R	Design Strength at 28 days	N/R psi	Batch Size (cubic yards)	N/R
Source of Sample	Soil-Cement Lab Trial Batch for SW Basin Material, Sample B-3. 8% Cementitious Material Added per Dry Weight of Soil (85% Cement, 15% "F" Fly Ash)			Time Batched	N/R
				Time Sampled	N/R
				Time in Truck	N/R
Sampled by	Weston Hallum			Date Sampled	June 6, 1994
Submitted by	Weston Hallum			Date Submitted	June 13, 1994

Cylinder Number	Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in²)	Ultimate Load (lb)	Compressive Strength (psi)
13660 A	June 13, 1994	7	4.02" X 4.56"	12.69	12,910	1020
13660 B	June 13, 1994	7	4.02" X 4.56"	12.69	12,230	960
13660 C	June 20, 1994	14	4.02" X 4.65"	12.69	15,320	1210
13660 D	July 4, 1994	28	4.02" X 4.56"	12.69	18,320	1440
					Average 28 Day Strength (psi) »»>	1440

Remarks: Fabricated in Accordance with ASTM D559 and Tested in Accordance with ASTM D1633

Unless prior arrangements are made, HOLD samples will be discarded if design strength is attained.

Reviewed by: ____________________

Date: ____________________

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Las Vegas, NV 89119-3735

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CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No:31-128118 Phase: Date: 8/31/94
Project :Hiko Springs Detention Basin
Location :

Permit No:

Black and Veatch Engineers-Architects
Attn:Mr. Steve Canney

Phone: (000) 000-0000

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	78
Contractor	National Heritage Corporation	Slump (in)	N/R	Concrete Temperature (°F)	N/R
Mix Number	Mix #3 with 6% Cement	Max. Size Agg. (in)	1 1/ 2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	N/R	Water Added (gal)	N/R
Truck/Ticket	N/R / N/R	Design Strength at 28 days	N/R psi	Batch Size (cubic yards)	N/R
Source of Sample	Soil-Cement Lab Trial Batch for SE Bank Material, Sample B-4. 6% Cementitious Material Added per Dry Weight of Soil (85% Cement, 15% "F" Fly Ash)			Time Batched	N/R
				Time Sampled	N/R
				Time in Truck	N/R
Sampled by	Weston Hallum			Date Sampled	June 6, 1994
Submitted by	Weston Hallum			Date Submitted	June 13, 1994

Cylinder Number	Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in^2)	Ultimate Load (lb)	Compressive Strength (psi)
13661 A	June 13, 1994	7	4.02" X 4.56"	12.69	4,670	370
13661 B	June 13, 1994	7	4.02" X 4.56"	12.69	4,000	320
13661 C	June 20, 1994	14	4.02" X 3.60"	12.69	5,300	420
13661 D	July 4, 1994	28	4.02" X 4.56"	12.69	10,880	860
					Average 28 Day Strength (psi) »»>	860

Remarks:Fabricated in Accordance with ASTM D559 and Tested in Accordance with ASTM D1633

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Reviewed by:__________

Date:__________

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6850 South Paradise Road
Las Vegas, NV 89119-3735
Phone: (702) 736-2936

CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

Project No: 31-128118 Phase: Date: 9/01/94
Project :Hiko Springs Detention Basin
Location :
Permit No:

Black and Veatch Engineers-Architects
Attn: Mr. Steve Canney Phone: (000) 000-0000

1900 East Flamingo Road
Suite 295
Las Vegas, NV 89119

Supplier	Jet Concrete	Cement Type	V	Air Temperature (°F)	78
Contractor	N/A	Slump (in)	N/R	Concrete Temperature (°F)	N/R
Mix Number	Mix #4 with 8% Cement	Max. Size Agg. (in)	1 1/ 2	Air Content (%)	N/R
Admixtures	N/R	Cement Factor (sk/cy)	N/R	Water Added (gal)	N/
Truck/Ticket	N/R / N/R	Design Strength at 28 days	N/R psi	Batch Size (cubic yards)	N/R
Source of Sample	Soil-Cement Lab Trial Batch for SE Bank Material, Sample B-4. 8% Cementitious Material Added for Dry Weight of Soil (85% Cement, 15% "F" Fly Ash)			Time Batched	N/R
				Time Sampled	N/R
				Time in Truck	N/R
Sampled by	Weston Hallum			Date Sampled	June 6, 1994
Submitted by	Weston Hallum			Date Submitted	June 13, 1994

Cylinder Number	Date Tested	Cylinder Age (Days)	Dimensions Diameter X Height	Area (in^2)	Ultimate Load (lb)	Compressive Strength (psi)
13662 A	June 13, 1994	7	4.02" X 4.56"	12.69	8,250	650
13662 B	June 13, 1994	7	4.02" X 4.56"	12.69	7,850	620
13662 C	June 20, 1994	14	4.02" X 4.65"	12.69	10,130	800
13662 D	July 4, 1994	28	4.02" X 4.56"	12.69	16,280	1280
					Average 28 Day Strength (psi) »»>	1280

Remarks: Fabricated in Accordance with ASTM D559 and Tested in Accordance with ASTM D1633

Unless prior arrangements are made, HOLD samples will be discarded if design strength is attained.

Reviewed by: ____________________

Date: ____________________

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IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used*:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage*, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time*. Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

Published by

ASFE THE ASSOCIATION OF ENGINEERING FIRMS PRACTICING IN THE GEOSCIENCES

8811 Colesville Road/Suite G106/Silver Spring, Maryland 20910/(301) 565-2733

0788 3M

Soil Tests

General Fill

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-06-95
Job No. 2745JC249
Event/Invoice No. 27450632-10
Authorized By KEN SMITH Date 11-29-95
Tested By P. LLEWELLYN/WT Date 11-29-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
559		6.5	123.7	0.0	2	128.5	7.5	96		95	YES
560		7.2	123.1	0.0	2	128.5	7.5	96		95	YES
561		6.8	122.6	0.0	2	128.5	7.5	95		95	YES

RECEIVED
DEC 11 1995
GREINER, INC.

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
559	STA. 20+00, 80' RIGHT OF CENTERLINE, UPSTREAM SLOPE		1058.5	SUBGRADE
560	STA. 21+25, 100' RIGHT OF CENTERLINE, UPSTREAM SLOPE		1058.0	SUBGRADE
561	STA. 22+50, 60' RIGHT OF CENTERLINE, UPSTREAM SLOPE		1078.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-01-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-7
Authorized By KEN SMITH Date 11-15-95
Tested By P. LLEWELLYN/WT Date 11-15-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
557		6.8	124.4	0.0	2	128.5	7.5	97		95	YES
558		6.3	122.5	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	TEST LOCATION, VERTICAL: Elevation *	MATERIAL TESTED
557	RETEST 499A	1.0	1015.0	TRENCH BACKFILL
558	RETEST 500A	1.0	1015.0	TRENCH BACKFILL

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DEC 4 1995
GREINER, INC.

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-18-95
Job No. 2745JC249 Page 1 of 2
Event/Invoice No. 27450485-19
Authorized By KEN SMITH Date 09-13-95
Tested By P. LLEWELLYN/WT Date 09-13-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3069 H_2O 617

TEST NO.	IN-PLACE CHARACTERISTICS: Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	LAB CHARACTERISTICS: ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	COMPACTION: % of Maximum Dry Unit Weight	REQUIREMENTS: Moisture %	Compaction %	CONFORMANCE INDICATED
248		7.0	122.6	0.0	2	128.5	7.5	95		95	YES
249		6.6	123.8	0.0	2	128.5	7.5	96		95	YES
250		5.9	124.3	0.0	2	128.5	7.5	97		95	YES
251		6.2	123.6	0.0	2	128.5	7.5	96		95	YES
252		5.3	122.5	0.0	2	128.5	7.5	95		95	YES
253		6.1	122.6	0.0	2	128.5	7.5	95		95	YES
254		6.0	123.0	0.0	2	128.5	7.5	96		95	YES
255		5.6	123.4	0.0	2	128.5	7.5	96		95	YES
256		5.8	124.4	0.0	2	128.5	7.5	97		95	YES
257		6.2	123.1	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	Elevation •	MATERIAL TESTED
248	STA. 16+00, 10' LEFT OF CENTERLINE	3.0	1006.0	SUBBASE FILL
249	STA. 16+50, 200' RIGHT OF CENTERLINE	2.0	1016.0	SUBBASE FILL
250	STA. 2+50, 15' RIGHT OF OUTLET WORKS CENTERLINE	2.0	1000.5	SUBBASE FILL
251	STA. 3+25, 15' RIGHT OF OUTLET WORKS CENTERLINE	3.5	1000.5	SUBBASE FILL
252	STA. 3+00, 15' LEFT OF OUTLET WORKS CENTERLINE	3.0	1000.5	SUBBASE FILL
253	STA. 3+25, 15' LEFT OF OUTLET WORKS CENTERLINE	3.0	1000.0	SUBBASE FILL
254	STA. 2+75, 15' RIGHT OF OUTLET WORKS CENTERLINE	4.5	1002.5	SUBBASE FILL
255	STA. 3+25, 15' RIGHT OF OUTLET WORKS CENTERLINE	4.5	1001.5	SUBBASE FILL
256	STA. 2+75, 15' LEFT OF OUTLET WORKS CENTERLINE	5.0	1003.0	SUBBASE FILL
257	STA. 3+25, 15' LEFT OF OUTLET WORKS CENTERLINE	5.0	1002.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #8,250-259, BID #9, 248 & 249, 260 & 261
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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Since 1955

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-18-95
Job No. 2745JC249

Event/Invoice No. 27450485-19
Authorized By KEN SMITH Date 09-13-95
Tested By P. LLEWELLYN/WT Date 09-13-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
258		6.0	123.7	0.0	2	128.5	7.5	96		95	YES
259		6.5	122.8	0.0	2	128.5	7.5	96		95	YES
260		4.1	123.9	0.0	2	128.5	7.5	96		95	YES
261		6.6	122.3	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
258	STA. 2+50, 15' RIGHT OF OUTLET WORKS CENTERLINE	5.5	1000.4	SUBBASE FILL
259	STA. 3+00, 15' RIGHT OF OUTLET WORKS CENTERLINE	5.5	1003.0	SUBBASE FILL
260	STA. 14+50, 200' RIGHT OF CENTERLINE	7.0	1019.0	SUBBASE FILL
261	STA. 11+00, 175' RIGHT OF CENTERLINE	14.0	1021.0	SUBBASE FILL

Comments: BID #8,250-259, BID #9, 248 & 249, 260 & 261
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 8/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-18-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-18
Authorized By KEN SMITH Date 09-12-95
Tested By P. LLEWELLYN/WT Date 09-12-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
241		2.2	119.4	0.0	2	128.5	7.5	93		95	NO
242		6.5	122.1	0.0	2	128.5	7.5	95		95	YES
243		5.2	123.7	0.0	2	128.5	7.5	96		95	YES
244		6.0	122.5	0.0	2	128.5	7.5	95		95	YES
245		5.1	126.4	0.0	2	128.5	7.5	98		95	YES
246		5.6	123.5	0.0	2	128.5	7.5	96		95	YES
247		5.2	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
241	STA. 1+20, 50' RIGHT OF OUTLET WORKS CENTERLINE	2.0	1013.0	SUBBASE FILL
242	RETEST 241A	2.0	1013.0	SUBBASE FILL
243	STA. 2+30, 15' RIGHT OF OUTLET WORKS CENTERLINE	2.0	1000.0	SUBBASE FILL
244	STA. 2+25, 15' RIGHT OF OUTLET WORKS CENTERLINE	4.0	1002.0	SUBBASE FILL
245	STA. 16+00 AT CENTERLINE		1013.0	SUBGRADE
246	STA. 2+30, 15' LEFT OF OUTLET WORKS CENTERLINE	3.0	1001.0	SUBBASE FILL
247	STA. 2+40, 15' LEFT OF OUTLET WORKS CENTERLINE	5.0	1003.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 245, BID #8, 241-244, 246 & 247
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 09-13-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-15
Authorized By WOODY THOMAS Date 09-07-95
Tested By P. LLEWELLYN/WT Date 09-07-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
221		5.1	124.3	0.0	2	128.5	7.5	97		95	YES
222		6.2	122.6	0.0	2	128.5	7.5	95		95	YES
223		6.5	123.7	0.0	2	128.5	7.5	96		95	YES
224		6.1	121.9	0.0	2	128.5	7.5	95		95	YES
225		7.5	121.7	0.0	2	128.5	7.5	95		95	YES
226		4.8	122.3	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
221	STA. 0+90, RIGHT OF CENTERLINE	13.0	1013.0	SUBBASE FILL
222	STA. 1+50, LEFT OF CENTERLINE	12.0	1012.0	SUBBASE FILL
223	STA. 2+00, RIGHT OF CENTERLINE	11.0	1011.0	SUBBASE FILL
224	STA. 1+00, LEFT OF CENTERLINE	15.0	1015.0	SUBBASE FILL
225	STA. 11+20, 50' RIGHT OF CENTERLINE	11.0	1015.0	SUBBASE FILL
226	STA. 11+80, 60' LEFT OF CENTERLINE	9.0	1012.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: TRENCH BACKFILL, BID #8, 221-224, BID #9, 225 & 226
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95 MAP

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REVIEWED BY CORWIN ANDEREGG

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-08-95
Job No. 2745JC249
Event/Invoice No. 27450485-13
Authorized By WOODY THOMAS Date 09-06-95
Tested By P. LLEWELLYN/WT Date 09-06-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
210		7.0	115.1	0.0	2	128.5	7.5	90		95	NO
211		6.7	121.8	0.0	2	128.5	7.5	95		95	YES
212		5.0	119.1	0.0	2	128.5	7.5	93		95	NO
213		5.8	121.8	0.0	2	128.5	7.5	95		95	YES
214		4.7	124.4	0.0	2	128.5	7.5	97		95	YES
215		4.9	124.9	0.0	2	128.5	7.5	97		95	YES
216		6.3	123.9	0.0	2	128.5	7.5	96		95	YES
217		2.1	117.2	0.0	2	128.5	7.5	91		95	NO
218		5.6	123.0	0.0	2	128.5	7.5	96		95	YES
219		4.9	122.2	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
210	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	9.0	1009.0	SUBBASE FILL
211	RETEST 210A	9.0	1009.0	SUBBASE FILL
212	STA. 0+90, LEFT OF CENTERLINE, OUTLET WORKS	8.0	1008.0	SUBBASE FILL
213	RETEST 212A	8.0	1008.0	SUBBASE FILL
214	STA. 11+50, 260' LEFT OF CENTERLINE	6.0	995.0	SUBBASE FILL
215	STA. 10+60, 75' LEFT OF CENTERLINE	15.0	1010.0	SUBBASE FILL
216	STA. 11+50, 265' RIGHT OF CENTERLINE	8.0	1016.0	SUBBASE FILL
217	STA. 0+90, RIGHT OF CENTERLINE, OUTLET WORKS	12.0	1012.0	SUBBASE FILL
218	RETEST ~~218A~~ 217A	12.0	1012.0	SUBBASE FILL
219	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	10.0	1010.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #8, 210-213, 217-220, TRENCH BACKFILL/BID #9, 214-216,
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

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Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-08-95
Job No. 2745JC249
Event/Invoice No. 27450485-13
Authorized By WOODY THOMAS Date 09-06-95
Tested By P. LLEWELLYN/WT Date 09-06-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
220		5.2	123.7	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
220	STA. 1+75, LEFT OF CENTERLINE, OUTLET WORKS	9.0	1009.0	SUBBASE FILL

Comments: BID #8, 210-213, 217-220, TRENCH BACKFILL/BID #9, 214-216,
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

9S MP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-08-95
Job No. 2745JC249
Event/Invoice No. 27450485-12
Authorized By WOODY THOMAS Date 09-05-95
Tested By P. LLEWELLYN/WT Date 09-05-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
188		6.7	121.8	0.0	2	128.5	7.5	95		95	YES
189		5.8	123.6	0.0	2	128.5	7.5	96		95	YES
190		7.1	125.9	0.0	2	128.5	7.5	98		95	YES
191		6.9	121.9	0.0	2	128.5	7.5	95		95	YES
192		6.2	122.2	0.0	2	128.5	7.5	95		95	YES
193		7.3	124.3	0.0	2	128.5	7.5	97		95	YES
194		7.1	124.5	0.0	2	128.5	7.5	97		95	YES
195		6.8	123.1	0.0	2	128.5	7.5	96		95	YES
196		4.3	119.8	0.0	2	128.5	7.5	93		95	NO
197		5.8	123.5	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
188	STA. 0+40, RIGHT OF CENTERLINE, OUTLET WORKS	3.0	1003.0	SUBBASE FILL
189	STA. 0+40, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
190	STA. 0+85, RIGHT OF CENTERLINE, OUTLET WORKS	3.0	1003.0	SUBBASE FILL
191	STA. 0+85, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
192	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	3.0	1002.0	SUBBASE FILL
193	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1004.0	SUBBASE FILL
194	STA. 2+00, RIGHT OF CENTERLINE, OUTLET WORKS	2.0	1002.0	SUBBASE FILL
195	STA. 2+00, RIGHT OF CENTERLINE, OUTLET WORKS	4.0	1004.0	SUBBASE FILL
196	STA. 11+00, 200' RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1014.0	SUBBASE FILL
197	RETEST 196A	6.0	1014.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #8, 188-195, 198-209, BID #9, 196 & 197, TRENCH BACKFILL
• DATUM TOPOGRAPHIC

REVIEWED - COMMENTS HEED

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95

GREINER, INC.

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REVIEWED BY CORWIN ANDEREGG
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-08-95
Job No. 2745JC249
Event/Invoice No. 27450485-12
Authorized By WOODY THOMAS Date 09-05-95
Tested By P. LLEWELLYN/WT Date 09-05-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
198		6.2	123.1	0.0	2	128.5	7.5	96		95	YES
199		6.8	122.5	0.0	2	128.5	7.5	95		95	YES
200		7.4	123.7	0.0	2	128.5	7.5	96		95	YES
201		6.5	123.4	0.0	2	128.5	7.5	96		95	YES
202		7.0	123.0	0.0	2	128.5	7.5	96		95	YES
203		6.9	122.0	0.0	2	128.5	7.5	95		95	YES
204		7.2	123.9	0.0	2	128.5	7.5	96		95	YES
205		7.5	124.4	0.0	2	128.5	7.5	97		95	YES
206		5.0	124.4	0.0	2	128.5	7.5	97		95	YES
207		7.1	123.1	0.0	2	128.5	7.5	96		95	YES
208		4.0	123.2	0.0	2	128.5	7.5	96		95	YES
209		4.7	125.0	0.0	2	128.5	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
198	STA. 0+50, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1001.0	SUBBASE FILL
199	STA. 1+00, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1001.0	SUBBASE FILL
200	STA. 1+50, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1002.0	SUBBASE FILL
201	STA. 2+00, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1002.0	SUBBASE FILL
202	STA. 0+50, RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1006.0	SUBBASE FILL
203	STA. 1+00, RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1006.0	SUBBASE FILL
204	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1005.0	SUBBASE FILL
205	STA. 2+00, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
206	STA. 0+75, RIGHT OF CENTERLINE, OUTLET WORKS	8.0	1008.0	SUBBASE FILL
207	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	8.0	1008.0	SUBBASE FILL
208	STA. 1+25, LEFT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
209	STA. 1+75, LEFT OF CENTERLINE, OUTLET WORKS	6.0	1006.0	SUBBASE FILL

Comments: BID #8, 188-195, 198-209, BID #9, 196 & 197, TRENCH BACKFILL
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MP

GREINER, INC.

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REVIEWED BY CORWIN ANDEREGG
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Embankment Fill

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-14-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-20
Authorized By KEN SMITH Date 12-11-95
Tested By P. LLEWELLYN/WT Date 12-11-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3088 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS: Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	LAB CHARACTERISTICS: ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	COMPACTION: % of Maximum Dry Unit Weight	REQUIREMENTS: Moisture %	Compaction %	CONFORMANCE INDICATED
577		6.5	122.5	0.0	2	128.5	7.5	95		95	YES
578		7.0	124.8	0.0	2	128.5	7.5	97		95	YES
579		7.2	123.7	0.0	2	128.5	7.5	96		95	YES
580		6.8	124.4	0.0	2	128.5	7.5	97		95	YES
581		6.3	123.6	0.0	2	128.5	7.5	96		95	YES
582		7.0	125.0	0.0	2	128.5	7.5	97		95	YES
583		6.4	124.1	0.0	2	128.5	7.5	97		95	YES
584		6.3	122.6	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	Elevation *	MATERIAL TESTED
577	STA. 4+00, 6' RIGHT OF CENTERLINE, TOP OF DAM	22.0	1086.0	EMBANKMENT FILL
578	STA. 7+00, 3' LEFT OF CENTERLINE, TOP OF DAM	26.0	1086.0	EMBANKMENT FILL
579	STA. 11+00, 5' RIGHT OF CENTERLINE, TOP OF DAM	79.0	1086.0	EMBANKMENT FILL
580	STA. 13+50, 8' RIGHT OF CENTERLINE, TOP OF DAM	68.0	1073.0	EMBANKMENT FILL
581	STA. 15+00, 8' RIGHT OF CENTERLINE, TOP OF DAM	71.0	1073.0	EMBANKMENT FILL
582	STA. 18+00, 6' LEFT OF CENTERLINE, TOP OF DAM	75.0	1086.0	EMBANKMENT FILL
583	STA. 19+50, 8' RIGHT OF CENTERLINE, TOP OF DAM	40.0	1086.0	EMBANKMENT FILL
584	STA. 22+00, 5' LEFT OF CENTERLINE, TOP OF DAM	15.0	1086.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

DEC 2 0 1995

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

GREINER, INC

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REVIEWED BY CORWIN ANDEREGG
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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-15-95
Job No. 2745JC249
Event/Invoice No. 27450583-17
Authorized By KEN SMITH Date 11-10-95
Tested By P. LLEWELLYN/WT Date 11-10-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 613

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
517		6.5	123.7	0.0	2	128.5	7.5	96		95	YES
518		6.8	122.5	0.0	2	128.5	7.5	95		95	YES
519		7.2	122.3	0.0	2	128.5	7.5	95		95	YES
520		6.5	122.6	0.0	2	128.5	7.5	95		95	YES
521		7.4	120.1	0.0	5	126.0	10.0	95		95	YES
522		7.0	121.5	0.0	5	126.0	10.0	96		95	YES
523		6.8	123.6	0.0	2	128.5	7.5	96		95	YES
524		7.3	124.8	0.0	2	128.5	7.5	97		95	YES
525		7.5	122.5	0.0	2	128.5	7.5	95		95	YES
526		7.8	120.6	0.0	5	126.0	10.0	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
517	STA. 3+50, 12' RIGHT OF CENTERLINE	15.0	1078.0	EMBANKMENT FILL
518	STA. 7+00, 10' LEFT OF CENTERLINE	18.0	1078.0	EMBANKMENT FILL
519	STA. 17+00, 10' RIGHT OF CENTERLINE	75.0	1085.0	EMBANKMENT FILL
520	STA. 22+00. 11' LEFT OF CENTERLINE	15.0	1085.0	EMBANKMENT FILL
521	STA. 4+00, 2' LEFT OF CENTERLINE	17.0	1080.0	EMBANKMENT FILL
522	STA. 7+00, 5' RIGHT OF CENTERLINE	20.0	1080.0	EMBANKMENT FILL
523	STA. 11+00, 10' LEFT OF CENTERLINE	75.0	1080.0	EMBANKMENT FILL
524	STA. 12+00, 10' RIGHT OF CENTERLINE	75.0	1080.0	EMBANKMENT FILL
525	STA. 16+00, 8' LEFT OF CENTERLINE	71.0	1086.0	EMBANKMENT FILL
526	STA. 19+00, 5' RIGHT OF CENTERLINE	40.0	1086.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
5	27450583	SAND W/GRAVEL, TRACE SILT	ON SITE	10.0	126.0	D1557-B

Comments: BID #9
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report **11-15-95**
Job No. **2745JC249**
Event/Invoice No. **27450583-17**
Authorized By **KEN SMITH** Date **11-10-95**
Tested By **P. LLEWELLYN/WT** Date **11-10-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
527		6.5	121.3	0.0	5	126.0	10.0	96		95	YES
528		4.3	122.3	0.0	5	126.0	10.0	97		95	YES
529		6.2	122.5	0.0	2	128.5	7.5	95		95	YES
530		7.0	123.5	0.0	2	128.5	7.5	96		95	YES
531		7.2	121.3	0.0	5	126.0	10.0	96		95	YES
532		7.8	120.2	0.0	5	126.0	10.0	95		95	YES
533		4.8	117.8	0.0	5	126.0	10.0	93		95	NO
534		5.0	117.4	0.0	5	126.0	10.0	93		95	NO
535		5.2	116.3	0.0	5	126.0	10.0	92		95	NO
536		5.2	116.9	0.0	5	126.0	10.0	93		95	NO
537		5.6	117.6	0.0	5	126.0	10.0	93		95	NO
538		7.2	117.1	0.0	5	126.0	10.0	93		95	NO
539		7.0	113.9	0.0	5	126.0	10.0	90		95	NO
540		7.1	117.3	0.0	5	126.0	10.0	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
527	STA. 22+00, 11' LEFT OF CENTERLINE	15.0	1086.0	EMBANKMENT FILL
528	STA. 14+00, 5' LEFT OF CENTERLINE	67.0	1072.0	EMBANKMENT FILL
529	STA. 5+00, 6' LEFT OF CENTERLINE	24.0	1082.0	EMBANKMENT FILL
530	STA. 9+00, 8' RIGHT OF CENTERLINE	28.0	1082.0	EMBANKMENT FILL
531	STA. 14+00, 2' LEFT OF CENTERLINE	70.0	1072.0	EMBANKMENT FILL
532	STA. 15+00, 5' RIGHT OF CENTERLINE	71.0	1072.0	EMBANKMENT FILL
533	STA. 13+50, 11' LEFT OF CENTERLINE	68.0	1073.0	EMBANKMENT FILL
534	STA. 14+50, 11' RIGHT OF CENTERLINE	69.0	1073.0	EMBANKMENT FILL
535	STA. 15+00, 11' LEFT OF CENTERLINE	71.0	1073.0	EMBANKMENT FILL
536	STA. 4+00, 11' RIGHT OF CENTERLINE	20.0	1083.0	EMBANKMENT FILL
537	STA. 6+00, 11' LEFT OF CENTERLINE	23.0	1083.0	EMBANKMENT FILL
538	STA. 8+00, 11' RIGHT OF CENTERLINE	38.0	1083.0	EMBANKMENT FILL
539	STA. 10+00, 11' LEFT OF CENTERLINE	75.0	1083.0	EMBANKMENT FILL
540	STA. 12+00, 11' RIGHT OF CENTERLINE	78.0	1083.0	EMBANKMENT FILL

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

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GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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REVIEWED BY **CORWIN ANDEREGG**
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Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-15-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-18
Authorized By KEN SMITH Date 11-09-95
Tested By P. LLEWELLYN/WT Date 11-09-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 613

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
510		8.2	123.1	0.0	2	128.5	7.5	96		95	YES
511		8.9	124.5	0.0	5	126.0	10.0	99		95	YES
512		9.2	120.0	0.0	5	126.0	10.0	95		95	YES
513		9.5	120.6	0.0	5	126.0	10.0	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
510	RETEST 507B		960.0	SUBGRADE
511	STA. 5+00, 12' RIGHT OF CENTERLINE	15.0	1074.0	EMBANKMENT FILL
512	STA. 18+00, 15' LEFT OF CENTERLINE	71.0	1082.0	EMBANKMENT FILL
513	STA. 21+00, 5' RIGHT OF CENTERLINE	15.0	1082.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
5	27450583	SAND W/GRAVEL, TRACE SILT	ON SITE	10.0	126.0	D1557-B

Comments: TEST 510-BID #12, TEST 511-513-BID #9
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-15-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-19
Authorized By KEN SMITH Date 11-09-95
Tested By P. LLWEWLLYN/WT Date 11-09-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3073** H_2O **613**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
514		10.8	121.3	0.0	5	126.0	10.0	96		95	YES
515		9.8	120.7	0.0	5	126.0	10.0	96		95	YES
516		9.5	122.5	0.0	5	126.0	10.0	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
514	STA. 6+00, 10' LEFT OF CENTERLINE	15.0	1076.0	EMBANKMENT FILL
515	STA. 4+00, 8' RIGHT OF CENTERLINE	13.0	1076.0	EMBANKMENT FILL
516	STA. 19+00, 10' RIGHT OF CENTERLINE	33.0	1083.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
5	27450583	SAND W/GRAVEL, TRACE SILT	ON SITE	10.0	126.0	D1557-B

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

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GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-13-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-15
Authorized By KEN SMITH Date 11-06-95
Tested By P. LLEWELLYN/WT Date 11-06-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
501		6.8	119.9	0.0	2	128.5	7.5	93		95	NO
502		7.0	117.5	0.0	2	128.5	7.5	91		95	NO
503		7.2	123.7	0.0	2	128.5	7.5	96		95	YES
504		7.6	123.2	0.0	2	128.5	7.5	96		95	YES
505		7.0	123.5	0.0	2	128.5	7.5	96		95	YES
506		7.3	124.4	0.0	2	128.5	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
501	STA. 4+00, 10' LEFT OF CENTERLINE	6.0	1081.0	EMBANKMENT FILL
502	STA. 5+00, 10' LEFT OF CENTERLINE	10.0	1080.0	EMBANKMENT FILL
503	RETEST 501A	6.0	1081.0	EMBANKMENT FILL
504	RETEST 502A	10.0	1080.0	EMBANKMENT FILL
505	STA. 22+00, 30' LEFT OF CENTERLINE	6.0	1081.0	EMBANKMENT FILL
506	STA. 17+00, 25' RIGHT OF CENTERLINE	51.0	1071.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

RECEIVED
NOV 1 6 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING CO.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **11/08/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
132	11/08/95 N	25' LT OF CENTERLINE, STATION 22+00 **(RETEST A.M.)**	1082±
133	11/08/95 N	20' LT OF CENTERLINE, STATION 9+00	1076±
134	11/08/95 N	25' LT OF CENTERLINE, STATION 5+00	1069±
135	11/08/95 N	30' RT OF CENTERLINE, STATION 17+50 **(RETEST A.M.)**	1072±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
132	7.5	128.5	4.0	126.9	99	YES
133	7.5	128.5	4.2	125.3	98	YES
134	7.5	128.5	?	121.8	95	YES
135	7.5	128.5	8.4	121.7	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL___ FULL TIME___

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ________

Visual Soil Classification per ASTM D2488 ________

Job No. ________ Page ____ of ____

Event / Invoice No. ________ Lab No. ________

Authorized By ________ Date ________

Tested By WHT Date 11·8·95

Test Locations Designated By ________ Date ________

Gauge: Make TROXLER Model 3411B Serial No. 11044 — Standard Count: (1) Unit Weight 2526 (2) H_2O 674				
Test Hole No.	132	133	134	135
Horizontal Location of Test Hole	STA. 22+00 25' LT. ℄	STA. 9+00 20' LT. ℄	STA. 5+00 25' LT. ℄	STA. 17+00 30' RT. ℄
Vertical Distance From Elevation Datum, ft. †	1082±	1076±	1069±	1012±
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	8"
DENSITY — Counts	1271	1318	1240	1264
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	74	77	137	131
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.9	130.6	132.6	131.9
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	126.9	125.3	121.8	121.7
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	4.0	4.2	?	8.4
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	99	98	95	95
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*	RETEST of 4/14			RETEST of 4/14

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ________

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ________

20. ________

† Datum ________

REVIEWED BY ________

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Western Technologies Inc.

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **11/07/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
128	11/07/95 N	30' RT OF CENTERLINE, STATION 9+00	1073±
129	11/07/95 N	25' LT OF CENTERLINE, STATION 10+00	1073±
130	11/07/95 N	30' LT OF CENTERLINE, STATION 21+00	1073±
131	11/07/95 N	40' RT OF CENTERLINE, STATION 11+50	1074±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
128	7.5	128.5	6.9	124.1	97	YES
129	7.5	128.5	5.9	122.1	95	YES
130	7.5	128.5	7.0	122.0	95	YES
131	7.5	128.5	6.4	121.6	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____________

Visual Soil Classification per ASTM D2488 ____________

Job No. ____________ Page ____ of ____

Event / Invoice No. ____________ Lab No. ____________

Authorized By ____________ Date ____________

Tested By WHT Date 11-7-95

Test Locations Designated By ____________ Date ____________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2504 (2) H_2O 662

Test Hole No.	128	129	130	131
Horizontal Location of Test Hole	STA. 9+00 30' RT ℄	STA. 10+00 25' LT ℄	STA. 21+00 30' LT ℄	STA. 11+56 40' RT ℄
Vertical Distance From Elevation Datum, ft. †	1073±	1073±	1073±	1074±
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	8"
DENSITY — Counts	1231	1347	1298	1345
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	111	96	111	102
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	132.6	129.3	130.6	129.3
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	124.1	122.1	122.0	121.6
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	6.9	5.9	7.0	6.4
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	97	[illegible]	95	95
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____________
20. ____________

† Datum ____________

REVIEWED BY ____________

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Western Technologies Inc.

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **11/06/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
125	11/06/95 N	40' RT OF CENTERLINE, STATION 8+50	1075±
126	11/06/95 N	30' RT OF CENTERLINE, STATION 20+50	1070±
127	11/06/95 N	30' LT OF CENTERLINE, STATION 21+00	1070±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
125	7.5	128.5	9.0	122.3	95	YES
126	7.5	128.5	5.8	122.1	95	YES
127	7.5	128.5	7.0	123.7	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 11-6-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2499 (2) H_2O 680

Test Hole No.		125	126	127	
Horizontal Location of Test Hole		STA. 8+50 40' RT ℄	STA. 20+50 30' RT ℄	STA. 21+00 30' LT. ℄	
Vertical Distance From Elevation Datum, ft. †		1075±?	1070±	1070±	
Depth of Fill					
DENSITY	Probe Depth	8"	8"	8"	
	Counts	1201	1351	1236	
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	142	97	115	
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		133.4	129.1	~~123.7~~ 132.4	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		122.3	122.1	123.7	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		9.0	5.8	7.0	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		95	95	96	
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **11/03/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
121	11/03/95 N	30' RT OF CENTERLINE, STATION 20+00	1069±
122	11/03/95 N	10' LT OF CENTERLINE, STATION 17+00	1065±
123	11/03/95 N	10' LT OF CENTERLINE, STATION 16+00	1066±
124	11/03/95 N	40' RT OF CENTERLINE, STATION 18+00	1068±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
121	7.5	128.5	6.9	122.1	95	YES
122	7.5	128.5	5.8	121.5	95	YES
123	7.5	128.5	4.8	123.3	96	YES
124	7.5	128.5	4.2	121.7	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____________

Visual Soil Classification per ASTM D2488 ____________

Job No. ____________ Page ____ of ____

Event / Invoice No. ____________ Lab No. ____________

Authorized By ____________ Date ____________

Tested By WHT Date 11-3-95

Test Locations Designated By ____________ Date ____________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2543 (2) H_2O 673

Test Hole No.		121	122	123	124
Horizontal Location of Test Hole		STA. 20+00 30' RT ℄	STA. 17+00 0' LT ℄	STA. 16+00 10' LT. ℄	STA 18+00 40' RT ℄
Vertical Distance From Elevation Datum, ft. †		1069±	1065±	1066±	1068±
Depth of Fill					
DENSITY	Probe Depth	8"	8"	8"	8'
	Counts	1318	1396	1370	1468
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	112	96	84	74
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		130.6	128.5	129.3	126.7
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		122.1	121.5	123.3	121.7
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		6.9	5.8	4.8	4.2
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		95	95	96	95
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____________

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ____________

20. ____________

† Datum ____________

REVIEWED BY ____________

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-08-95
Job No. 2745JC249
Event/Invoice No. 27450583-14
Authorized By KEN SMITH Date 11-03-95
Tested By P. LLEWELLYN/WT Date 11-03-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
495		7.2	123.6	0.0	2	128.5	7.5	96		95	YES
496		7.5	122.1	0.0	2	128.5	7.5	95		95	YES
497		7.5	123.1	0.0	2	128.5	7.5	96		95	YES
498		7.8	122.8	0.0	2	128.5	7.5	96		95	YES
499		5.0	116.0	0.0	2	128.5	7.5	90		95	NO
500		4.9	114.9	0.0	2	128.5	7.5	89		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
495	STA. 10+00, 25' LEFT OF CENTERLINE	71.0	1071.0	EMBANKMENT FILL
496	STA. 13+50, 50' RIGHT OF CENTERLINE	71.0	1071.0	EMBANKMENT FILL
497	STA. 16+50, 40' LEFT OF CENTERLINE	71.0	1071.0	EMBANKMENT FILL
498	STA. 22+00, 25' RIGHT OF CENTERLINE	13.0	1078.0	EMBANKMENT FILL
499	USGS GAUGE VAULT TRENCH, STA. 14+00	1.0	1015.0	TRENCH BACKFILL
500	USGS GAUGE VAULT TRENCH, STA. 12+50	1.0	1015.0	TRENCH BACKFILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **11/02/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
118	11/02/95 N	30' RT OF CENTERLINE, STATION 8+50	1066±
119	11/02/95 N	20' LT OF CENTERLINE, STATION 9+00	1066±
120	11/02/95 N	40' LT OF CENTERLINE, STATION 17+50	1066±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
118	7.5	128.5	6.4	122.3	95	YES
119	7.5	128.5	7.7	121.8	95	YES
120	7.5	128.5	5.8	122.1	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

CALL___ FULL TIME___

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ________

Visual Soil Classification per ASTM D2488 ________

Job No. ________ Page ____ of ____

Event / Invoice No. ________ Lab No. ________

Authorized By ________ Date ________

Tested By WAT Date 11·2·95

Test Locations Designated By ________ Date ________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2531 (2) H_2O 679

Test Hole No.		118			119			120					
Horizontal Location of Test Hole		STA. 8+50 30' LT ℄			STA 9+00 20' LT. ℄			STA 17+50 40' LT ℄					
Vertical Distance From Elevation Datum, ft. †		1066±			1066±			1066±					
Depth of Fill													
DENSITY	Probe Depth	8"			8"			8"					
	Counts	1332			1292			1365					
	(3) Count Average												
	Density Ratio												
MOISTURE	Counts	105			123			97					
	(4) Count Average												
	Moisture Ratio												
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		130.1			131.2			129.2					
(6) Water, lbf / cu. ft. from Calibration Chart or Readout													
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested													
(7) Wet Weight of Sample, lbf													
(8) Wet Weight of +No. 4 Material													
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/			/			/			/		
ID. No. – Lab Maximum Unit Weight & Optimum Moisture													
Optimum Moisture (Lab), % of Dry Unit Weight		7.5			7.5			7.5					
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5			128.5			128.5					
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)													
(10) Corrected Optimum Moisture, % (See Chart)													
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		122.3			121.8			122.1					
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		6.4			7.7			5.8					
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		95			95			95					
Conformance Indicated?		YES	NO	15	YES	NO	15	YES	NO	15	YES	NO	15
Comments*													

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ________
20. ________

† Datum ________

REVIEWED BY ________

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-08-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-13
Authorized By KEN SMITH Date 11-02-95
Tested By P. LLEWELLYN/WT Date 11-02-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
487		7.0	123.1	0.0	2	128.5	7.5	96		95	YES
488		6.8	124.9	0.0	2	128.5	7.5	97		95	YES
489		7.3	122.4	0.0	2	128.5	7.5	95		95	YES
490		7.5	122.2	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
487	STA. 12+00, 10' LEFT OF CENTERLINE	69.0	1069.0	EMBANKMENT FILL
488	STA. 13+50, 30' RIGHT OF CENTERLINE	69.0	1069.0	EMBANKMENT FILL
489	STA. 15+50, 40' RIGHT OF CENTERLINE	69.0	1069.0	EMBANKMENT FILL
490	STA. 16+50, 20' LEFT OF CENTERLINE	59.0	1069.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **11/01/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
115	11/01/95 N	40' LT OF CENTERLINE, STATION 11+00	1066±
116	11/01/95 N	20' LT OF CENTERLINE, STATION 15+50	1065±
117	11/01/95 N	40' LT OF CENTERLINE, STATION 18+00	1063±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	IN-PLACE CHARACTERISTICS DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
115	7.5	128.5	7.3	122.2	95	YES
116	7.5	128.5	8.4	122.5	95	YES
117	7.5	128.5	5.6	123.5	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

UN CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____

Visual Soil Classification per ASTM D2488 ____

Job No. ____ Page ___ of ___

Event / Invoice No. ____ Lab No. ____

Authorized By ____ Date ____

Tested By WAT Date 11-1-95

Test Locations Designated By ____ Date ____

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2520 (2) H_2O 676

Test Hole No.	115	116	117	
Horizontal Location of Test Hole	STA. 11+00 40' LT ℄	STA. 15+50 20' LT ℄	STA. 18+00 40' LT ℄	
Vertical Distance From Elevation Datum, ft. †	1066±	1065±	1063±	
Depth of Fill				
DENSITY — Probe Depth	8"	8'	8"	
DENSITY — Counts	1289	1232	1317	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	117	132	95	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.1	132.8	130.4	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	122.2	122.5	123.5	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	7.3	8.4	5.6	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95	95	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____
20. ____

† Datum ____

REVIEWED BY ____

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-08-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-12
Authorized By KEN SMITH Date 11-01-95
Tested By P. LLEWELLYN/WT Date 11-01-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
483		7.2	123.7	0.0	2	128.5	7.5	96		95	YES
484		7.8	123.2	0.0	2	128.5	7.5	96		95	YES
485		7.5	122.8	0.0	2	128.5	7.5	96		95	YES
486		6.9	122.5	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
483	STA. 10+50, 10' LEFT OF CENTERLINE	67.0	1067.0	EMBANKMENT FILL
484	STA. 13+50, 30' RIGHT OF CENTERLINE	67.0	1067.0	EMBANKMENT FILL
485	STA. 17+00, 70' LEFT OF CENTERLINE	47.0	1067.0	EMBANKMENT FILL
486	STA. 21+00, 10' RIGHT OF CENTERLINE	8.0	1073.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
• DATUM TOPOGRAPHIC

RECEIVED
NOV 9 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/31/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
112	10/31/95 N	40' RT OF CENTERLINE, STATION 9+00	1061±
113	10/31/95 N	40' RT OF CENTERLINE, STATION 13+00	1063±
114	10/31/95 N	40' RT OF CENTERLINE, STATION 16+00	1062±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
112	7.5	128.5	3.6	127.0	99	YES
113	7.5	128.5	7.1	126.3	98	YES
114	7.5	128.5	7.2	124.2	97	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ________

Visual Soil Classification per ASTM D2488 ________

Job No. ________ Page ____ of ____

Event/Invoice No. ________ Lab No. ________

Authorized By ________ Date ________

Tested By WHT Date 10-31-95

Test Locations Designated By ________ Date ________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2525 (2) H_2O 682

Test Hole No.	112	113	114	
Horizontal Location of Test Hole	STA. 9+00 40' RT ℄	STA. 13+00 40' RT ℄	STA. 16+00 40' RT ℄	
Vertical Distance From Elevation Datum, ft. †	1061±	1063±	1062±	
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	
DENSITY — Counts	1280	1157	1228	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	70	119	119	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.7	135.3	133.2	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	127.0	126.3	124.2	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	3.6	7.1	7.2	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	99	98	97	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. *Below Footing Bottom*
9. Above Footing Bottom
10. ________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ________
20. ________

† Datum ________

REVIEWED BY ________

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-08-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-11
Authorized By KEN SMITH Date 10-31-95
Tested By P. LLEWELLYN/WT Date 10-31-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
479		7.0	122.5	0.0	2	128.5	7.5	95		95	YES
480		6.5	124.1	0.0	2	128.5	7.5	97		95	YES
481		6.8	123.1	0.0	2	128.5	7.5	96		95	YES
482		7.2	123.5	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
479	STA. 7+00, 30' RIGHT OF CENTERLINE	65.0	1065.0	EMBANKMENT FILL
480	STA. 11+00, 55' LEFT OF CENTERLINE	65.0	1065.0	EMBANKMENT FILL
481	STA. 14+50, 40' LEFT OF CENTERLINE	65.0	1065.0	EMBANKMENT FILL
482	STA. 18+00, 35' RIGHT OF CENTERLINE	45.0	1065.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

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NOV 9 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-6
Authorized By KEN SMITH Date 10-30-95
Tested By J. WADDELL/WT Date 10-30-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
475		6.8	122.2	0.0	2	128.5	7.5	95		95	YES
476		5.4	122.1	0.0	2	128.5	7.5	95		95	YES
477		5.5	122.4	0.0	2	128.5	7.5	95		95	YES
478		6.0	123.3	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
475	STA. 12+00, 30' LEFT OF CENTERLINE	63.0	1063.0	EMBANKMENT FILL
476	STA. 14+00, 50' RIGHT OF CENTERLINE	63.0	1063.0	EMBANKMENT FILL
477	STA. 16+00, 50' RIGHT OF CENTERLINE	63.0	1063.0	EMBANKMENT FILL
478	STA. 18+45, 90' RIGHT OF CENTERLINE	63.0	1063.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

RECEIVED
NOV 8 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/27/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
109	10/27/95 N	50' RT OF CENTERLINE, STATION 14+00	1062±
110	10/27/95 N	30' LT OF CENTERLINE, STATION 8+00	1060±
111	10/27/95 N	40' LT OF CENTERLINE, STATION 17+50	1059±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
109	7.5	128.5	6.8	123.5	96	YES
110	7.5	128.5	5.2	122.1	95	YES
111	7.5	128.5	4.2	122.7	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____________

Visual Soil Classification per ASTM D2488 ____________

Job No. ____________ Page ____ of ____

Event / Invoice No. ____________ Lab No. ____________

Authorized By ____________ Date ____________

Tested By CWAT Date 10-27-93

Test Locations Designated By ____________ Date ____________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2506 (2) H_2O 685

Test Hole No.	109	110	111	
Horizontal Location of Test Hole	STA. 14+00 50' LT ℄	STA. 8+00 30' LT ℄	STA. 11+50 40' LT ℄	
Vertical Distance From Elevation Datum, ft. †	1062±	1060±	1059±	
Depth of Fill				
DENSITY – Probe Depth	8"	8"	8"	
DENSITY – Counts	1256	1379	1403	
DENSITY – (3) Count Average				
DENSITY – Density Ratio				
MOISTURE – Counts	113	90	77	
MOISTURE – (4) Count Average				
MOISTURE – Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.9	128.5	127.9	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	123.5	122.1	122.7	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	6.8	5.2	4.2	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	96	95	95	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data:
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____________
20. ____________

† Datum ____________

REVIEWED BY ____________

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Western Technologies Inc.

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/26/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
106	10/26/95 N	80' RT OF CENTERLINE, STATION 9+20	1059±
107	10/26/95 N	20' LT OF CENTERLINE, STATION 13+50	1059±
108	10/26/95 N	70' RT OF CENTERLINE, STATION 16+00	1059±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
106	7.5	128.5	4.8	123.7	96	YES
107	7.5	128.5	5.2	121.5	95	YES
108	7.5	128.5	8.5	122.5	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-10
Authorized By KEN SMITH Date 10-27-95
Tested By P. LLEWELLYN/WT Date 10-27-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3082** H_2O **618**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
471		7.2	122.0	0.0	2	128.5	7.5	95		95	YES
472		7.0	123.8	0.0	2	128.5	7.5	96		95	YES
473		6.9	123.2	0.0	2	128.5	7.5	96		95	YES
474		7.5	125.3	0.0	2	128.5	7.5	98		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
471	STA. 10+00, 60' LEFT OF CENTERLINE	62.0	1062.0	EMBANKMENT FILL
472	STA. 13+00, 40' RIGHT OF CENTERLINE	62.0	1062.0	EMBANKMENT FILL
473	STA. 16+00, 30' LEFT OF CENTERLINE	62.0	1062.0	EMBANKMENT FILL
474	STA. 19+00, 70' RIGHT OF CENTERLINE	62.0	1062.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

RECEIVED
NOV 8 1995
GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (1)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ____ of ____

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WAT Date 10-26-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2520 (2) H_2O 677

Test Hole No.			106	107	108	
Horizontal Location of Test Hole			STA 9+20 80' RT ℄	STA. 13+30 20' LT. ℄	STA. 16+00 70' RT ℄	
Vertical Distance From Elevation Datum, ft. †			1059±	1059±	1059±	
Depth of Fill						
DENSITY	Probe Depth		8"	8"	8"	
	Counts		1347	1408	?	
	(3) Count Average					
	Density Ratio					
MOISTURE	Counts		84	89	?	
	(4) Count Average					
	Moisture Ratio					
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout			129.6	127.9	132.9	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout						
Specific Gravity of +No. 4 Material	☐ Assumed	☐ Tested				
(7) Wet Weight of Sample, lbf						
(8) Wet Weight of +No. 4 Material						
% of +No. 4 Material – Lab / Field	[(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture						
Optimum Moisture (Lab), % of Dry Unit Weight			7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.			128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft.	(See Chart)					
(10) Corrected Optimum Moisture, %	(See Chart)					
(11) Dry Unit Weight, lbf / cu. ft.	Readout or (5) – (6)		123.7	121.5	122.5	
(12) Report % Moisture, Total Sample	Readout or [(6) ÷ (11)] x 100		4.8	5.2	8.5	
Relative Compaction, %	Readout or [(11) ÷ (9)] x 100		96	95	95	
Conformance Indicated?			YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*						

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY ______

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-17-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-9
Authorized By KEN SMITH Date 10-26-95
Tested By P. LLEWELLYN/WT Date 10-26-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA** **REVISED REPORT: 11/17/95**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3082** H_2O **618**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
464		7.0	124.9	0.0	2	128.5	7.5	97		95	YES
465		7.5	122.5	0.0	2	128.5	7.5	95		95	YES
466		6.7	122.3	0.0	2	128.5	7.5	95		95	YES
467		6.9	122.0	0.0	2	128.5	7.5	95		95	YES
468		4.6	125.5	0.0	3	137.4	1.0	91		90	YES
469		5.0	129.4	0.0	3	137.4	1.0	94		90	YES
470		4.9	130.3	0.0	3	137.4	1.0	95		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
464	STA. 8+50, 20' RIGHT OF CENTERLINE	50.0	1062.0	EMBANKMENT FILL
465	STA. 11+00, 60' LEFT OF CENTERLINE	61.0	1061.0	EMBANKMENT FILL
466	STA. 15+00, 90' RIGHT OF CENTERLINE	61.0	1061.0	EMBANKMENT FILL
467	STA. 16+50, 50' LEFT OF CENTERLINE	61.0	1061.0	EMBANKMENT FILL
468	STA. 19+00, 70' LEFT OF CENTERLINE	2.0	1057.0	DRAIN ROCK
469	STA. 21+00, 40' LEFT OF CENTERLINE	2.0	1069.0	DRAIN ROCK
470	STA. 22+00, 35' LEFT OF CENTERLINE	5.0	1071.0	DRAIN ROCK

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: **BID #9-TEST #464-467, BID #10-TEST 468-470**
*** DATUM TOPOGRAPHIC**

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GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/25/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
102	10/25/95 N	70' RT OF CENTERLINE, STATION 9+50	1058±
103	10/25/95 N	70' RT OF CENTERLINE, STATION 17+00	1058±
104	10/25/95 N	20' LT OF CENTERLINE, STATION 16+00	1058±
105	10/25/95 N	20' LT OF CENTERLINE, STATION 11+00	1058±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
102	7.5	128.5	5.3	122.0	95	YES
103	7.5	128.5	7.0	121.6	95	YES
104	7.5	128.5	4.0	129.4	100+	YES
105	7.5	128.5	9.3	121.6	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By CWT Date 10-25-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2540 (2) H_2O 682

Test Hole No.	102	103	104	105
Horizontal Location of Test Hole	STA 9+00 70' Lt ℄	STA 17+00 70' Rt ℄	STA 16+00 20' Lt ℄	STA 11+00 20' Lt ℄
Vertical Distance From Elevation Datum, ft. †	1058±	1058±	1058±	1058±
Depth of Fill				
DENSITY — Probe Depth	8"	8'	8"	8"
DENSITY — Counts	1397	1332	1194	1237
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	91	114	76	145
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	128.5	130.2	134.5	132.8
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.3	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	122.0	121.6	129.4	121.6
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	5.3	7.0	4.0	9.3
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95	95	100+	95
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-8
Authorized By KEN SMITH Date 10-25-95
Tested By P. LLEWELLYN/WT Date 10-25-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
460		7.3	123.7	0.0	2	128.5	7.5	96		95	YES
461		6.8	123.1	0.0	2	128.5	7.5	96		95	YES
462		7.2	122.2	0.0	2	128.5	7.5	95		95	YES
463		7.8	123.7	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
460	STA. 11+00, 50' LEFT OF CENTERLINE	60.0	1060.0	EMBANKMENT FILL
461	STA. 13+50, 90' RIGHT OF CENTERLINE	60.0	1060.0	EMBANKMENT FILL
462	STA. 15+50, 30' LEFT OF CENTELRINE	60.0	1060.0	EMBANKMENT FILL
463	STA. 19+50, 35' RIGHT OF CENTERLINE	12.0	1060.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
• DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/24/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
99	10/24/95 **N**	75' RT OF CENTERLINE, STATION 14+00	1056±
100	10/24/95 **N**	20' LT OF CENTERLINE, STATION 17+00	1056±
101	10/24/95 **N**	20' LT OF CENTERLINE, STATION 9+50	1056±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	IN-PLACE CHARACTERISTICS DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
99	7.5	128.5	5.0	125.3	98	YES
100	7.5	128.5	7.0	122.1	95	YES
101	7.5	128.5	5.6	124.0	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS — Job No. ________ Page ____ of ____

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ________ Event/Invoice No. ________ Lab No. ________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ________ Date ________

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ________ Tested By WHT Date 10-24-95

Visual Soil Classification per ASTM D2488 ________ Test Locations Designated By ________ Date ________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2500 (2) H_20 684

Test Hole No.	99	100	101	
Horizontal Location of Test Hole	STA 14+00 75' RT ℄	STA 17+00 20' LT ℄	STA 9+50 20' LT ℄	
Vertical Distance From Elevation Datum, ft. †	1056±	1056±	1056±	
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	
DENSITY — Counts	1267	1295	1290	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	89	114	96	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.6	130.6	130.9	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab); % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	125.3	122.1	124.0	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	5.0	7.0	5.6	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	98	95	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data:
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ________

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 — METHOD ☐A ☐B ☐C ☐D

19. ________

20. ________

† Datum ________

REVIEWED BY [signature]

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-7
Authorized By KEN SMITH Date 10-24-95
Tested By P. LLEWELLYN/WT Date 10-24-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
456		7.2	123.9	0.0	2	128.5	7.5	96		95	YES
457		7.0	122.5	0.0	2	128.5	7.5	95		95	YES
458		6.9	122.1	0.0	2	128.5	7.5	95		95	YES
459		7.5	124.3	0.0	2	128.5	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
456	STA. 10+50, 90' LEFT OF CENTERLINE	58.0	1058.0	EMBANKMENT FILL
457	STA. 12+50, 50' RIGHT OF CENTERLINE	58.0	1058.0	EMBANKMENT FILL
458	STA. 15+00, 20' LEFT OF CENTERLINE	58.0	1058.0	EMBANKMENT FILL
459	STA. 18+00, 80' RIGHT OF CENTERLINE	58.0	1058.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/23/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
96	10/23/95 N	70' RT OF CENTERLINE, STATION 9+50	1056±
97	10/23/95 N	50' RT OF CENTERLINE, STATION 14+00	1056±
98	10/23/95 N	70' RT OF CENTERLINE, STATION 17+00	1056±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
96	7.5	128.5	5.5	124.9	97	YES
97	7.5	128.5	6.5	124.0	97	YES
98	7.5	128.5	5.9	124.5	97	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

Job No. ______ Page ___ of ___

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 10-23-95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2306 (2) H_2O 655

Test Hole No.	96	97	98	
Horizontal Location of Test Hole	STA. 9+50 70' RT ℄	STA. 14+00 50' RT ℄	STA. 17+00 70' RT ℄	
Vertical Distance From Elevation Datum, ft. †	1056±	1056±	1056±	
Depth of Fill				
DENSITY Probe Depth	8"	8"	8"	
DENSITY Counts	1263	1252	1258	
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts	91	104	97	
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	128.5	132.0	131.9	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	124.9	124.0	124.5	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	5.5	6.0	5.9	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	97	97	97	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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Western Technologies Inc.

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report **10-31-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450583-5**
Authorized By **KEN SMITH** Date **10-23-95**
Tested By **P. LLEWELLYN/WT** Date **10-23-95**

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3082** H_2O **618**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
448		7.6	121.9	0.0	2	128.5	7.5	95		95	YES
449		9.6	123.1	0.0	2	128.5	7.5	96		95	YES
450		7.2	118.6	0.0	2	128.5	7.5	92		95	NO
451		7.3	122.8	0.0	2	128.5	7.5	96		95	YES
452		7.0	122.6	0.0	2	128.5	7.5	95		95	YES
453		7.5	124.9	0.0	2	128.5	7.5	97		95	YES
454		6.9	123.3	0.0	2	128.5	7.5	96		95	YES
455		7.2	122.1	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
448	STA. 10+00, 98' LEFT OF CENTERLINE	56.0	1056.0	EMBANKMENT FILL
449	STA. 10+50, 40' RIGHT OF CENTERLINE	56.0	1056.0	EMBANKMENT FILL
450	STA. 12+00, 98' RIGHT OF CENTERLINE	56.0	1056.0	EMBANKMENT FILL
451	RETEST 450A	56.0	1056.0	EMBANKMENT FILL
452	STA. 14+00, 75' LEFT OF CENTERLINE	56.0	1056.0	EMBANKMENT FILL
453	STA. 17+00, 85' RIGHT OF CENTERLINE	56.0	1056.0	EMBANKMENT FILL
454	STA. 19+20, 80' LEFT OF CENTERLINE	10.0	1059.0	EMBANKMENT FILL
455	STA. 19+75, 80' LEFT OF CENTERLINE	7.0	1061.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9**
• DATUM TOPOGRAPHIC

RECEIVED
NOV 1 1995
GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/20/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
94	10/20/95 N	20' LT OF CENTERLINE, STATION 13+00	1056±
95	10/20/95 N	30' LT OF CENTERLINE, STATION 16+00	1054±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
94	7.5	128.5	10.4	122.3	95	YES
95	7.5	128.5	8.9	121.7	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WAT Date 10-20-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 34HB Serial No. 11044 Standard Count: (1) Unit Weight 2505 (2) H_2O 612

Test Hole No.		94	95	
Horizontal Location of Test Hole	STA 8+50 30' LT. ℄	STA 13+00 20' LT. ℄	STA. 16+00 30' LT. ℄	
Vertical Distance From Elevation Datum, ft. †		1056±	1054±	
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	
DENSITY — Counts		1149	1230	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts		143	126	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	133.3	135.1	132.6	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		122.3	121.7	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		10.4	8.9	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		95	95	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-31-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-4
Authorized By KEN SMITH Date 10-20-95
Tested By P. LLEWELLYN/WT Date 10-20-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
440		6.7	123.7	0.0	2	128.5	7.5	96		95	YES
441		6.9	119.1	0.0	2	128.5	7.5	93		95	NO
442		7.2	122.2	0.0	2	128.5	7.5	95		95	YES
443		7.0	122.5	0.0	2	128.5	7.5	95		95	YES
444		7.4	124.4	0.0	2	128.5	7.5	97		95	YES
445		7.8	122.0	0.0	2	128.5	7.5	95		95	YES
446		7.4	123.6	0.0	2	128.5	7.5	96		95	YES
447		7.0	123.1	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
440	STA. 11+00, 60' RIGHT OF CENTERLINE	54.0	1054.0	EMBANKMENT FILL
441	STA. 12+50, 98' LEFT OF CENTERLINE	54.0	1054.0	EMBANKMENT FILL
442	RETEST 441A	54.0	1054.0	EMBANKMENT FILL
443	STA. 14+00, 98' RIGHT OF CENTERLINE	54.0	1054.0	EMBANKMENT FILL
444	STA. 15+00, 98' LEFT OF CENTERLINE	54.0	1054.0	EMBANKMENT FILL
445	STA. 13+50, 40' LEFT OF CENTERLINE	54.0	1054.0	EMBANKMENT FILL
446	STA. 16+50, 75' RIGHT OF CENTERLINE	54.0	1054.0	EMBANKMENT FILL
447	STA. 16+00, 98' RIGHT OF CENTERLINE	54.0	1054.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

RECEIVED
NOV 1 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/19/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
91	10/19/95 N	ON CENTERLINE, STATION 10+00	1052±
92	10/19/95 N	10' LT OF CENTERLINE, STATION 14+50	1063±
93	10/19/95 N	20' LT OF CENTERLINE, STATION 16+50	1042±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
91	7.5	128.5	6.6	123.8	96	YES
92	7.5	128.5	7.7	125.9	98	YES
93	7.5	128.5	5.3	124.4	97	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ________

Visual Soil Classification per ASTM D2488 ________

Job No. ________ Page ____ of ____

Event / Invoice No. ________ Lab No. ________

Authorized By ________ Date ________

Tested By CWAT Date 10.19.95

Test Locations Designated By ________ Date ________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2520 (2) H_2O 683

Test Hole No.	91	92	93	
Horizontal Location of Test Hole	STA 10+00 ON ℄	STA 14+30 10' LT. ℄	STA 16+80 20' LT. ℄	
Vertical Distance From Elevation Datum, ft. †	1052±	1063±7	1062±	
Depth of Fill				
DENSITY — Probe Depth	8"	8'	8"	
DENSITY — Counts	1269	1150	1303	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	106	123	89	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	132.0	135.7	131.1	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	123.8	125.9	124.4	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	6.6	7.7	5.3	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	96	98	97	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ________
20. ________

† Datum ________

REVIEWED BY ________

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-31-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-3
Authorized By KEN SMITH Date 10-19-95
Tested By P. LLEWELLYN/WT Date 10-19-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
432		7.0	123.7	0.0	2	128.5	7.5	96		95	YES
433		6.5	122.5	0.0	2	128.5	7.5	95		95	YES
434		6.9	120.0	0.0	2	128.5	7.5	93		95	NO
435		6.6	122.3	0.0	2	128.5	7.5	95		95	YES
436		6.2	123.7	0.0	2	128.5	7.5	96		95	YES
437		6.9	122.5	0.0	2	128.5	7.5	95		95	YES
438		7.0	119.2	0.0	2	128.5	7.5	93		95	NO
439		7.5	123.9	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
432	STA. 9+50, 60' LEFT OF CENTERLINE	52.0	1052.0	EMBANKMENT FILL
433	STA. 12+00, 98' LEFT OF CENTERLINE	52.0	1052.0	EMBANKMENT FILL
434	STA. 12+20, 98' RIGHT OF CENTERLINE	52.0	1052.0	EMBANKMENT FILL
435	RETEST 434A	52.0	1052.0	EMBANKMENT FILL
436	STA. 14+50, 65' LEFT OF CENTERLINE	52.0	1052.0	EMBANKMENT FILL
437	STA. 16+00, 98' RIGHT OF CENTERLINE	52.0	1052.0	EMBANKMENT FILL
438	STA. 15+00, 60' LEFT OF CENTERLINE	52.0	1052.0	EMBANKMENT FILL
439	RETEST 438A	52.0	1052.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

RECEIVED
NOV 1 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/18/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
88	10/18/95 **N**	110' LT OF CENTERLINE, STATION 18+00	1046±
89	10/18/95 **N**	50' LT OF CENTERLINE, STATION 14+70	1060±
90	10/18/95 **N**	110' LT OF CENTERLINE, STATION 10+00	1052±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
88	7.5	128.5	5.2	127.4	99	YES
89	7.5	128.5	4.5	125.1	97	YES
90	7.5	128.5	5.2	124.6	97	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____

Visual Soil Classification per ASTM D2488 ____

Job No. ____ Page ____ of ____

Event / Invoice No. ____ Lab No. ____

Authorized By ____ Date ____

Tested By WHT Date 10-18-95

Test Locations Designated By ____ Date ____

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2500 (2) H_2O 682

Test Hole No.		88	89	90	
Horizontal Location of Test Hole		STA. 18+00 110' LT. ℄	STA. 14+70 50' LT ℄	STA. 10+00 110' LT ℄	
Vertical Distance From Elevation Datum, ft. †		1046 ±	1060 ± 3	1052 ±	
Depth of Fill		1			
DENSITY	Probe Depth	8"	8"		
	Counts	1188	1296	1283	
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	92	82	91	
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		134.0	130.8	131.1	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		127.4	125.1	124.6	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		5.2	4.5	5.2	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		99	97	97	
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ____

20. ____

† Datum ____

REVIEWED BY ____

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-31-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-2
Authorized By KEN SMITH Date 10-18-95
Tested By P. LLEWELLYN/WT Date 10-18-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3082** H_2O **618**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
424		6.8	122.5	0.0	2	128.5	7.5	95		95	YES
425		7.2	118.0	0.0	2	128.5	7.5	92		95	NO
426		7.0	122.6	0.0	2	128.5	7.5	95		95	YES
427		7.5	123.6	0.0	2	128.5	7.5	96		95	YES
428		6.9	121.8	0.0	2	128.5	7.5	95		95	YES
429		7.2	124.9	0.0	2	128.5	7.5	97		95	YES
430		6.5	122.6	0.0	2	128.5	7.5	95		95	YES
431		7.0	122.5	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
424	STA. 9+50, 20' LEFT OF CENTERLINE	51.0	1051.0	EMBANKMENT FILL
425	STA. 10+00, 98' LEFT OF CENTERLINE	51.0	1051.0	EMBANKMENT FILL
426	RETEST 425A	51.0	1051.0	EMBANKMENT FILL
427	STA. 11+00, 60' RIGHT OF CENTERLINE	51.0	1051.0	EMBANKMENT FILL
428	STA. 11+50, 98' RIGHT OF CENTERLINE	51.0	1051.0	EMBANKMENT FILL
429	STA. 13+50, 30' RIGHT OF CENTERLINE	51.0	1051.0	EMBANKMENT FILL
430	STA. 15+00, 98' RIGHT OF CENTERLINE	51.0	1051.0	EMBANKMENT FILL
431	STA. 17+00, 50' LEFT OF CENTERLINE	51.0	1051.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

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GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/17/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
85	10/17/95 N	50' LT OF CENTERLINE, STATION 16+70	1053±
86	10/17/95 N	20' LT OF CENTERLINE, STATION 15+00	1044±
87	10/17/95 N	40' LT OF CENTERLINE, STATION 10+00	1050±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
85	7.5	128.5	5.1	124.9	97	YES
86	7.5	128.5	7.8	122.9	96	YES
87	7.5	128.5	9.7	123.8	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event/Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 10-17-95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Job No. ______ Page ___ of ___

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2816 (2) H_2O 674

Test Hole No.	85	86	87	
Horizontal Location of Test Hole	STA. 16+70 50' LT. ℄	STA. 13+00 20' LT. ℄	STA. 10+00 40' LT. ℄	
Vertical Distance From Elevation Datum, ft. †	1053±	1044±	1050±	
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	
DENSITY — Counts	1287	1237	1133	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	88	125	151	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.2	132.6	135.8	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	124.9	122.9	123.8	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	5.1	7.8	9.7	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	97	96	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 10-31-95
Job No. 2745JC249
Event/Invoice No. 27450583-1
Authorized By KEN SMITH Date 10-17-95
Tested By P. LLEWELLYN/WT Date 10-17-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
413		7.0	118.6	0.0	2	128.5	7.5	92		95	NO
414		6.8	123.9	0.0	2	128.5	7.5	96		95	YES
415		7.2	115.3	0.0	2	128.5	7.5	90		95	NO
416		6.5	123.1	0.0	2	128.5	7.5	96		95	YES
417		6.3	124.3	0.0	2	128.5	7.5	97		95	YES
418		7.0	117.3	0.0	2	128.5	7.5	91		95	NO
419		6.9	119.4	0.0	2	128.5	7.5	93		95	NO
420		6.5	121.9	0.0	2	128.5	7.5	95		95	YES
421		7.2	122.6	0.0	2	128.5	7.5	95		95	YES
422		7.3	123.1	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
413	STA. 10+50, 98' LEFT OF CENTERLINE	49.0	1049.0	EMBANKMENT FILL
414	STA. 11+00, 45' LEFT OF CENTERLINE	49.0	1049.0	EMBANKMENT FILL
415	STA. 14+50, 98' RIGHT OF CENTERLINE	49.0	1049.0	EMBANKMENT FILL
416	STA. 15+00, 30' RIGHT OF CENTERLINE	49.0	1049.0	EMBANKMENT FILL
417	STA. 18+00, 42' LEFT OF CENTERLINE	49.0	1049.0	EMBANKMENT FILL
418	STA. 16+50, 98' LEFT OF CENTERLINE	49.0	1049.0	EMBANKMENT FILL
419	STA. 16+50, 98' RIGHT OF CENTERLINE	49.0	1049.0	EMBANKMENT FILL
420	RETEST 413A	49.0	1049.0	EMBANKMENT FILL
421	RETEST 415A	49.0	1049.0	EMBANKMENT FILL
422	RETEST 418A	49.0	1049.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 10-31-95
Job No. 2745JC249

Event/Invoice No. 27450583-1
Authorized By KEN SMITH Date 10-17-95
Tested By P. LLEWELLYN/WT Date 10-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
423		7.0	122.2	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
423	RETEST 419A	49.0	1049.0	EMBANKMENT FILL

Comments: * DATUM TOPOGRAPHIC

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REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/16/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
83	10/16/95 N	110' LT OF CENTERLINE, STATION 17+00	1036±
84	10/16/95 N	70' LT OF CENTERLINE, STATION 15+20	1050±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	IN-PLACE CHARACTERISTICS DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
83	7.5	128.5	8.5	125.1	97	YES
84	7.5	128.5	8.7	122.2	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 10-16-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2531 (2) H_2O 673

Test Hole No.		93	94		
Horizontal Location of Test Hole		STA. 17+00 10' LT. ℄	STA. 15+20 70' LT. ℄		
Vertical Distance From Elevation Datum, ft. †		1036±	1050±		
Depth of Fill					
DENSITY	Probe Depth	8"	8"		
	Counts	1145	1232		
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	136	136		
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		135.7	132.9		
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5		
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5		
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		125.1	122.2		
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		8.5	8.7		
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		97	95		
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-31-95
Job No. 2745JC249

Event/Invoice No. 27450583
Authorized By KEN SMITH Date 10-16-95
Tested By J. WADDELL/WT Date 10-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 2742 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
409		6.4	126.0	0.0	2	128.5	7.5	98		95	YES
410		5.9	125.8	0.0	2	128.5	7.5	98		95	YES
411		5.9	128.0	0.0	2	128.5	7.5	100		95	YES
412		5.2	125.3	0.0	2	128.5	7.5	98		95	YES
408		2.6	121.8	0.0	2	128.5	7.5	95		95	YES
409		3.5	122.4	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
409	STA. 10+00, 75' RIGHT OF CENTERLINE	38.0	1048.0	EMBANKMENT FILL
410	STA. 12+50, 150' RIGHT OF CENTERLINE	38.0	1048.0	EMBANKMENT FILL
411	STA. 15+25, 210' RIGHT OF CENTERLINE	38.0	1048.0	EMBANKMENT FILL
412	STA. 17+50, 210' RIGHT OF CENTERLINE	38.0	1048.0	EMBANKMENT FILL
408	RETEST 407A	26.0	1028.0	EMBANKMENT FILL
409	STA. 17+00, 50' LEFT OF CENTERLINE	52.0	1034.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-26-95
Job No. 2745JC249
Event/Invoice No. 27450527-19
Authorized By KEN SMITH Date 10-13-95
Tested By J. WADDELL/WT Date 10-13-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
401		8.4	122.2	0.0	2	128.5	7.5	95		95	YES
402		8.5	123.2	0.0	2	128.5	7.5	96		95	YES
403		8.9	121.6	0.0	2	128.5	7.5	95		95	YES
404		5.9	123.0	0.0	2	128.5	7.5	96		95	YES
405		8.3	126.7	0.0	2	128.5	7.5	99		95	YES
406		8.9	122.6	0.0	2	128.5	7.5	95		95	YES
407		11.2	116.4	0.0	2	128.5	7.5	91		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
401	STA. 17+00, 200' LEFT OF CENTERLINE	24.0	1026.0	EMBANKMENT FILL
402	STA. 9+00, 125' LEFT OF CENTERLINE	47.0	1041.0	EMBANKMENT FILL
403	STA. 10+00, 50' LEFT OF CENTERLINE	47.0	1041.0	EMBANKMENT FILL
404	STA. 12+10, 100' RIGHT OF CENTERLINE	40.0	1048.0	EMBANKMENT FILL
405	STA. 17+00, 120' LEFT OF CENTERLINE	25.0	1027.0	EMBANKMENT FILL
406	STA. 10+25, 100' LEFT OF CENTERLINE	48.0	1042.0	EMBANKMENT FILL
407	STA. 18+00, 100' LEFT OF CENTERLINE	26.0	1028.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
• DATUM TOPOGRAPHIC

RECEIVED
OCT 27 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/12/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **KEN SMITH** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
81	10/12/95 N	100' LT OF CENTERLINE, STATION 11+00	1040±
82	10/12/95 N	150' LT OF CENTERLINE, STATION 17+45	1031±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
81	7.5	128.5	8.0	124.4	97	YES
82	7.5	128.5	6.5	121.5	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By KAS Date 10/12/95

Test Locations Designated By KAS Date ______

Gauge: Make Model Serial No.	Standard Count: (1) Unit Weight 2503	(2) H_2O 654		
Test Hole No.	81	82		
Horizontal Location of Test Hole	6:10 PM 11+00 100' Lt	7 Am 17+95 150' Lt		
Vertical Distance From Elevation Datum, ft. †	1040±	1032±		
Depth of Fill	8"			
DENSITY — Probe Depth	8"	8"		
DENSITY — Counts	1176	1359		
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	127	106		
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	134.3	128.9		
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5			
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.6			
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	124.4	121.5		
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	8.0	6.5		
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	97	95		
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

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Western Technologies Inc.

REVIEWED BY ______

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/11/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
78	10/11/95 N	150' LT OF CENTERLINE, STATION 18+00	1024±
79	10/11/95 N	ON CENTERLINE, STATION 19+50	OVEREXC SUBGRADE
80	10/11/95 N	20' RT OF CENTERLINE, STATION 8+50	1045±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
78	7.5	128.5	7.8	123.1	96	YES
79	7.5	128.5	6.4	128.9	100+	YES
80	7.5	128.5	9.8	122.9	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____________

Visual Soil Classification per ASTM D2488 ____________

Job No. ____________ Page ____ of ____

Event / Invoice No. ____________ Lab No. ____________

Authorized By ____________ Date ____________

Tested By ~~10-11-95~~ WHT Date 10-11-95

Test Locations Designated By ____________ Date ____________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2510 (2) H_2O 686

Test Hole No.	78	79	80	
Horizontal Location of Test Hole	STA. 18+00 150' LT. ℄	STA. 19+50 ON ℄ OVEREXCAV. SUBGR.	STA 8+30 20' RT ℄	
Vertical Distance From Elevation Datum, ft. †	1024±		1045±	
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	
DENSITY — Counts	1229	1099	1157	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	127	111	154	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	132.7	137.1	134.9	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	123.1	128.9	122.9	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	7.8	6.4	9.8	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	96	100+	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____________

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ____________

20. ____________

† Datum ____________

REVIEWED BY ____________

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Western Technologies Inc.

Western Technologies Inc.
The Quality People
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1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-15-95
Job No. 2745JC249
Event/Invoice No. 27450527-17
Authorized By KEN SMITH Date 10-11-95
Tested By J. WADDELL/WT Date 10-11-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
389		7.7	126.5	0.0	2	128.5	7.5	98		95	YES
390		7.2	121.5	0.0	2	128.5	7.5	95		95	YES
391		5.5	123.7	0.0	2	128.5	7.5	96		95	YES
392		4.9	125.0	0.0	2	128.5	7.5	97		95	YES
393		7.0	122.3	0.0	2	128.5	7.5	95		95	YES
394		7.6	122.6	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
389	STA. 15+25, 100' RIGHT OF CENTERLINE	40.0	1046.0	EMBANKMENT FILL
390	STA. 16+00, 125' RIGHT OF CENTERLINE	40.0	1046.0	EMBANKMENT FILL
391	STA. 17+50, 150' RIGHT OF CENTERLINE	40.0	1046.0	EMBANKMENT FILL
392	STA. 18+00, 225' RIGHT OF CENTERLINE	40.0	1046.0	EMBANKMENT FILL
393	STA. 16+80, 200' LEFT OF CENTERLINE	18.0	1022.0	EMBANKMENT FILL
394	STA. 17+00, 100' LEFT OF CENTERLINE	18.0	1022.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (3)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/10/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
75	10/10/95 N	120' LT OF CENTERLINE, STATION 16+00	1014±
76	10/10/95 N	ON CENTERLINE, STATION 8+50	1040±
77	10/10/95 N	110' LT OF CENTERLINE, STATION 16+50	1015±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	IN-PLACE CHARACTERISTICS DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
75	7.5	128.5	5.3	126.6	99	YES
76	7.5	128.5	8.0	124.1	97	YES
77	7.5	128.5	7.0	122.4	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ________

Visual Soil Classification per ASTM D2488 ________

Job No. ________ Page ____ of ____

Event / Invoice No. ________ Lab No. ________

Authorized By ________ Date ________

Tested By WAT Date 10-10-95

Test Locations Designated By ________ Date ________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2538 (2) H_2O 683

Test Hole No.	75	76	77	
Horizontal Location of Test Hole	STA. 16+00 120' Lt ℄	STA 8+50 on ℄	STA 16+30 110' Rt ℄	
Vertical Distance From Elevation Datum, ft. †				
Depth of Fill	1014±	1040±	1015±	
DENSITY Probe Depth	8"	8'		
DENSITY Counts	1228	1199	1301	
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts	94	130	115	
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	133.3	134.1	131.0	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.3	7.3	7.3	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.3	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	126.6	124.1	122.4	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	5.3	8.0	7.0	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	99	97	95	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ________

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ________

20. ________

† Datum ________

REVIEWED BY ________

Western Technologies Inc.
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Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-07-95
Job No. 2745JC249 — Page 1 of 1
Event/Invoice No. 27450527-16
Authorized By KEN SMITH — Date 10-10-95
Tested By J. WADDELL/WT — Date 10-10-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA REVISED REPORT: 11/03/95
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3104 H_2O 620

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
383		6.0	123.1	0.0	2	128.5	7.5	96		95	YES
384		6.3	121.8	0.0	2	128.5	7.5	95		95	YES
385		3.6	123.2	0.0	2	128.5	7.5	96		95	YES
386		4.2	122.1	0.0	2	128.5	7.5	95		95	YES
387		5.0	130.7	0.0	2	128.5	7.5	100+		95	YES
388		4.0	122.3	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
383	STA. 10+00, 75' RIGHT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
384	STA. 12+50, 125' RIGHT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
385	STA. 15+00, 175' LEFT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
386	STA. 17+50, 200' RIGHT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
387	STA. 11+50, 150' LEFT OF CENTERLINE	44.0	1038.0	EMBANKMENT FILL
388	STA. 17+10, 250' LEFT OF CENTERLINE	12.0	1014.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * DATUM TOPOGRAPHIC

RECEIVED
NOV 8 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Paul is correcting & reissuing

Date of Report 10-15-95
Job No. 2745JC249 Page 1 of 1
nt/Invoice No. 27450527-16
Authorized By KEN SMITH Date 10-10-95
Tested By J. WADDELL/WT Date 10-10-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 2
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASII**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3104** H_2O **620**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
383		6.0	123.1	0.0	2	128.5	7.5	96		95	YES
384		6.3	121.8	0.0	2	128.5	7.5	95		95	YES
385		3.6	123.2	0.0	2	128.5	7.5	96		95	YES
386		6.3	119.7	0.0	2	128.5	7.5	93		95	NO
387		5.0	130.7	0.0	2	128.5	7.5	100+		95	YES
388		4.0	122.3	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL Approximate Fill Depth, ft.	Elevation *	MATERIAL TESTED
383	STA. 10+00, 75' RIGHT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
384	STA. 12+50, 125' RIGHT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
385	STA. 15+00, 175' LEFT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
386	STA. 17+50, 200' RIGHT OF CENTERLINE	41.0	1045.0	EMBANKMENT FILL
387	STA. 11+50, 150' LEFT OF CENTERLINE	44.0	1038.0	EMBANKMENT FILL
388	STA. 17+10, 250' LEFT OF CENTERLINE	12.0	1014.0	EMBANKMENT FILL

VOID

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * **DATUM TOPOGRAPHIC**

RECEIVED
NOV 3 1995
GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/09/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
73	10/09/95 N	10' RT OF CENTERLINE, STATION 8+75	1035±
74	10/09/95 N	150' LT OF CENTERLINE, STATION 16+50	1012±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	IN-PLACE CHARACTERISTICS DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
73	7.5	128.5	5.8	125.5	98	YES
74	7.5	128.5	4.6	125.6	98	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS — Job No. ______ Page 1 of ______

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 10.9.95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2327 (2) H_2O 667

Test Hole No.	73	74		
Horizontal Location of Test Hole	STA. 8+75 10' RT. ℄	STA. 16+50 150' LT. ℄		
Vertical Distance From Elevation Datum, ft. †	1035±	1012±		
Depth of Fill				
DENSITY — Probe Depth	8'			
DENSITY — Counts	1239	1286		
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	98	83		
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	132.8	131.4		
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5		
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5		
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	125.5	125.6		
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	5.8	4.6		
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	98	98		
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

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(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-15-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-15
Authorized By KEN SMITH Date 10-09-95
Tested By J. WADDELL/WT Date 10-09-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3083** H_2O **616**

TEST NO.	IN-PLACE CHARACTERISTICS: Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	LAB CHARACTERISTICS: ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	COMPACTION: % of Maximum Dry Unit Weight	REQUIREMENTS: Moisture %	Compaction %	CONFORMANCE INDICATED
378		8.0	122.3	0.0	2	128.5	7.5	95		95	YES
379		8.2	124.4	0.0	2	128.5	7.5	97		95	YES
380		8.7	124.5	0.0	2	128.5	7.5	97		95	YES
381		7.5	123.7	0.0	2	128.5	7.5	96		95	YES
382		5.9	122.3	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	Elevation *	MATERIAL TESTED
378	STA. 9+00, 100' RIGHT OF CENTERLINE	24.0	1044.0	EMBANKMENT FILL
379	STA. 10+00, 80' RIGHT OF CENTERLINE	24.0	1044.0	EMBANKMENT FILL
380	STA. 11+00, 120' RIGHT OF CENTERLINE	24.0	1044.0	EMBANKMENT FILL
381	STA. 12+00, 100' RIGHT OF CENTERLINE	24.0	1044.0	EMBANKMENT FILL
382	STA. 16+98, LEFT OF CENTERLINE	75.0	1011.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

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GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/06/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
70	10/06/95 N	30' RT OF CENTERLINE, STATION 9+75	1040±
71	10/06/95 N	70' RT OF CENTERLINE, STATION 15+00	1038±
72	10/06/95 N	80' LT OF CENTERLINE, STATION 10+50	1040±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
70	7.5	128.5	7.1	122.3	95	YES
71	7.5	128.5	7.6	128.4	100	YES
72	7.5	128.5	6.2	123.7	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 10-6-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2519 (2) H_2O 664

Test Hole No.	70	71	72	
Horizontal Location of Test Hole	STA. 9+75 30' LT ℄	STA. 15+00 70' RT ℄	STA. 10+50 80' LT. ℄	
Vertical Distance From Elevation Datum, ft. †	1040±	1038±	1040±	
Depth of Fill				
DENSITY — Probe Depth	8"	8'	8'	
DENSITY — Counts	1292	1071	1282	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	113	125	101	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.0	138.2	131.4	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	122.3	128.4	123.7	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	7.1	7.6	6.2	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95	100	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ___ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY ______

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Western Technologies Inc.

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/05/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
67	10/05/95 N	20' LT OF CENTERLINE, STATION 9+75	1035±
68	10/05/95 N	ON CENTERLINE, STATION 12+00	1037±
69	10/05/95 N	70' RT OF CENTERLINE, STATION 17+25	1034±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
67	7.5	128.5	4.1	121.6	95	YES
68	7.5	128.5	7.3	124.6	97	YES
69	7.5	128.5	5.7	122.0	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 10-5-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2535 (2) H_2O 672

Test Hole No.		67	68	69	
Horizontal Location of Test Hole		STA. 9+75 20' LT ℄	STA. 12+00 ON ℄	STA. 17+25 70' RT ℄	
Vertical Distance From Elevation Datum, ft. †		1035±	1037±	1034±	
Depth of Fill					
DENSITY	Probe Depth	8"	8"	8"	
	Counts	1471	1211	1379	
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	73	119	95	
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		126.6	133.7	129.0	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		121.6	124.6	122.0	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		4.1	7.3	5.7	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		95	97	95	
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-09-95
Job No. 2745JC249

Event/Invoice No. 27450527-14
Authorized By KEN SMITH Date 10-05-95
Tested By P. LLEWELLYN/WT Date 10-05-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
374		5.9	123.7	0.0	2	128.5	7.5	96		95	YES
375		6.2	124.8	0.0	2	128.5	7.5	97		95	YES
376		6.8	124.4	0.0	2	128.5	7.5	97		95	YES
377		6.0	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
374	STA. 11+50, 150' LEFT OF CENTERLINE	43.0	1037.0	SUBBASE FILL
375	STA. 12+50, 50' LEFT OF CENTERLINE	39.0	1036.0	SUBBASE FILL
376	STA. 16+50, 175' LEFT OF CENTERLINE	12.0	1014.0	SUBBASE FILL
377	STA. 17+50, 200' LEFT OF CENTERLINE	10.0	1017.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

RECEIVED
OCT 11 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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The Quality People
Since 1955

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(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **10-09-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450527-13**
Authorized By **KEN SMITH** Date **10-05-95**
Tested By **P. LLEWELLYN/WT** Date **10-05-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
366		7.2	123.0	0.0	2	128.5	7.5	96		95	YES
367		6.5	123.6	0.0	2	128.5	7.5	96		95	YES
368		6.8	124.4	0.0	2	128.5	7.5	97		95	YES
369		6.0	122.5	0.0	2	128.5	7.5	95		95	YES
370		6.3	124.9	0.0	2	128.5	7.5	97		95	YES
371		5.9	122.6	0.0	2	128.5	7.5	95		95	YES
372		6.0	123.2	0.0	2	128.5	7.5	96		95	YES
373		6.2	123.3	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
366	STA. 12+00, 100' RIGHT OF CENTERLINE	37.0	1034.0	SUBBASE FILL
367	STA. 15+00, 75' RIGHT OF CENTERLINE	39.0	1033.0	SUBBASE FILL
368	STA. 11+50, 125' LEFT OF CENTERLINE	41.0	1035.0	SUBBASE FILL
369	STA. 13+50, 100' LEFT OF CENTERLINE	37.0	1031.0	SUBBASE FILL
370	STA. 16+15, 175' LEFT OF CENTERLINE	11.0	1011.0	SUBBASE FILL
371	STA. 17+00, 125' LEFT OF CENTERLINE	9.0	1013.0	SUBBASE FILL
372	STA. 16+50, 200' LEFT OF CENTERLINE	10.0	1012.0	SUBBASE FILL
373	STA. 17+50, 150' LEFT OF CENTERLINE	9.0	1016.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * **DATUM TOPOGRAPHIC**

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GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/04/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
65	10/04/95 N	100' RT OF CENTERLINE, STATION 10+00	1030±
66	10/04/95 N	50' RT OF CENTERLINE, STATION 14+00	1030±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
65	7.5	128.5	5.4	121.5	95	YES
66	7.5	128.5	5.8	122.2	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ________

Visual Soil Classification per ASTM D2488 ________

Job No. ________ Page ____ of ____

Event / Invoice No. ________ Lab No. ________

Authorized By ________ Date ________

Tested By WHT Date 10-4-95

Test Locations Designated By ________ Date ________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2530 (2) H_2O 679

Test Hole No.		65	66		
Horizontal Location of Test Hole		STA. 10+00 100' RT ℄	STA. 11+00 50' RT ℄	STA. 10+90 30' LT. ℄	
Vertical Distance From Elevation Datum, ft. †		1030±	1030±	1035±	
Depth of Fill					
DENSITY	Probe Depth	8"	8"	8"	
	Counts	1406	1360		
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	92	98		
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		128.1	129.3		
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		121.5	122.2		
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		5.4	5.8		
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		95	95		
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ________
20. ________

† Datum ________

REVIEWED BY ________

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-05-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-12
Authorized By KEN SMITH Date 10-04-95
Tested By P. LLEWELLYN/WT Date 10-04-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
358		5.0	123.6	0.0	2	128.5	7.5	96		95	YES
359		5.8	123.1	0.0	2	128.5	7.5	96		95	YES
360		6.0	124.8	0.0	2	128.5	7.5	97		95	YES
361		5.4	122.5	0.0	2	128.5	7.5	95		95	YES
362		5.4	121.9	0.0	2	128.5	7.5	95		95	YES
363		5.5	123.7	0.0	2	128.5	7.5	96		95	YES
364		5.9	123.1	0.0	2	128.5	7.5	96		95	YES
365		6.3	122.5	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
358	STA. 12+00, 150' RIGHT OF CENTERLINE	39.0	1032.0	SUBBASE FILL
359	STA. 14+50, 100' RIGHT OF CENTERLINE	34.0	1026.0	SUBBASE FILL
360	STA. 18+00, 230' RIGHT OF CENTERLINE	7.0	1016.0	SUBBASE FILL
361	STA. 11+50, 150' LEFT OF CENTERLINE	35.0	1033.0	SUBBASE FILL
362	STA. 13+50, 100' LEFT OF CENTERLINE	35.0	1030.0	SUBBASE FILL
363	STA. 16+00, 200' LEFT OF CENTERLINE	8.0	1007.0	SUBBASE FILL
364	STA. 16+50, 220' LEFT OF CENTERLINE	7.0	1009.0	SUBBASE FILL
365	STA. 17+50, 175' LEFT OF CENTERLINE	8.0	1015.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * DATUM TOPOGRAPHIC
B1#9

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(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/03/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
63	10/03/95 N	75' RT OF CENTERLINE, STATION 14+00	1038±
64	10/03/95 N	75' RT OF CENTERLINE, STATION 10+00	1035±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
63	7.5	128.5	6.2	127.3	99	YES
64	7.5	128.5	4.3	121.6	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 10-3-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2538 (2) H_20 650

Test Hole No.		63	64		
Horizontal Location of Test Hole		STA. 14+00 75' RT ℄	STA. 10+00 76' RT ℄		
Vertical Distance From Elevation Datum, ft. †		1038±	1033±		
Depth of Fill					
DENSITY	Probe Depth	8"	8"		
	Counts	1168	1464		
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	102	73		
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf/cu. ft. from Calibration Chart or Readout		135.2	126.8		
(6) Water, lbf/cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5		
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5		
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		127.3	121.6		
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		6.2	4.3		
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		99	95		
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **10-05-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450527-11**
Authorized By **KEN SMITH** Date **10-03-95**
Tested By **P. LLEWELLYN/WT** Date **10-03-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
352		6.0	123.7	0.0	2	128.5	7.5	96		95	YES
353		5.8	122.6	0.0	2	128.5	7.5	95		95	YES
354		5.2	122.2	0.0	2	128.5	7.5	95		95	YES
355		6.3	124.3	0.0	2	128.5	7.5	97		95	YES
356		5.9	122.4	0.0	2	128.5	7.5	95		95	YES
357		6.2	123.1	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
352	STA. 12+00, 150' RIGHT OF CENTERLINE	37.0	1030.0	SUBBASE FILL
353	STA. 11+50, 100' LEFT OF CENTERLINE	35.0	1033.0	SUBBASE FILL
354	STA. 16+15, 75' LEFT OF CENTERLINE	5.0	1005.0	SUBBASE FILL
355	STA. 16+50, 175' LEFT OF CENTERLINE	5.0	1007.0	SUBBASE FILL
356	STA. 16+15, 170' LEFT OF CENTERLINE	7.0	1007.0	SUBBASE FILL
357	STA. 17+50, 200' LEFT OF CENTERLINE	7.0	1014.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

RECEIVED
OCT 6 1995
GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **10/02/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
61	10/02/95 N	70' RT OF CENTERLINE, STATION 14+00	1028±
62	10/02/95 N	70' RT OF CENTERLINE, STATION 11+00	1025±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	IN-PLACE CHARACTERISTICS DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
61	7.5	128.5	3.7	122.0	95	YES
62	7.5	128.5	6.3	121.3	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____

Visual Soil Classification per ASTM D2488 ____

Job No. ____ Page ___ of ___

Event/Invoice No. ____ Lab No. ____

Authorized By ____ Date ____

Tested By WHT Date 10-2-95

Test Locations Designated By ____ Date ____

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2517 (2) H_2O 677

Test Hole No.	61	62		
Horizontal Location of Test Hole	STA. 14+00 70' RT ℄	STA. 11+00 70' RT ℄		
Vertical Distance From Elevation Datum, ft. †	1028±	1025±		
Depth of Fill				
DENSITY – Probe Depth	8"	8"		
DENSITY – Counts	1463	1356		
DENSITY – (3) Count Average				
DENSITY – Density Ratio				
MOISTURE – Counts	69	104		
MOISTURE – (4) Count Average				
MOISTURE – Moisture Ratio				
(5) Wet Unit Weight, lbf/cu. ft. from Calibration Chart or Readout	126.5	129.2		
(6) Water, lbf/cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5		
Maximum Dry Unit Weight (Lab), lbf/cu. ft.	128.5	128.5		
(9) Corrected Maximum Dry Unit Weight, lbf/cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf/cu. ft. Readout or (5) – (6)	122.0	121.3		
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	3.7	6.3		
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95	95		
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____
20. ____

† Datum ____

REVIEWED BY ____

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-05-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-10
Authorized By KEN SMITH Date 10-02-95
Tested By P. LLEWELLYN/WT Date 10-02-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
348		5.8	122.9	0.0	2	128.5	7.5	96		95	YES
349		6.2	122.3	0.0	2	128.5	7.5	95		95	YES
350		6.0	123.1	0.0	2	128.5	7.5	96		95	YES
351		6.6	123.6	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
348	STA. 12+00, 150' LEFT OF CENTERLINE 135?	~~39.0~~	1036.0	SUBBASE FILL
349	STA. 16+50, 75' LEFT OF CENTERLINE	14.0	1016.6	SUBBASE FILL
350	STA. 11+00, 100' LEFT OF CENTERLINE	42.0	1038.0	SUBBASE FILL
351	STA. 14+50, 125' LEFT OF CENTERLINE	34.0	1032.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * **DATUM TOPOGRAPHIC**
B149

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OCT 6 1995
GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/29/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
58	09/29/95 N	110' LT OF CENTERLINE, STATION 11+50	1018±
59	09/29/95 N	15' RT OF CENTERLINE, STATION 10+50	1025±
60	09/29/95 N	10' RT OF CENTERLINE, STATION 15+50	1017±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
58	7.5	128.5	3.8	122.0	95	YES
59	7.5	128.5	4.4	122.7	95	YES
60	7.5	128.5	4.4	123.7	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

Job No. ______ Page 1 of 1

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event/Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 9-29-95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2552 (2) H_2O 670

Test Hole No.	58	59	60	
Horizontal Location of Test Hole	STA. 11+50 110' LT ℄	STA. 10+50 15' RT ℄	STA. 15+50 10' RT ℄	
Vertical Distance From Elevation Datum, ft. †	1018±	1025±	1017±	
Depth of Fill				
DENSITY — Probe Depth	8"	8'	8"	
DENSITY — Counts	1481	1419	1381	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	69	77	78	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	126.6	128.1	129.1	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	122.0	122.7	123.7	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	3.8	4.4	4.4	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95	95	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data:
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-02-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-9
Authorized By KEN SMITH Date 09-27-95
Tested By P. LLEWELLYN/WT Date 09-29-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
344		9.0	122.4	0.0	2	128.5	7.5	95		95	YES
345		7.8	121.9	0.0	2	128.5	7.5	95		95	YES
346		8.4	122.8	0.0	2	128.5	7.5	96		95	YES
347		7.2	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
344	STA. 16+50, 200' LEFT OF CENTERLINE	5.0	1007.0	SUBBASE FILL
345	STA. 11+50, 200' LEFT OF CENTERLINE	32.0	1030.0	SUBBASE FILL
346	STA. 10+50, 100' LEFT OF CENTERLINE	29.0	1027.0	SUBBASE FILL
347	STA. 14+00, 150' LEFT OF CENTERLINE	30.0	1022.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9, 344-347
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/4/95
MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/28/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
55	09/28/95 N	10' LT OF CENTERLINE, STATION 14+00	1020±
56	09/28/95 N	10' LT OF CENTERLINE, STATION 14+00-**RETEST 55**	1020±
57	09/28/95 N	ON CENTERLINE, STATION 10+50	1020±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
55	7.5	128.5	9.7	120.8	94	NO
56	7.5	128.5	9.3	121.5	95	YES
57	7.5	128.5	7.7	123.1	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page 1 of 8

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WNT Date 9-28-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2504 (2) H_2O 664

Test Hole No.	55	56	57	#
Horizontal Location of Test Hole	STA. 14+00 10' LT ℄	RETEST	STA 10+70 ON ℄	STA. 16+50 200' LT ℄
Vertical Distance From Elevation Datum, ft. †	1020±	1020±	1020	995±
Depth of Fill				
DENSITY Probe Depth	8"	8"	8"	8"
DENSITY Counts	1230	1226	1229	
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts	146	141	121	
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	132.5	132.8	132.6	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	120.8	121.5	123.1	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	9.7	9.3	7.7	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	94	95	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 10-02-95
Job No. 2745JC249
Event/Invoice No. 27450527-8
Authorized By KEN SMITH Date 09-28-95
Tested By P. LLEWELLYN/WT Date 09-29-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
335		6.0	122.6	0.0	2	128.5	7.5	95		95	YES
336		5.8	123.5	0.0	2	128.5	7.5	96		95	YES
337		6.3	122.3	0.0	2	128.5	7.5	95		95	YES
338		6.7	122.8	0.0	2	128.5	7.5	96		95	YES
339		5.8	122.5	0.0	2	128.5	7.5	95		95	YES
340		6.7	122.1	0.0	2	128.5	7.5	95		95	YES
341		3.1	130.9	0.0	3	137.4	1.0	95		90 ~~95~~	YES
342		2.8	130.5	0.0	3	137.4	1.0	95		90 ~~95~~	YES
343		3.5	132.5	0.0	3	137.4	1.0	96		90 ~~95~~	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	TEST LOCATION, VERTICAL: Elevation *	MATERIAL TESTED
335	STA. 10+25, 200' LEFT OF CENTERLINE	27.0	1019.0	SUBBASE FILL
336	STA. 11+00, 150' LEFT OF CENTERLINE	29.0	1022.0	SUBBASE FILL
337	STA. 12+50, 50' LEFT OF CENTERLINE	28.0	1021.0	SUBBASE FILL
338	STA. 14+50, 100' LEFT OF CENTERLINE	20.0	1017.0	SUBBASE FILL
339	STA. 16+00, 100' LEFT OF CENTERLINE	5.0	1009.0	SUBBASE FILL
340	STA. 17+50, 100' LEFT OF CENTERLINE	3.5	1012.0	SUBBASE FILL
341	STA. 16+15, 160' LEFT OF CENTERLINE, DRAIN ROCK	3.0	1003.0	SUBBASE FILL
342	STA. 16+50, 200' LEFT OF CENTERLINE, DRAIN ROCK	3.0	1005.0	SUBBASE FILL
343	STA. 17+50, 175' LEFT OF CENTERLINE, DRAIN ROCK	3.0	1010.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #9, 335-340, BID #10, 341-343
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/4/95
RSP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/27/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
51	09/27/95 N	50' LT OF CENTERLINE, STATION 15+30	1004±
52	09/27/95 N	70' LT OF CENTERLINE, STATION 10+50	1020±
53	09/27/95 N	30' LT OF CENTERLINE, STATION 14+50	1015±
54	09/27/95 N	200' LT OF CENTERLINE, STATION 10+25	1019±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
51	7.5	128.5	9.3	122.8	96	YES
52	7.5	128.5	5.2	121.7	95	YES
53	7.5	128.5	7.3	122.4	95	YES
54	7.5	128.5	3.7	118.5	92	NO

TEST # 54
IS RETESTED
WT I # 335

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS — Job No. ______ Page ___ of ___

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 9.27.95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2519 (2) H_2O 683

Test Hole No.	51	52	53	54
Horizontal Location of Test Hole	STA. 15+30 50' LT. ℄	STA. 10+50 70' LT ℄	STA. 14+50 30' LT ℄	STA. 10+25 200' LT ℄
Vertical Distance From Elevation Datum, ft. †	1004±	1020±	1015±	1019±
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	8"
DENSITY — Counts	1184	1404	1283	1615
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	147	89	119	68
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	134.2	128.0	131.3	122.9
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	122.8	121.7	122.4	118.5
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	9.3	5.2	7.3	3.7
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	96	95	95	92
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ___ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☒ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-28-95
Job No. 2745JC249

Event/Invoice No. 27450527-7
Authorized By KEN SMITH Date 09-27-95
Tested By P. LLEWELLYN/WT Date 09-27-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
318		6.0	124.4	0.0	2	128.5	7.5	97		95	YES
319		5.4	122.9	0.0	2	128.5	7.5	96		95	YES
320		5.1	123.4	0.0	2	128.5	7.5	96		95	YES
321		5.8	122.5	0.0	2	128.5	7.5	95		95	YES
322		2.7	133.5	0.0	3	137.4	1.0	97		90 ~~95~~	YES
323		3.9	131.0	0.0	3	137.4	1.0	95		~~95~~	YES
324		3.5	131.9	0.0	3	137.4	1.0	96		~~95~~	YES
325		4.1	130.6	0.0	3	137.4	1.0	95		~~95~~	YES
326		6.0	122.5	0.0	2	128.5	7.5	95		95	YES
327		7.1	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
318	STA. 15+25, 75' LEFT OF CENTERLINE	4.0	998.0	SUBBASE FILL
319	STA. 15+60, 130' LEFT OF CENTERLINE	7.0	999.0	SUBBASE FILL
320	STA. 15+45, 80' LEFT OF CENTERLINE	7.0	1001.0	SUBBASE FILL
321	STA. 15+65, 125' LEFT OF CENTERLINE	9.0	1001.0	SUBBASE FILL
322	STA. 15+50, 140' LEFT OF CENTERLINE, DRAIN ROCK	4.0	996.0	SUBBASE FILL
323	STA. 16+15, 160' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1002.0	SUBBASE FILL
324	STA. 16+50, 200' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1004.0	SUBBASE FILL
325	STA. 17+50, 175' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1009.0	SUBBASE FILL
326	STA. 11+00, 50' LEFT OF CENTERLINE	28.0	1019.0	SUBBASE FILL
327	STA. 12+50, 200' LEFT OF CENTERLINE	24.0	1017.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: **BID #9, 318-321, 326-333, BID #10,322-325 & 334**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-28-95
Job No. 2745JC249
Event/Invoice No. 27450527-7
Authorized By KEN SMITH Date 09-27-95
Tested By P. LLEWELLYN/WT Date 09-27-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
328		6.8	122.6	0.0	2	128.5	7.5	95		95	YES
329		5.9	123.7	0.0	2	128.5	7.5	96		95	YES
330		5.4	123.5	0.0	2	128.5	7.5	96		95	YES
331		6.1	122.6	0.0	2	128.5	7.5	95		95	YES
332		5.4	122.5	0.0	2	128.5	7.5	95		95	YES
333		5.0	121.9	0.0	2	128.5	7.5	95		95	YES
334		3.0	132.2	0.0	3	137.4	1.0	96		90 ~~95~~	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
328	STA. 14+00, 100' LEFT OF CENTERLINE	18.0	1014.0	SUBBASE FILL
329	STA. 11+50, 100' LEFT OF CENTERLINE	27.0	1019.0	SUBBASE FILL
330	STA. 12+50, 150' LEFT OF CENTERLINE	24.0	1017.0	SUBBASE FILL
331	STA. 14+60, 75' LEFT OF CENTERLINE	16.0	1013.0	SUBBASE FILL
332	STA. 15+30, 80' LEFT OF CENTERLINE	10.0	1004.0	SUBBASE FILL
333	STA. 15+60, 125' LEFT OF CENTERLINE	11.0	1003.0	SUBBASE FILL
334	STA. 16+75, 75' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1006.6	SUBBASE FILL

Comments: **BID #9, 318-321, 326-333, BID #10,322-325 & 334**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MOP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/26/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
48	09/26/95 N	20' LT OF CENTERLINE, STATION 13+75±	1016±
49	09/26/95 N	250' LT OF CENTERLINE, STATION 12+10, CORNER RETEST 45	1016±
50	09/26/95 N	240' LT OF CENTERLINE, STATION 12+10, CORNER	1017±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
48	7.5	128.5	7.8	123.6	96	YES
49	7.5	128.5	5.3	123.7	96	YES
50	7.5	128.5	3.6	123.4	96	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 9-26-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2513 (2) H_2O 674

Test Hole No.	48	49	50	
Horizontal Location of Test Hole	STA. 13+75 20' LT. ℄	STA. 12+10 250' LT. ℄ CORNER	STA. 12+10 240' LT ℄ CORNER	
Vertical Distance From Elevation Datum, ft. †	1016±	1016±	1017±	
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	
DENSITY — Counts	1214	1316	1413	
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	125	91	67	
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	133.2	130.3	127.8	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	123.6	123.7	123.4	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	7.8	5.3	3.6	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	96	96	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY [signature]

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-28-95
Job No. 2745JC249
Event/Invoice No. 27450527-6
Authorized By KEN SMITH Date 09-26-95
Tested By P. LLEWELLYN/WT Date 09-26-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
313		6.0	124.8	0.0	2	128.5	7.5	97		95	YES
314		5.9	122.5	0.0	2	128.5	7.5	95		95	YES
315		6.6	123.1	0.0	2	128.5	7.5	96		95	YES
316		6.3	122.8	0.0	2	128.5	7.5	96		95	YES
317		6.2	122.7	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
313	STA. 14+50, 50' LEFT OF CENTERLINE	13.0	1011.0	SUBBASE FILL
314	STA. 12+60, 240' LEFT OF CENTERLINE	14.0	1011.0	SUBBASE FILL
315	STA. 10+50, 150' LEFT OF CENTERLINE	23.0	1015.0	SUBBASE FILL
316	STA. 11+50, 100' LEFT OF CENTERLINE	25.0	1017.0	SUBBASE FILL
317	STA. 12+00, 230' LEFT OF CENTERLINE	25.0	1013.5	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
IMP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/25/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
44	09/25/95 N	50' LT OF CENTERLINE, STATION 13+90	1014±
45	09/25/95 N	CORNER, 250' LT OF CENTERLINE, STATION 12+00	1013±
46	09/25/95 N	230' LT OF CENTERLINE, STATION 10+50	1015±
47	09/25/95 N	230' LT OF CENTERLINE, STATION 10+50-**RETEST 46**	1015±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
44	7.5	128.5	7.7	124.0	97	YES
45	7.5	128.5	4.6	115.7	90	NO
46	7.5	128.5	10.2	120.6	94	NO
47	7.5	128.5	9.8	121.9	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____________

Visual Soil Classification per ASTM D2488 ____________

Job No. ____________ Page ____ of ____

Event / Invoice No. ____________ Lab No. ____________

Authorized By ____________ Date ____________

Tested By WHT Date 9.25.95

Test Locations Designated By ____________ Date ____________

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2512 (2) H_2O 664

Test Hole No.	44	45	46	47
Horizontal Location of Test Hole	STA. 13+90 50' LT. ℄	STA. 12+00 250' LT. ℄ CORNER	STA. 10+50 230' LT. ℄	STA 10+50 230' LT ℄ RETEST
Vertical Distance From Elevation Datum, ft. †	1014±	1013±	1016±	1016±
Depth of Fill				
DENSITY Probe Depth	8"	8"	8"	8
DENSITY Counts	1203	1697	1221	1689
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts	122	76	152	148
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	133.6	121.0	132.9	133.9
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	124.0	115.7	120.6	121.9
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	7.7	4.6	10.2	9.8
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	97	90	94	95
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____________
20. ____________

† Datum ____________

REVIEWED BY ____________

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **09-28-95**
Job No. **2745JC249**

Event/Invoice No. **27450527-5**
Authorized By **KEN SMITH** Date **09-25-95**
Tested By **P. LLEWELLYN/WT** Date **09-25-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
301		2.9	130.9	0.0	3	137.4	1.0	95		90 ~~95~~	YES
302		4.3	132.3	0.0	3	137.4	1.0	96		90 ~~95~~	YES
303		3.9	131.2	0.0	3	137.4	1.0	95		90 ~~95~~	YES
304		4.8	131.5	0.0	3	137.4	1.0	96		90 ~~95~~	YES
305		5.3	122.5	0.0	2	128.5	7.5	95		95	YES
306		6.0	122.9	0.0	2	128.5	7.5	96		95	YES
307		4.9	123.0	0.0	2	128.5	7.5	96		95	YES
308		6.2	122.6	0.0	2	128.5	7.5	95		95	YES
309		6.0	122.2	0.0	2	128.5	7.5	95		95	YES
310		6.3	122.6	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
301	STA. 15+50, 130' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	996.0	SUBBASE FILL
302	STA. 15+30, 75' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	994.0	SUBBASE FILL
303	STA. 15+60, 120' LEFT OF CENTERLINE, BLANKET DRAIN	4.0	996.0	SUBBASE FILL
304	STA. 15+50, 125' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	996.0	SUBBASE FILL
305	STA. 15+50, 130' LEFT OF CENTERLINE		992.0	SUBGRADE
306	STA. 16+15, 150' LEFT OF CENTERLINE		1000.0	SUBGRADE
307	STA. 16+50, 175' LEFT OF CENTERLINE		1002.0	SUBGRADE
308	STA. 17+00, 150' LEFT OF CENTERLINE		1004.0	SUBGRADE
309	STA. 10+00, 100' LEFT OF CENTERLINE	29.0	1021.0	SUBBASE FILL
310	STA. 12+00, 200' LEFT OF CENTERLINE	22.0	1016.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #6, 305-308, BID #9, 309-312, BID #10, 301-304**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MMP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**

Western Technologies Inc.
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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report **09-28-95**
Job No. **2745JC249**

Event/Invoice No. **27450527-5**
Authorized By **KEN SMITH** Date **09-25-95**
Tested By **P. LLEWELLYN/WT** Date **09-25-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3G50 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
311		5.8	122.0	0.0	2	128.5	7.5	95		95	YES
312		5.3	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
311	STA. 13+00, 150' LEFT OF CENTERLINE	23.0	1012.0	SUBBASE FILL
312	STA. 14+50, 100' LEFT OF CENTERLINE	19.0	1009.0	SUBBASE FILL

Comments: **BID #6, 305-308, BID #9, 309-312, BID #10, 301-304**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95 MGT

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/22/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
40	09/22/95 N	15' LT OF CENTERLINE, STATION 13+25	1010±
41	09/22/95 N	90' LT OF CENTERLINE, STATION 13+00	1011±
42	09/22/95 N	200' LT OF CENTERLINE, STATION 11+00	1011±
43	09/22/95 N	CORNER, STATION 12+00	1010±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	IN-PLACE CHARACTERISTICS DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
40	7.5	128.5	7.5	122.9	96	YES
41	7.5	128.5	7.6	122.6	95	YES
42	7.5	128.5	6.2	123.2	96	YES
43	7.5	128.5	8.0	122.2	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 9-22-95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight ~~2532~~ 2525 (2) H_2O ~~678~~ 679

Test Hole No.	40	41	42	43
Horizontal Location of Test Hole	STA. 13+25 15' LT ℄	STA. 13+00 90' LT. ℄	STA. 11+00 200' LT ℄	STA. 12+00 CORNER
Vertical Distance From Elevation Datum, ft. †	1010±	1011±	1011±	1010±
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	8"
DENSITY — Counts	1257	1263	1305	~~1320~~ 1260
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts	121	122	103	127
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	132.1	131.9	130.8	132.0
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	122.9	122.6	123.2	122.2
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	7.5	7.6	6.2	8.0
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	96	95	96	95
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ___ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY [signature]

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-26-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-4
Authorized By KEN SMITH Date 09-22-95
Tested By P. LLEWELLYN/WT Date 09-22-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3087 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
297		7.1	122.2	0.0	2	128.5	7.5	95		95	YES
298		6.3	123.7	0.0	2	128.5	7.5	96		95	YES
299		6.9	122.8	0.0	2	128.5	7.5	96		95	YES
300		5.8	122.5	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
297	STA. 13+50, 125' LEFT OF CENTERLINE	23.0	1012.0	SUBBASE FILL
298	STA. 11+00, 100' LEFT OF CENTERLINE	24.0	1015.0	SUBBASE FILL
299	STA. 12+50, 200' LEFT OF CENTERLINE	20.0	1013.0	SUBBASE FILL
300	STA. 10+00, 50' LEFT OF CENTERLINE	26.0	1020.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

RL'd
9/28/95
MKP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-26-95
Job No. 2745JC249
Event/Invoice No. 27450527-3
Authorized By KEN SMITH Date 09-21-95
Tested By P. LLEWELLYN/WT Date 09-21-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
291		5.2	123.0	0.0	2	128.5	7.5	96		95	YES
292		5.0	122.5	0.0	2	128.5	7.5	95		95	YES
293		5.5	123.7	0.0	2	128.5	7.5	96		95	YES
294		4.9	124.9	0.0	2	128.5	7.5	97		95	YES
295		3.8	130.4	0.0	3	137.4	1.0	95		90 ~~95~~	YES
296		4.1	130.9	0.0	3	137.4	1.0	95		96 ~~95~~	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
291	STA. 10+00, 125' LEFT OF CENTERLINE	26.0	1019.0	SUBBASE FILL
292	STA. 11+50, 200' LEFT OF CENTERLINE	25.0	1014.0	SUBBASE FILL
293	STA. 12+50, 75' LEFT OF CENTERLINE	20.0	1009.0	SUBBASE FILL
294	STA. 14+00, 150' LEFT OF CENTERLINE	15.0	1004.0	SUBBASE FILL
295	STA. 15+00, 250' LEFT OF CENTERLINE, STRIP DRAINS	2.0	991.0	SUBBASE FILL
296	STA. 15+50, 225' LEFT OF CENTERLINE, STRIP DRAINS	2.0	991.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #9, 291-294, BID #10, 295 & 296
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/28/95 MAF

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/20/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
36	09/20/95 N	150' LT OF CENTERLINE, STATION 14+25	998±
37	09/20/95 N	70' LT OF CENTERLINE, STATION 13+50	999±
38	09/20/95 N	250' LT OF CENTERLINE, STATION 12+50-CORNER	1010±
39	09/20/95 N	230' LT OF CENTERLINE, STATION 11+50	1012±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
36	7.5	128.5	10.2	122.9	96	YES
37	7.5	128.5	6.9	125.3	93	YES
38	7.5	128.5	7.3	125.3	98	YES
39	7.5	128.5	7.5	129.0	100	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____

Visual Soil Classification per ASTM D2488 ____

Job No. ____ Page ___ of ___

Event / Invoice No. ____ Lab No. ____

Authorized By ____ Date ____

Tested By WHT Date 9.20.95

Test Locations Designated By ____ Date ____

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2549 (2) H_20 663

Test Hole No.		36	37	38	39
Horizontal Location of Test Hole		STA. 14+25 150' LT. ℄	STA. 13+50 70' LT. ℄	STA. 12+50 250' LT ℄ CORNER	STA. 11+50 230' LT ℄
Vertical Distance From Elevation Datum, ft. †		998±	999±	1010±	1012±
Depth of Fill					
DENSITY	Probe Depth	8"	8"	8"	8"
	Counts	1158	1210	1193	1071
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	155	112	117	124
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		135.5	134.0	134.5	138.7
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		122.9	123.3	125.3	129.0
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		10.2	6.9	7.3	7.5
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		96	98	98	100
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____
20. ____

† Datum ____

REVIEWED BY KB

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-27-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-2
Authorized By KEN SMITH Date 09-20-95
Tested By P. LLEWELLYN/WT Date 09-20-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA REVISED REPORT: 09/28/95
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS: Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	LAB CHARACTERISTICS: ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	COMPACTION: % of Maximum Dry Unit Weight	REQUIREMENTS: Moisture %	Compaction %	CONFORMANCE INDICATED
285		4.2	130.9	0.0	3	137.4	1.0	95		95	YES
286		3.8	133.0	0.0	3	137.4	1.0	97		95	YES
287		6.4	124.1	0.0	2	128.5	7.5	97		95	YES
288		4.1	122.9	0.0	2	128.5	7.5	96		95	YES
289		5.0	122.6	0.0	2	128.5	7.5	95		95	YES
290		6.2	123.5	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	Elevation *	MATERIAL TESTED
285	STA. 13+50, 75' LEFT OF CENTERLINE	2.0	996.0	SUBBASE FILL
286	STA. 14+00, 120' LEFT OF CENTERLINE	2.0	994.0	SUBBASE FILL
287	STA. 10+00, 100' RIGHT OF CENTERLINE	27.0	1030.0	SUBBASE FILL
288	STA. 13+50, 80' LEFT OF CENTERLINE	4.0	998.0	SUBBASE FILL
289	STA. 14+50, 150' RIGHT OF CENTERLINE	24.0	1031.0	SUBBASE FILL
290	STA. 16+50, 50' RIGHT OF CENTERLINE	14.0	1027.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9, 287-290, BID #10, 285 & 286
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/29/95 MLP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

Greiner

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/19/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
32	09/19/95 N	30' RT OF CENTERLINE, STATION 12+00	1017±
33	09/19/95 N	50' RT OF CENTERLINE, STATION 17+00	1016±
34	09/19/95 N	60' RT OF CENTERLINE, STATION 9+50	1018±
35	09/19/95 N	60' RT OF CENTERLINE, STATION 9+50-**RETEST 34**	1018±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
32	7.5	128.5	3.4	121.5	95	YES
33	7.5	128.5	6.9	124.7	97	YES
34	7.5	128.5	3.5	118.6	92	NO
35	7.5	128.5	2.8	116.7	90	NO

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

Job No. ______ Page ___ of ___

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 9-19-95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2506 (2) H_2O 680

Test Hole No.		32	33	34	35
Horizontal Location of Test Hole		STA 12+00 30' RT ℄	STA. 11+00 50' RT ℄	STA. 9+80 60' RT. ℄	STA 9+90 60' RT ℄ RETEST
Vertical Distance From Elevation Datum, ft. †		1017±	1016±	1018±	1018±
Depth of Fill		8"	8"	8"	8"
DENSITY	Probe Depth				
	Counts		1210	1616	1771
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts		114	65	55
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		125.6	133.3	122.7	119.4
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		121.5	124.7	118.6	116.7
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		3.4	6.9	3.5	2.8
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		95	97	92	90
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					R

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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Western Technologies Inc.

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The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-21-95
Job No. 2745JC249
Event/Invoice No. 27450527-1
Authorized By KEN SMITH Date 09-19-95
Tested By P. LLEWELLYN/WT Date 09-19-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
281		3.9	121.5	0.0	2	128.5	7.5	95		95	YES
282		5.8	122.9	0.0	2	128.5	7.5	96		95	YES
283		6.0	123.7	0.0	2	128.5	7.5	96		95	YES
284		5.2	124.4	0.0	2	128.5	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
281	RETEST 264C	15.0	1004.0	SUBBASE FILL
282	STA. 11+00, 100' RIGHT OF CENTERLINE	20.0	1026.0	SUBBASE FILL
283	STA. 14+20, 25' LEFT OF CENTERLINE	8.0	1010.0	SUBBASE FILL
284	STA. 16+50, 200' RIGHT OF CENTERLINE	11.0	1027.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: * **DATUM TOPOGRAPHIC**
B1#9.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/25/95
MNP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/18/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
27	09/18/95 N	250' LT OF CENTERLINE, STATION 12+50-**RETEST A.M.**	1008±
28	09/18/95 N	90' RT OF CENTERLINE, STATION 14+75	1017±
29	09/18/95 N	250' LT OF CENTERLINE, STATION 12+50-**RETEST 27**	1008±
30	09/18/95 N	250' LT OF CENTERLINE, STATION 12+50-**RETEST 27**	1008±
31	09/15/95 N	90' RT OF CENTERLINE, STATION 16+50	1008±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
27	7.5	128.5	7.2	118.2	92	NO
28	7.5	128.5	4.0	127.7	99	YES
29	7.5	128.5	5.1	121.1	94	NO
30	7.5	128.5	5.2	120.5	94	NO
31	7.5	128.5	8.0	124.6	97	YES

FAILING TEST
27 IS
RETESTED
WTI # 281

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

Job No. ______ Page 1 of 2

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 9-18-95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2543 (2) H_2O 674

Test Hole No.	27	28	29	30
Horizontal Location of Test Hole	STA. 12+50 250' LT. ℄	STA. 14+75 90' RT. ℄	STA. 12+50 250' LT. ℄	STA. 12+00 250' LT ℄
Vertical Distance From Elevation Datum, ft. †	1008 ±	1017 ±	1008 ±	1008 ±
Depth of Fill				
DENSITY Probe Depth	8"	8"	8"	8"
DENSITY Counts	1461	1249	1443	1465
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts	111	75	86	88
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	126.7	132.8	127.3	126.8
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	118.2	127.7	121.1	120.5
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	7.2	4.0	5.1	5.2
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	92	99	94	94
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*	RETEST AM		RETEST	RETEST

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS — Job No. ______ Page 2 of 2

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 9.18.95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2543 (2) H_2O 674

Test Hole No.		31			
Horizontal Location of Test Hole		STA. 16+50 90' RT ℄			
Vertical Distance From Elevation Datum, ft. †		1008±			
Depth of Fill					
DENSITY	Probe Depth	8"			
	Counts	1186			
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	129			
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		134.6			
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5			
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5			
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		124.6			
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		8.0			
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		97			
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **09-21-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450527**
Authorized By **KEN SMITH** Date **09-18-95**
Tested By **P. LLEWELLYN/WT** Date **09-18-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3069** H_2O **617**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
275		2.9	119.1	0.0	2	128.5	7.5	93		95	NO
276		3.6	119.8	0.0	2	128.5	7.5	93		95	NO
277		5.1	123.0	0.0	2	128.5	7.5	96		95	YES
278		6.0	122.5	0.0	2	128.5	7.5	95		95	YES
279		5.6	122.9	0.0	2	128.5	7.5	96		95	YES
280		3.4	121.5	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
275	RETEST 264A	15.0	1004.0	SUBBASE FILL
276	RETEST 264B	15.0	1004.0	SUBBASE FILL
277	STA. 11+50, 175' RIGHT OF CENTERLINE	19.0	1024.0	SUBBASE FILL
278	STA. 14+00, 200' RIGHT OF CENTERLINE	20.0	1028.0	SUBBASE FILL
279	STA. 17+00, 50' RIGHT OF CENTERLINE	7.0	1025.0	SUBBASE FILL
280	STA. 14+20, 75' RIGHT OF CENTERLINE	20.0	1022.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/25/95
MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/15/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
23	09/15/95 N	40' LT OF CENTERLINE, STATION 17+00	
24	09/15/95 N	70' RT OF CENTERLINE, STATION 15+40	1016±
25	09/15/95 N	100' RT OF CENTERLINE, STATION 12+00	1016±
26	09/15/95 N	50' RT OF CENTERLINE, STATION 10+50	1016±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
23	7.5	128.5	4.4	126.7	99	YES
24	7.5	128.5	9.5	123.7	96	YES
25	7.5	128.5	6.8	124.9	97	YES
26	7.5	128.5	6.3	126.4	98	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

Job No. E10042100 Page ____ of ____

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date 9·

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 9·15·95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2527 (2) H_2O 670

Test Hole No.		23	24	25	26
Horizontal Location of Test Hole		STA. 17+00 40' LT. ℄	STA. 15+40 70' RT ℄	STA. 12+00 100' RT ℄	STA 10+50 50' RT ℄
Vertical Distance From Elevation Datum, ft. †		ELEV. ~~1013±~~ 994	1016±	1016±	1016±
Depth of Fill					
DENSITY	Probe Depth	8"	8"	8"	8
	Counts	1322	1208	1278	1246
	(3) Count Average	~~1322~~	1		
	Density Ratio				
MOISTURE	Counts	92	158	123	117
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		132.3	135.4	133.4	134.4
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		126.7	123.7	124.9	126.4
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		4.4	9.5	6.8	6.3
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		99	96	97	98
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*		~~Retest Am~~			

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY ______

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Western Technologies Inc.

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The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **09-21-95**
Job No. **2745JC249**
Event/Invoice No. **27450485-21**
Authorized By **KEN SMITH** Date **09-15-95**
Tested By **C. ANDEREGG/WT** Date **09-15-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3097** H_2O **612**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
269		4.5	123.4	0.0	4	128.0	9.5	96		95	YES
270		4.3	121.2	0.0	4	128.0	9.5	95		95	YES
271		4.8	121.2	0.0	4	128.0	9.5	95		95	YES
272		8.5	122.3	0.0	4	128.0	9.5	96		95	YES
273		8.1	122.7	0.0	4	128.0	9.5	96		95	YES
274		8.0	121.9	0.0	4	128.0	9.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
269	STA. 11+00, 30' RIGHT OF CENTERLINE		1023.0	EMBANKMENT FILL
270	STA. 15+10, 180' LEFT OF CENTERLINE		1011.0	EMBANKMENT FILL
271	RETEST 270A		1012.0	EMBANKMENT FILL
272	STA. 16+50, 200' RIGHT CENTERLINE	3.0	1012.0	EMBANKMENT FILL
273	RETEST 270B	6.0	1010.0	EMBANKMENT FILL
274	OUTLET WORKS BACKFILL, STA. 3+25, LEFT OF CENTERLINE	6.0	1010.5	STRUCTURE BACKFILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
4	27450485	SAND W/GRAVEL TRACE SILT	STA. 10+50, 100' L OF CL	9.5	128.0	D1557-A

Comments: **BID ~~#6~~ 13, 274, BID #9 269-273**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/25/95
MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/14/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
19	09/14/95 N	180' RT OF CENTERLINE, STATION 13+20	1007±
20	09/14/95 N	195' RT OF CENTERLINE, STATION 15+80	1016±
21	09/14/95 N	150' RT OF CENTERLINE, STATION 10+50	1016±
22	09/14/95 N	100' RT OF CENTERLINE, STATION 15+50	1016±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
19	7.5	128.5	4.1	123.4	96	YES
20	7.5	128.5	2.8	127.7	99	YES
21	7.5	128.5	6.1	124.9	97	YES
22	7.5	128.5	3.0	125.2	97	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By WHT Date 9.14.95

Test Locations Designated By ______ Date ______

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2507 (2) H_2O 653

Test Hole No.	19	20	21	22
Horizontal Location of Test Hole	STA. 13+20 180' RT. ℄	STA. 15+80 195' RT. ℄	STA. 10+50 150' RT. ℄	STA. 15+50 100' RT. ℄
Vertical Distance From Elevation Datum, ft. †	1007±	1016±	1016±	1016±
Depth of Fill				
DENSITY — Probe Depth	8"	8"	8"	8"
DENSITY — Counts				
DENSITY — (3) Count Average				
DENSITY — Density Ratio				
MOISTURE — Counts				
MOISTURE — (4) Count Average				
MOISTURE — Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	128.5	131.3	132.5	129.0
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	123.4	127.7	124.9	125.2
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	4.1	2.8	6.1	3.0
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	96	99	97	97
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY ______

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The Quality People
Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-26-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-20
Authorized By KEN SMITH Date 09-14-95
Tested By C. ANDEREGG/WT Date 09-14-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA** **REVISED REPORT: 10/24/95**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3097** H_2O **612**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
262		2.0	117.8	0.0	2	128.5	7.5	92		95	NO
263		4.5	117.7	0.0	2	128.5	7.5	92		95	NO
264		3.1	116.4	0.0	2	128.5	7.5	91		95	NO
265		5.3	111.9	0.0	2	128.5	7.5	87		95	NO
266		2.7	121.5	0.0	2	128.5	7.5	95		95	YES
267		4.4	123.0	0.0	2	128.5	7.5	96		95	YES
268		8.2	127.3	0.0	2	128.5	7.5	99		95	YES
269		9.5	122.1	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
262	OVEREXCAVATION ROCK BLANKET, STA. 13+50, 75' L OF CL		994.0	SUBGRADE
263	OVEREXCAVATION, STA. 13+80, 30' LEFT OF CENTERLINE		998.0	SUBGRADE
264	STA. 12+70, 260' LEFT OF CENTERLINE	11.0	1000.0	EMBANKMENT FILL
265	RETEST 262A		994.0	SUBGRADE
266	RETEST 262B		994.0	SUBGRADE
267	RETEST 263A		998.0	SUBGRADE
268	STA. 16+75, 30' RIGHT OF CENTERLINE	5.0	1024.0	EMBANKMENT FILL
269	STA. 17+00, 150' LEFT OF CENTERLINE	1.5	1010.5	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #6, 262, 263, 265-267, BID #9, 264, 268, 269**
• DATUM TOPOGRAPHIC

RECEIVED
OCT 27 1995
GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

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10/6 Patsy - Please revise - need retest for #264 #2

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 09-27-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-20
Authorized By KEN SMITH Date 09-14-95
Tested By C. ANDEREGG/WT Date 09-14-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA REVISED REPORT: 09/27/95
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3097 H_2O 612

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
262		2.0	117.8	0.0	2	128.5	7.5	92		95	NO
263		4.5	117.7	0.0	2	128.5	7.5	92		95	NO
264		3.1	116.4	0.0	2	128.5	7.5	91		95	NO
265		5.3	111.9	0.0	2	128.5	7.5	87		95	NO
266		2.7	121.5	0.0	2	128.5	7.5	95		95	YES
267		4.4	123.0	0.0	2	128.5	7.5	96		95	YES
268		8.2	127.3	0.0	2	128.5	7.5	99		95	YES
269		9.5	122.1	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
262	OVEREXCAVATION ROCK BLANKET, STA. 13+50, 75' L OF CL		994.0	SUBGRADE
263	OVEREXCAVATION, STA. 13+80, 30' LEFT OF CENTERLINE		998.0	SUBGRADE
264	STA. 12+70, 260' LEFT OF CENTERLINE	11.0	1000.0	EMBANKMENT FILL
265	RETEST 262A		994.0	SUBGRADE
266	RETEST ~~265A~~ 262B		994.0	SUBGRADE
267	RETEST 263A		998.0	SUBGRADE
268	STA. 16+75, 30' RIGHT OF CENTERLINE	5.0	1024.0	EMBANKMENT FILL
269	STA. 17+00, 150' LEFT OF CENTERLINE	1.5	1010.5	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 262, 263, 265-267, BID #9, 264, 268, 269
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

Rec'd 9/29/95 MAP

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Patsy - Please ASAP

Date of Report 09-19-95
Job No. 2745JC249

Event/Invoice No. 27450485-20
Authorized By KEN SMITH Date 09-14-95
Tested By C. ANDEREGG/WT Date 09-14-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3097 H_2O 612

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
262		2.0	117.8	0.0	2	128.5	7.5	92		95	NO
263		4.5	117.7	0.0	2	128.5	7.5	92		95	NO
264		3.1	116.4	0.0	2	128.5	7.5	91		95	NO
265		5.3	111.9	0.0	2	128.5	7.5	87		95	NO
266		2.8	121.4	0.0	2	128.5	7.5	94		95	NO
267		4.4	123.0	0.0	2	128.5	7.5	96		95	YES
268		8.2	127.3	0.0	2	128.5	7.5	99		95	YES
169		9.5	122.1	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
262	OVEREXCAVATION ROCK BLANKET~~, 2ND TIER~~ 17+00, 40' LT		994.0	SUBGRADE
263	OVEREXCAVATION, STA. 13+80, 30' LEFT OF CENTERLINE		998.0	SUBGRADE
264	STA. 12+70, 260' LEFT OF CENTERLINE	11.0	1000.0	EMBANKMENT FILL
265	RETEST 262A		994.0	SUBGRADE
266	RETEST 265A		994.0	SUBGRADE
267	RETEST 263A		998.0	SUBGRADE
268	STA. 16+75, 30' RIGHT OF CENTERLINE	5.0	1024.0	EMBANKMENT FILL
169	STA. 17+00, 150' LEFT OF CENTERLINE	1.5	1010.5	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 262, 263, 265-267, BID #9, 264, 268, 269
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/13/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
16	09/13/95 N	50' RT OF CENTERLINE, STATION 18+00	1006±
17	09/13/95 N	100' RT OF CENTERLINE, STATION 15+70	1016±
18	09/13/95 N	100' RT OF CENTERLINE, STATION 18+00	1016±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
16	7.5	128.5	4.5	125.5	98	YES
17	7.5	128.5	6.7	123.5	96	YES
18	7.5	128.5	8.1	122.7	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____

Visual Soil Classification per ASTM D2488 ____

Job No. ____ Page ___ of ___

Event / Invoice No. ____ Lab No. ____

Authorized By ____ Date ____

Tested By WHT Date 9-13-95

Test Locations Designated By ____ Date ____

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2503 (2) H_2O 665

Test Hole No.	16	17	18	
Horizontal Location of Test Hole	STA 18+00 50' LT. ℄	STA. 15+70 100' RT. ℄	STA. 18+00 100' RT ℄	
Vertical Distance From Elevation Datum, ft. †	1006 ±	1016 ±	1016 ±	
Depth of Fill				
DENSITY – Probe Depth	8"	8"	8"	8"
DENSITY – Counts				
DENSITY – (3) Count Average				
DENSITY – Density Ratio				
MOISTURE – Counts				
MOISTURE – (4) Count Average				
MOISTURE – Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.1	131.8	132.6	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	125.5	123.5	122.7	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	4.5	6.7	8.1	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	98	96	95	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ____

20. ____

† Datum ____

REVIEWED BY ____

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Western Technologies Inc.

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
(FIELD DENSITY)

Date of Report 09-18-95
Job No. 2745JC249
Event/Invoice No. 27450485-19
Authorized By KEN SMITH Date 09-13-95
Tested By P. LLEWELLYN/WT Date 09-13-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3069** H_2O **617**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
248		7.0	122.6	0.0	2	128.5	7.5	95		95	YES
249		6.6	123.8	0.0	2	128.5	7.5	96		95	YES
250		5.9	124.3	0.0	2	128.5	7.5	97		95	YES
251		6.2	123.6	0.0	2	128.5	7.5	96		95	YES
252		5.3	122.5	0.0	2	128.5	7.5	95		95	YES
253		6.1	122.6	0.0	2	128.5	7.5	95		95	YES
254		6.0	123.0	0.0	2	128.5	7.5	96		95	YES
255		5.6	123.4	0.0	2	128.5	7.5	96		95	YES
256		5.8	124.4	0.0	2	128.5	7.5	97		95	YES
257		6.2	123.1	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
248	STA. 16+00, 10' LEFT OF CENTERLINE	3.0	1006.0	SUBBASE FILL
249	STA. 16+50, 200' RIGHT OF CENTERLINE	2.0	1016.0	SUBBASE FILL
250	STA. 2+50, 15' RIGHT OF OUTLET WORKS CENTERLINE	2.0	1000.5	SUBBASE FILL
251	STA. 3+25, 15' RIGHT OF OUTLET WORKS CENTERLINE	3.5	1000.5	SUBBASE FILL
252	STA. 3+00, 15' LEFT OF OUTLET WORKS CENTERLINE	3.0	1000.5	SUBBASE FILL
253	STA. 3+25, 15' LEFT OF OUTLET WORKS CENTERLINE	3.0	1000.0	SUBBASE FILL
254	STA. 2+75, 15' RIGHT OF OUTLET WORKS CENTERLINE	4.5	1002.5	SUBBASE FILL
255	STA. 3+25, 15' RIGHT OF OUTLET WORKS CENTERLINE	4.5	1001.5	SUBBASE FILL
256	STA. 2+75, 15' LEFT OF OUTLET WORKS CENTERLINE	5.0	1003.0	SUBBASE FILL
257	STA. 3+25, 15' LEFT OF OUTLET WORKS CENTERLINE	5.0	1002.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #8,250-259, BID #9, 248 & 249, 260 & 261**
• DATUM TOPOGRAPHIC

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Western Technologies Inc.
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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-18-95
Job No. 2745JC249
Event/Invoice No. 27450485-19
Authorized By KEN SMITH Date 09-13-95
Tested By P. LLEWELLYN/WT Date 09-13-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
258		6.0	123.7	0.0	2	128.5	7.5	96		95	YES
259		6.5	122.8	0.0	2	128.5	7.5	96		95	YES
260		4.1	123.9	0.0	2	128.5	7.5	96		95	YES
261		6.6	122.3	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	TEST LOCATION, VERTICAL: Elevation *	MATERIAL TESTED
258	STA. 2+50, 15' RIGHT OF OUTLET WORKS CENTERLINE	5.5	1000.4	SUBBASE FILL
259	STA. 3+00, 15' RIGHT OF OUTLET WORKS CENTERLINE	5.5	1003.0	SUBBASE FILL
260	STA. 14+50, 200' RIGHT OF CENTERLINE	7.0	1019.0	SUBBASE FILL
261	STA. 11+00, 175' RIGHT OF CENTERLINE	14.0	1021.0	SUBBASE FILL

Comments: BID #8,250-259, BID #9, 248 & 249, 260 & 261
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **09-21-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450485-21**
Authorized By **KEN SMITH** Date **09-15-95**
Tested By **C. ANDEREGG/WT** Date **09-15-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3097** H_2O **612**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
269		4.5	123.4	0.0	4	128.0	9.5	96		95	YES
270		4.3	121.2	0.0	4	128.0	9.5	95		95	YES
271		4.8	121.2	0.0	4	128.0	9.5	95		95	YES
272		8.5	122.3	0.0	4	128.0	9.5	96		95	YES
273		8.1	122.7	0.0	4	128.0	9.5	96		95	YES
274		8.0	121.9	0.0	4	128.0	9.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
269	STA. 11+00, 30' RIGHT OF CENTERLINE		1023.0	EMBANKMENT FILL
270	STA. 15+10, 180' LEFT OF CENTERLINE		1011.0	EMBANKMENT FILL
271	RETEST 270A		1012.0	EMBANKMENT FILL
272	STA. 16+50, 200' RIGHT CENTERLINE	3.0	1012.0	EMBANKMENT FILL
273	RETEST 270B	6.0	1010.0	EMBANKMENT FILL
274	OUTLET WORKS BACKFILL, STA. 3+25, LEFT OF CENTERLINE	6.0	1010.5	STRUCTURE BACKFILL

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
4	27450485	SAND W/GRAVEL TRACE SILT	STA. 10+50, 100' L OF CL	9.5	128.0	D1557-A

Comments: **BID #~~6~~ 13, 274, BID #9 269-273**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/25/95
MAP.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
49		5.8	119.9	0.0	2	128.5	7.5	93		95	NO
50		6.1	120.8	0.0	2	128.5	7.5	94		95	NO
51		7.0	122.5	0.0	2	128.5	7.5	95		95	YES
52		7.3	123.1	0.0	2	128.5	7.5	96		95	YES
53		6.7	122.0	0.0	2	128.5	7.5	95		95	YES
54		8.5	122.7	0.0	2	128.5	7.5	95		95	YES
55		7.2	122.9	0.0	2	128.5	7.5	96		95	YES
56		8.1	122.6	0.0	2	128.5	7.5	95		95	YES
57		6.9	125.4	0.0	2	128.5	7.5	98		95	YES
58		7.2	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
49	STATION 4+00, 10' LEFT OF CENTERLINE	12.0	1075.0	SUBBASE FILL
50	STATION 5+50, 7' RIGHT OF CENTERLINE	12.0	1071.0	SUBBASE FILL
51	RETEST 49A	12.0	1075.0	SUBBASE FILL
52	RETEST 50A	12.0	1071.0	SUBBASE FILL
53	STATION 7+00, 15' RIGHT OF DAM CENTERLINE		1059.0	SUBGRADE
54	STATION 11+10, 270' LEFT OF DAM CENTERLINE		987.0	SUBGRADE
55	STATION 3+50, 12' LEFT OF DAM CENTERLINE	5.5	1076.0	SUBBASE FILL
56	STATION 5+50, 18' RIGHT OF DAM CENTERLINE	13.0	1071.0	SUBBASE FILL
57	STATION 4+00, 6' LEFT OF DAM CENTERLINE	13.0	1076.0	SUBBASE FILL
58	STATION 5+00, 12' RIGHT OF DAM CENTERLINE	15.0	1074.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10./64-66 BID#13
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP
GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
59		7.8	122.4	0.0	2	128.5	7.5	95		95	YES
60		7.6	122.9	0.0	2	128.5	7.5	96		95	YES
61		6.4	126.5	0.0	3	137.4	1.0	92		90	YES
62		5.4	124.3	0.0	3	137.4	1.0	90		90	YES
63		5.9	123.9	0.0	3	137.4	1.0	90		90	YES
64		6.5	121.6	0.0	2	128.5	7.5	95		95	YES
65		6.7	122.3	0.0	2	128.5	7.5	95		95	YES
66		7.0	122.0	0.0	2	128.5	7.5	95		95	YES
67		6.3	120.5	0.0	2	128.5	7.5	94		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
59	STATION 6+00, 8' LEFT OF DAM CENTERLINE	9.0	1070.0	SUBBASE FILL
60	STATION 6+25, 10' RIGHT OF DAM CENTERLINE	7.0	1069.0	SUBBASE FILL
61	STATION 9+50, 130' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
62	STATION 11+50, 140' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
63	STATION 12+00, 110' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
64	STATION 0+50, RIGHT OF OULET CENTERLINE	1.0	1002.0	SUBBASE FILL
65	STATION 1+00, RIGHT OF OUTLET CENTERLINE	2.0	1001.0	SUBBASE FILL
66	STATION 1+20, RIGHT OF OUTLET CENTERLINE	1.0	999.0	SUBBASE FILL
67	STATION 4+00, 60' RIGHT OF CENTERLINE	1.0	1064.0	SUBBASE FILL

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10./64-66 BID#13
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MMP
GREINER, INC.

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REVIEWED BY CORWIN ANDEREGG

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Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-14-95
Job No. 2745JC232 Page 1 of 1
Event/Invoice No. 27450449-1
Authorized By WAYNE PHELPS Date 08-02-95
Tested By P. LLEWELLYN/WT Date 08-02-95

GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client AMERICAN ASPHALT & GRADING
Project HIKO SPRINGS DETENTION BASIN
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3063 H_2O 619

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
6		6.9	123.4	0.0	1	132.0	7.5	93		95	NO
7		7.2	125.9	0.0	1	132.0	7.5	95		95	YES
8		7.4	126.4	0.0	1	132.0	7.5	96		95	YES
9		6.9	125.6	0.0	1	132.0	7.5	95		95	YES
10		6.8	125.8	0.0	1	132.0	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
6	RETEST #1B		1002.0	SUBGRADE
7	RETEST #2A		1002.0	SUBGRADE
8	RETEST #3A		1000.0	SUBGRADE
9	RETEST #4A		992.0	SUBGRADE
10	RETEST #1C		1002.0	SUBGRADE

RECEIVED
AUG 15 95
GREINER, INC.

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
1	27450449	SAND W/SILT & FEW GRAVEL	OUTLET WORK TRENCH	7.5	132.0	D1557-B

Comments: BID #13 OUTLET WORKS
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (2)
GREINER, INC., SOUTHWEST (3)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 08-14-95
Job No. 2745JC232 Page 1 of 1
Event/Invoice No. 27450449
Authorized By WAYNE PHELPS Date 08-01-95
Tested By P. LLEWELLYN/WT Date 08-01-95

Client AMERICAN ASPHALT & GRADING
Project HIKO SPRINGS DETENTION BASIN
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make CAMPBELL Model 3411B Serial No. 12873 Standard Count: Unit Weight 2774 H_2O 585

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
5		11.6	118.4	0.0	1	132.0	7.5	90		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
5	RETEST #1A		1002.0	SUBGRADE

RECEIVED
AUG 1 5 95 MAP
GREINER, INC.

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
1	27450449	SAND W/SILT & FEW GRAVEL	OUTLET WORK TRENCH	7.5	132.0	D1557-B

Comments: BID #13 OUTLET WORKS
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (2)
GREINER, INC., SOUTHWEST (3)

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REVIEWED BY CORWIN ANDEREGG
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The Quality People
Since 1955

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-14-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450450
Authorized By KEN SMITH Date 08-01-95
Tested By P. LLEWELLYN/WT Date 08-01-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 12873 Standard Count: Unit Weight 2774 H_2O 585

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
1		5.8	116.5	0.0	1	132.0	7.5	88		95	NO
2		6.5	118.2	0.0	1	132.0	7.5	90		95	NO
3		5.4	116.7	0.0	1	132.0	7.5	88		95	NO
4		5.8	120.4	0.0	1	132.0	7.5	91		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
1	OUTLET WORKS DRAIN, STA. 0+35, LEFT OF CENTERLINE		1002.0	SUBGRADE
2	OUTLET WORKS DRAIN, STA. 0+35, RIGHT OF CENTERLINE		1002.0	SUBGRADE
3	OUTLET WORKS DRAIN, STA. 1+20,		1000.0	SUBGRADE
4	OUTLET WORKS DRAIN, STA. 3+70,		992.0	SUBGRADE

RECEIVED
AUG 15 95 AM
GREINER, INC.

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
1	27450450	SAND W/SILT & FEW GRAVEL	OUTLET WORK TRENCH	7.5	132.0	D1557-B

Comments: BID #13 OUTLET WORKS
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/12/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
12	09/12/95 N	200' LT OF CENTERLINE, STATION 16+50	1006±
13	09/12/95 N	110' RT OF CENTERLINE, STATION 15+50	1015±
14	09/12/95 N	50' RT OF CENTERLINE, STATION 18+00	1014±
15	09/12/95 N	**RETEST 14A**	1014±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
12	7.5	128.5	8.1	121.8	95	YES
13	7.5	128.5	2.1	128.2	99	YES
14	7.5	128.5	4.6	120.4	94	**NO**
15	7.5	128.5	4.6	126.4	98	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS
In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____
In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217
Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____
Visual Soil Classification per ASTM D2488 ____

Job No. ____ Page ____ of ____
Event / Invoice No. ____ Lab No. ____
Authorized By ____ Date ____
Tested By WHT Date 9-12-95
Test Locations Designated By ____ Date ____

Gauge: Make TROXLER Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight (2) H_2O

Test Hole No.	12	13	14	15
Horizontal Location of Test Hole	STA. 16+50 200' LT. ℄	STA. 15+50 110' RT. ℄	STA. 18+00 50' RT. ℄	STA. 18+00 50' RT ℄ RETEST
Vertical Distance From Elevation Datum, ft. †	1006±	1015±	1014±	1014±
Depth of Fill				
DENSITY Probe Depth	8"	8"	8"	8
DENSITY Counts				
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts				
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				132.2
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.7	130.9	125.9	~~126.4~~
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	121.8	128.2	120.4	126.4
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	8.1	2.1	4.6	4.6
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95	99	94	98
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____
20. ____
† Datum ____

REVIEWED BY ____

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/11/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **KENNETH A. SMITH, P.E.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
8	09/11/95 N	100' RT OF CENTERLINE, STATION 13+30	1012±
9	09/11/95 N	170' RT OF CENTERLINE, STATION 15+50	1011±
10	09/11/95 N	20' RT OF CENTERLINE, STATION 14+00	1013±
11	09/11/95 N	175' RT OF CENTERLINE, STATION 17+00	1018±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
8	7.5	128.5	6.8	122.0	95	YES
9	7.5	128.5	5.0	122.2	95	YES
10	7.5	128.5	5.9	123.4	96	YES
11	7.5	128.5	4.5	125.3	97	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ____________ Event / Invoice No. ____________ Lab No. ____________

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ____________ Date ____________

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ____________ Tested By KAS Date 9/11 & 9/12/95

Visual Soil Classification per ASTM D2488 ____________ Test Locations Designated By ____________ Date ____________

Job No. ____________ Page ____ of ____

Gauge: Make Troxler Model 3411B Serial No. 11044

Standard Count: (1) Unit Weight 2553 (2) H_2O 669

Test Hole No.	8	9/12 PM STANDARD COUNT 2545 & 673		
Horizontal Location of Test Hole	9/11 11 PM 13+30, 100' Rt	#9 9/12 1230 AM 15+50 150' Rt	#10 9/12 2AM 14+00 20' Rt	#11 9/12 9:20 PM 17+00 175' Rt
Vertical Distance From Elevation Datum, ft. †	1012±	1011±	1013±	1018±
Depth of Fill				
DENSITY – Probe Depth	8"	8"	8"	8"
DENSITY – Counts	1400	1484	1389	1381
DENSITY – (3) Count Average				
DENSITY – Density Ratio				
MOISTURE – Counts	120	97	110	92
MOISTURE – (4) Count Average				
MOISTURE – Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout				
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf +1.9 lb/cf	130.3	128.3	130.7	130.9
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	7.5
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5	128.5	128.5	128.5
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	122.0	122.2	123.4	125.3
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	6.8	5.0	5.9	4.5
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95	95	96	97
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ____________
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ____ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ____________
20. ____________

† Datum ____________

'3 - 130

REVIEWED BY ____________

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Western Technologies Inc.

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Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-18-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-17
Authorized By KEN SMITH Date 09-11-95
Tested By P. LLEWELLYN/WT Date 09-11-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
237		3.4	126.6	0.0	2	128.5	7.5	99		95	YES
238		5.0	123.0	0.0	2	128.5	7.5	96		95	YES
239		6.0	123.7	0.0	2	128.5	7.5	96		95	YES
240		6.2	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
237	RETEST 187A	2.0	993.0	SUBBASE FILL
238	STA. 13+00, HORIZONTAL STRIP DRAIN		992.0	SUBGRADE
239	STA. 11+00, 125' LEFT OF CENTERLINE	15.0	1009.0	SUBBASE FILL
240	STA. 11+50, 175' LEFT OF CENTERLINE	17.5	1009.5	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 238, BID #9, 239 & 240, BID #10, 237
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/08/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **KENNETH A. SMITH, P.E.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
5	09/08/95 N	20' RT OF CENTERLINE, STATION 11+00	1014±
6	09/08/95 N	200' RT OF CENTERLINE, STATION 14+50	1013±
7	09/08/95 N	225' RT OF CENTERLINE, STATION 13+60	1011±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
5	7.5	128.5	7.0	124.2	97	YES
6	7.5	128.5	7.8	126.3	98	YES
7	7.5	128.5	8.8	122.2	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

Job No. ______ Page ___ of ___

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By KAS Date 9/8/95 & 9/9/95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Gauge: Make Troxler Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2532 (2) H_2O 667

Test Hole No.		5	6	7	
Horizontal Location of Test Hole		9/8/95 11 AM 11+00, 20' RT	9/8/95 1130 AM 14+50, 200' RT	9/8/95 1130 13+60, 226' RT	
Vertical Distance From Elevation Datum, ft. †		1014 ±	1013 ±	1011 ±	
Depth of Fill					
DENSITY	Probe Depth	8"	8"	8"	
	Counts	1297	1208	1309	
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts	125	139	149	
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout					
(6) Water, lbf / cu. ft. from Calibration Chart or Readout					
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf +19 lb/cf		132.9	136.1	133.0	
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100		/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture					
Optimum Moisture (Lab), % of Dry Unit Weight		7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.		128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)					
(10) Corrected Optimum Moisture, % (See Chart)					
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)		124.2	126.3	122.2	
−1.0% (12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100		7.0%	7.8	8.8	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100		97	98	95	
Conformance Indicated?		YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*					

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY KAS

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-13-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-16
Authorized By KEN SMITH Date 09-08-95
Tested By P. LLEWELLYN/WT Date 09-08-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
227		6.8	123.2	0.0	2	128.5	7.5	96		95	YES
228		7.0	119.8	0.0	2	128.5	7.5	93		95	NO
229		4.7	119.4	0.0	2	128.5	7.5	93		95	NO
230		7.2	122.3	0.0	2	128.5	7.5	95		95	YES
231		5.6	123.6	0.0	2	128.5	7.5	96		95	YES
232		4.9	115.2	0.0	2	128.5	7.5	90		95	NO
233		5.0	116.7	0.0	2	128.5	7.5	91		95	NO
234		8.2	121.7	0.0	2	128.5	7.5	95		95	YES
235		5.3	122.5	0.0	2	128.5	7.5	95		95	YES
236		5.6	122.1	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
227	STA. 10+60, 70' LEFT OF CENTERLINE	18.0	1013.0	SUBBASE FILL
228	STA. 11+00, 140' LEFT OF CENTERLINE	17.0	1011.5	SUBBASE FILL
229	STA. 11+20, 225' LEFT OF CENTERLINE	16.0	1006.5	SUBBASE FILL
230	RETEST 228A	17.0	1011.5	SUBBASE FILL
231	RETEST 229A	16.0	1006.5	SUBBASE FILL
232	STA. 14+25, 165' RIGHT OF CENTERLINE		1008.0	SUBGRADE
233	STA. 14+50, 125' RIGHT OF CENTERLINE		1005.0	SUBGRADE
234	STA. 14+30, 75' RIGHT OF CENTERLINE		1003.0	SUBGRADE
235	RETEST 232A		1008.0	SUBGRADE
236	RETEST 233A		1005.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 232-236, BID #9, 227-231
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: **09/07/95**

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **KENNETH A. SMITH, P.E.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
4	09/07/95 N	50' RT OF CENTERLINE, STATION 11+00	1013±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
4	7.5	128.5	4.5	121.5	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME__

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______

Visual Soil Classification per ASTM D2488 ______

Job No. ______ Page ___ of ___

Event / Invoice No. ______ Lab No. ______

Authorized By ______ Date ______

Tested By KAS Date 9/7 & 9/8/95

Test Locations Designated By ______ Date ______

Gauge: Make Troxler Model 3411B Serial No. 11044 Standard Count: (1) Unit Weight 2532 (2) H_2O 667

Test Hole No.	4			
Horizontal Location of Test Hole	9/7 11 PM 11+00, 50' Rt			
Vertical Distance From Elevation Datum, ft. †	1013±			
Depth of Fill				
DENSITY Probe Depth	8"			
DENSITY Counts	1515			
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts	92			
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout				
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf (+1.9)	127.2			
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5			
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	128.5			
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	121.5			
(-1.02) (12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	4.7%			
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	95%			
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______
11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ______ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan
18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D
19. ______
20. ______

† Datum ______

REVIEWED BY KAS

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-13-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-15
Authorized By WOODY THOMAS Date 09-07-95
Tested By P. LLEWELLYN/WT Date 09-07-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
221		5.1	124.3	0.0	2	128.5	7.5	97		95	YES
222		6.2	122.6	0.0	2	128.5	7.5	95		95	YES
223		6.5	123.7	0.0	2	128.5	7.5	96		95	YES
224		6.1	121.9	0.0	2	128.5	7.5	95		95	YES
225		7.5	121.7	0.0	2	128.5	7.5	95		95	YES
226		4.8	122.3	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
221	STA. 0+90, RIGHT OF CENTERLINE	13.0	1013.0	SUBBASE FILL
222	STA. 1+50, LEFT OF CENTERLINE	12.0	1012.0	SUBBASE FILL
223	STA. 2+00, RIGHT OF CENTERLINE	11.0	1011.0	SUBBASE FILL
224	STA. 1+00, LEFT OF CENTERLINE	15.0	1015.0	SUBBASE FILL
225	STA. 11+20, 50' RIGHT OF CENTERLINE	11.0	1015.0	SUBBASE FILL
226	STA. 11+80, 60' LEFT OF CENTERLINE	9.0	1012.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: TRENCH BACKFILL, BID #8, 221-224, BID #9, 225 & 226
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Greiner

Greiner, Inc.
3650 South Pointe Circle, #203
Laughlin, Nevada 89029
(702) 298-0214
FAX: (702) 298-0219

FIELD DENSITY TESTS SUMMARY

PROJECT: **HIKO SPRINGS WASH DETENTION BASIN** BID No. **3476-94**

LOCATION: **LAUGHLIN, NEVADA** DATE OF TEST: 9/06/95

BID ITEM No: **9, EMBANKMENT FILL**

TESTED BY: **WOODROW THOMAS, S.E.T.** REVIEWED BY: **KEN SMITH, P.E.**

NUCLEAR GAUGE MAKE: **TROXLER** MODEL: **3411B** SERIAL No. **11044**

TEST No.	DATE/SHIFT	LOCATION OF TEST HOLE	TEST ELEVATION
1	9/06/95 N	40' RT OF CENTERLINE, STATION 10+80	1014±
2	9/06/95 N	RETEST 1A	1014±
3	9/06/95 N	40' LT OF CENTERLINE, STATION 10+50	1012±

TEST No.	OPTIM. MOIST. %	MAX. DRY DENSITY (PCF)	IN-PLACE CHARACTERISTICS MOISTURE %	DRY DENSITY (PCF)	RELATIVE COMPACTION	WITHIN SPECS ?
1	7.5	128.5	9.2	120.9	94	NO
2	7.5	128.5	7.8	121.5	95	YES
3	7.5	128.5	5.1	121.4	95	YES

DISTRIBUTION: American Asphalt & Grading
Laura Page - CCDPW
Ken Tischer - CCDPW
File

ON CALL__ FULL TIME X

SHI___ NGT X

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD

PROCEDURE / SPECIFICATIONS

Job No. 3475-1 Page 1 of 1

In-Place Unit Weight: ☐ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event / Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By ______ Date ______

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By WHT Date 9/6/95 & 9/7/95

Visual Soil Classification per ASTM D2488 ______ Test Locations Designated By ______ Date ______

Bid Item

Gauge: Make Troxler Model 3411 B Serial No. 11044 Standard Count: (1) Unit Weight (2) H_2O

Test Hole No.	1	2	3	
Horizontal Location of Test Hole	40' RT ℄ STA. 10+80	40' RT ℄ STA 10+80 Retest	40' LT ℄ STA 10+50	
Vertical Distance From Elevation Datum, ft. †	1014±	1014±	1012±	
Depth of Fill				
DENSITY Probe Depth	8"	8"		
DENSITY Counts	1286	1293	1432	
DENSITY (3) Count Average				
DENSITY Density Ratio				
MOISTURE Counts	133	122	85	
MOISTURE (4) Count Average				
MOISTURE Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout	131.5	131.1	127.6	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout				
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested				
(7) Wet Weight of Sample, lbf				
(8) Wet Weight of +No. 4 Material				
% of +No. 4 Material – Lab / Field [(8) ÷ (7)] x 100	/	/	/	/
ID. No. – Lab Maximum Unit Weight & Optimum Moisture				
Optimum Moisture (Lab), % of Dry Unit Weight	7.5	7.5	7.5	
Maximum Dry Unit Weight (Lab), lbf / cu. ft.	1 128.5	128.5	128.5	
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft. (See Chart)				
(10) Corrected Optimum Moisture, % (See Chart)				
(11) Dry Unit Weight, lbf / cu. ft. Readout or (5) – (6)	120.9	121.5	121.4	
(12) Report % Moisture, Total Sample Readout or [(6) ÷ (11)] x 100	9.2	7.8	5.1	
Relative Compaction, % Readout or [(11) ÷ (9)] x 100	94	95	96	
Conformance Indicated?	YES NO 15	YES NO 15	YES NO 15	YES NO 15
Comments*				

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data:
1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ___ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐D

19. ______

20. ______

† Datum ______

REVIEWED BY ______

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-08-95
Job No. 2745JC249
Event/Invoice No. 27450485-13
Authorized By WOODY THOMAS Date 09-06-95
Tested By P. LLEWELLYN/WT Date 09-06-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
210		7.0	115.1	0.0	2	128.5	7.5	90		95	NO
211		6.7	121.8	0.0	2	128.5	7.5	95		95	YES
212		5.0	119.1	0.0	2	128.5	7.5	93		95	NO
213		5.8	121.8	0.0	2	128.5	7.5	95		95	YES
214		4.7	124.4	0.0	2	128.5	7.5	97		95	YES
215		4.9	124.9	0.0	2	128.5	7.5	97		95	YES
216		6.3	123.9	0.0	2	128.5	7.5	96		95	YES
217		2.1	117.2	0.0	2	128.5	7.5	91		95	NO
218		5.6	123.0	0.0	2	128.5	7.5	96		95	YES
219		4.9	122.2	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
210	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	9.0	1009.0	SUBBASE FILL
211	RETEST 210A	9.0	1009.0	SUBBASE FILL
212	STA. 0+90, LEFT OF CENTERLINE, OUTLET WORKS	8.0	1008.0	SUBBASE FILL
213	RETEST 212A	8.0	1008.0	SUBBASE FILL
214	STA. 11+50, 260' LEFT OF CENTERLINE	6.0	995.0	SUBBASE FILL
215	STA. 10+60, 75' LEFT OF CENTERLINE	15.0	1010.0	SUBBASE FILL
216	STA. 11+50, 265' RIGHT OF CENTERLINE	8.0	1016.0	SUBBASE FILL
217	STA. 0+90, RIGHT OF CENTERLINE, OUTLET WORKS	12.0	1012.0	SUBBASE FILL
218	~~RETEST 218A~~ - 217A	12.0	1012.0	SUBBASE FILL
219	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	10.0	1010.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #8, 210-213, 217-220, TRENCH BACKFILL/BID #9, 214-216,
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MP
GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-08-95
Job No. 2745JC249
Event/Invoice No. 27450485-13
Authorized By WOODY THOMAS Date 09-06-95
Tested By P. LLEWELLYN/WT Date 09-06-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
220		5.2	123.7	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
220	STA. 1+75, LEFT OF CENTERLINE, OUTLET WORKS	9.0	1009.0	SUBBASE FILL

Comments: BID #8, 210-213, 217-220, TRENCH BACKFILL/BID #9, 214-216,
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

9 Sep

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-08-95
Job No. 2745JC249
Event/Invoice No. 27450485-12
Authorized By WOODY THOMAS Date 09-05-95
Tested By P. LLEWELLYN/WT Date 09-05-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
188		6.7	121.8	0.0	2	128.5	7.5	95		95	YES
189		5.8	123.6	0.0	2	128.5	7.5	96		95	YES
190		7.1	125.9	0.0	2	128.5	7.5	98		95	YES
191		6.9	121.9	0.0	2	128.5	7.5	95		95	YES
192		6.2	122.2	0.0	2	128.5	7.5	95		95	YES
193		7.3	124.3	0.0	2	128.5	7.5	97		95	YES
194		7.1	124.5	0.0	2	128.5	7.5	97		95	YES
195		6.8	123.1	0.0	2	128.5	7.5	96		95	YES
196		4.3	119.8	0.0	2	128.5	7.5	93		95	NO
197		5.8	123.5	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
188	STA. 0+40, RIGHT OF CENTERLINE, OUTLET WORKS	3.0	1003.0	SUBBASE FILL
189	STA. 0+40, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
190	STA. 0+85, RIGHT OF CENTERLINE, OUTLET WORKS	3.0	1003.0	SUBBASE FILL
191	STA. 0+85, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
192	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	3.0	1002.0	SUBBASE FILL
193	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1004.0	SUBBASE FILL
194	STA. 2+00, RIGHT OF CENTERLINE, OUTLET WORKS	2.0	1002.0	SUBBASE FILL
195	STA. 2+00, RIGHT OF CENTERLINE, OUTLET WORKS	4.0	1004.0	SUBBASE FILL
196	STA. 11+00, 200' RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1014.0	SUBBASE FILL
197	RETEST 196A	6.0	1014.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #8, 188-195, 198-209, BID #9, 196 & 197, TRENCH BACKFILL
* DATUM TOPOGRAPHIC

REVIEWED - COMMENTS HERON

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95

GREINER, INC.

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REVIEWED BY CORWIN ANDEREGG
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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-08-95
Job No. 2745JC249 Page 2 of 2
Event/Invoice No. 27450485-12
Authorized By WOODY THOMAS Date 09-05-95
Tested By P. LLEWELLYN/WT Date 09-05-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
198		6.2	123.1	0.0	2	128.5	7.5	96		95	YES
199		6.8	122.5	0.0	2	128.5	7.5	95		95	YES
200		7.4	123.7	0.0	2	128.5	7.5	96		95	YES
201		6.5	123.4	0.0	2	128.5	7.5	96		95	YES
202		7.0	123.0	0.0	2	128.5	7.5	96		95	YES
203		6.9	122.0	0.0	2	128.5	7.5	95		95	YES
204		7.2	123.9	0.0	2	128.5	7.5	96		95	YES
205		7.5	124.4	0.0	2	128.5	7.5	97		95	YES
206		5.0	124.4	0.0	2	128.5	7.5	97		95	YES
207		7.1	123.1	0.0	2	128.5	7.5	96		95	YES
208		4.0	123.2	0.0	2	128.5	7.5	96		95	YES
209		4.7	125.0	0.0	2	128.5	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
198	STA. 0+50, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1001.0	SUBBASE FILL
199	STA. 1+00, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1001.0	SUBBASE FILL
200	STA. 1+50, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1002.0	SUBBASE FILL
201	STA. 2+00, LEFT OF CENTERLINE, OUTLET WORKS	2.0	1002.0	SUBBASE FILL
202	STA. 0+50, RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1006.0	SUBBASE FILL
203	STA. 1+00, RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1006.0	SUBBASE FILL
204	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	6.0	1005.0	SUBBASE FILL
205	STA. 2+00, RIGHT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
206	STA. 0+75, RIGHT OF CENTERLINE, OUTLET WORKS	8.0	1008.0	SUBBASE FILL
207	STA. 1+50, RIGHT OF CENTERLINE, OUTLET WORKS	8.0	1008.0	SUBBASE FILL
208	STA. 1+25, LEFT OF CENTERLINE, OUTLET WORKS	5.0	1005.0	SUBBASE FILL
209	STA. 1+75, LEFT OF CENTERLINE, OUTLET WORKS	6.0	1006.0	SUBBASE FILL

Comments: BID #8, 188-195, 198-209, BID #9, 196 & 197, TRENCH BACKFILL
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MP
GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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Western Technologies Inc.
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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-08-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-14
Authorized By WOODY THOMAS Date 09-01-95
Tested By P. LLEWELLYN/WT Date 09-01-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
183		5.9	122.3	0.0	2	128.5	7.5	95		95	YES
184		6.0	125.2	0.0	2	128.5	7.5	97		95	YES
185		6.0	121.6	0.0	2	128.5	7.5	95		95	YES
186		4.3	123.7	0.0	2	128.5	7.5	96		95	YES
187		4.4	122.4	0.0	3	137.4	1.0	89		90	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
183	STA. 9+50, 270' LEFT OF CENTERLINE	4.0	1009.0	SUBBASE FILL
184	STA. 11+50, 280' LEFT OF CENTERLINE	3.0	989.0	SUBBASE FILL
185	STA. 11+50, 270' RIGHT OF CENTERLINE	7.0	1015.0	SUBBASE FILL
186	STA. 10+60, 50' LEFT OF CENTERLINE	5.0	1008.0	SUBBASE FILL
187	TRANSVERSE STRIP DRAIN, STA. 13+00, 260' LEFT OF CL	2.0	993.0	SUBBASE FILL
	RETEST 187?			

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #9, 183-186, BID #10, 187
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MP

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-11
Authorized By WOODY THOMAS Date 08-31-95
Tested By P. LLEWELLYN/WT Date 08-31-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
173		3.4	125.0	0.0	2	128.5	7.5	97		95	YES
174		5.7	120.1	0.0	2	128.5	7.5	93		95	NO
175		6.3	122.3	0.0	2	128.5	7.5	95		95	YES
176		5.7	125.5	0.0	2	128.5	7.5	98		95	YES
177		5.8	120.9	0.0	2	128.5	7.5	94		95	NO
178		5.5	124.4	0.0	2	128.5	7.5	97		95	YES
179		7.0	125.1	0.0	2	128.5	7.5	97		95	YES
180		5.4	125.7	0.0	2	128.5	7.5	98		95	YES
181		5.6	125.9	0.0	3	137.4	1.0	92		90	YES
182		2.8	128.0	0.0	3	137.4	1.0	93		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
173	STA. 11+00, 125' LEFT OF CENTERLINE	13.0	1007.0	SUBBASE FILL
174	TRANSVERSE STRIP DRAIN, STA. 13+00, 260' LEFT OF CL		991.0	SUBGRADE
175	TRANSVERSE STRIP DRAIN, STA. 13+50, 250' LEFT OF CL		991.0	SUBGRADE
176	TRANSVERSE STRIP DRAIN, STA. 14+00, 260' LEFT OF CL		991.0	SUBGRADE
177	RETEST 174A		991.0	SUBGRADE
178	RETEST 174B		991.0	SUBGRADE
179	STA. 11+50, 75' RIGHT OF CENTERLINE	6.0	1010.0	SUBBASE FILL
180	STA. 11+10, 60' LEFT OF CENTERLINE	12.0	1007.0	SUBBASE FILL
181	TRANSVERSE STRIP DRAIN, STA. 12+00, 260' LEFT OF CL	2.0	993.0	SUBBASE FILL
182	DRAIN BLANKET, STA. 6+75, 55' LEFT OF CL	2.0	1063.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #6, 174-178, BID #9, 173, 179-182
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

8 95
MP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-10
Authorized By WOODY THOMAS Date 08-30-95
Tested By P. LLEWELLYN/WT Date 08-30-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
167		5.5	121.7	0.0	2	128.5	7.5	95		95	YES
168		6.3	122.2	0.0	2	128.5	7.5	95		95	YES
169		7.1	111.3	0.0	2	128.5	7.5	87		95	NO
170		5.5	122.8	0.0	2	128.5	7.5	96		95	YES
171		6.1	121.9	0.0	2	128.5	7.5	95		95	YES
172		3.1	123.9	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
167	RETEST 157B		991.0	SUBGRADE
168	RETEST 158B		991.0	SUBGRADE
169	STA. 10+00, 285' LEFT OF CENTERLINE	7.0	999.0	SUBBASE FILL
170	STA. 10+50, 230' LEFT OF CENTERLINE	5.0	1001.0	SUBBASE FILL
171	RETEST 169A	7.0	999.0	SUBBASE FILL
172	STA. 11+90, 80' RIGHT OF CENTERLINE	4.0	1008.5	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 167, 168, BID #9, 169-172
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MP

GREINER, INC.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249 Page 1 of 2
Event/Invoice No. 27450485-9
Authorized By WOODY THOMAS Date 08-29-95
Tested By P. LLEWELLYN/WT Date 08-29-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
151		4.7	117.4	0.0	2	128.5	7.5	91		95	NO
152		5.3	121.6	0.0	2	128.5	7.5	95		95	YES
153		4.1	119.8	0.0	2	128.5	7.5	93		95	NO
154		5.5	122.7	0.0	2	128.5	7.5	95		95	YES
155		3.2	122.1	0.0	2	128.5	7.5	95		95	YES
156		3.2	123.6	0.0	2	128.5	7.5	96		95	YES
157		4.2	113.6	0.0	2	128.5	7.5	88		95	NO
158		4.9	116.5	0.0	2	128.5	7.5	91		95	NO
159		3.8	119.5	0.0	2	128.5	7.5	93		95	NO
160		4.5	119.0	0.0	2	128.5	7.5	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
151	STA. 10+80, 100' LEFT OF CENTERLINE	12.0	1005.5	SUBBASE FILL
152	STA. 10+00, 150' LEFT OF CENTERLINE	10.0	1004.0	SUBBASE FILL
153	STA. 9+50, 200' LEFT OF CENTERLINE	8.0	1003.0	SUBBASE FILL
154	RETEST ~~157A~~ 151A	12.0	1005.5	SUBBASE FILL
155	RETEST 153A	8.0	1003.0	SUBBASE FILL
156	HORIZONTAL STRIP DRAIN, STA. 12+50		991.0	SUBGRADE
157	HORIZONTAL STRIP DRAIN, STA. 12+00		991.0	SUBGRADE
158	HORIZONTAL STRIP DRAIN, STA. 11+50		991.0	SUBGRADE
159	STA. 10+25, 200' RIGHT OF CENTERLINE	3.0	1012.0	SUBBASE FILL
160	STA. 10+50, 80' RIGHT OF CENTERLINE	5.0	1010.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 156-158, 162,163, BID #9, 151-155, 159-161, 164-166 .
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MAT

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-07-95
Job No. 2745JC249
Event/Invoice No. 27450485-9
Authorized By WOODY THOMAS Date 08-29-95
Tested By P. LLEWELLYN/WT Date 08-29-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
161		8.5	115.9	0.0	2	128.5	7.5	90		95	NO
162		10.2	118.5	0.0	2	128.5	7.5	92		95	NO
163		7.5	115.0	0.0	2	128.5	7.5	89		95	NO
164		4.4	121.6	0.0	2	128.5	7.5	95		95	YES
165		2.5	121.5	0.0	2	128.5	7.5	95		95	YES
166		4.4	125.0	0.0	2	128.5	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
161	STA. 12+50, 125' RIGHT OF CENTERLINE	4.0	1008.0	SUBBASE FILL
162	RETEST 157A		991.0	SUBGRADE
163	RETEST 158A		991.0	SUBGRADE
164	RETEST 159A	3.0	1012.0	SUBBASE FILL
165	RETEST 160A	5.0	1010.0	SUBBASE FILL
166	RETEST 161A	4.0	1008.0	SUBBASE FILL

Comments: **BID #6, 156-158, 162,163, BID #9, 151-155, 159-161, 164-166**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

9S
GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-8
Authorized By WOODY THOMAS Date 08-28-95
Tested By P. LLEWELLYN/WT Date 08-28-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
148		3.3	121.5	0.0	2	128.5	7.5	95		95	YES
149		2.8	116.7	0.0	2	128.5	7.5	91		95	NO
150		2.8	123.0	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
148	STA. 12+00, 65' RIGHT OF CENTERLINE	4.0	1006.0	SUBBASE FILL
149	STA. 10+00, 225' RIGHT OF CENTERLINE	3.0	1008.5	SUBBASE FILL
150	RETEST 149A	3.0	1008.5	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-7
Authorized By WOODY THOMAS Date 08-25-95
Tested By P. LLEWELLYN/WT Date 08-25-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
144		4.6	122.9	0.0	2	128.5	7.5	96		95	YES
145		8.1	126.8	0.0	2	128.5	7.5	99		95	YES
146		3.6	123.0	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
144	STA. 11+30, 258' RIGHT OF CENTERLINE	1.0	1010.0	SUBBASE FILL
145	STA. 10+90, 100' RIGHT OF CENTERLINE	2.0	1007.0	SUBBASE FILL
146	STA. 12+30, 40' RIGHT OF CENTERLINE	1.0	1003.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249 Page 1 of 3
Event/Invoice No. 27450485-6
Authorized By WOODY THOMAS Date 08-24-95
Tested By P. LLEWELLYN/WT Date 08-24-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS: Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	LAB CHARACTERISTICS: ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	COMPACTION: % of Maximum Dry Unit Weight	REQUIREMENTS: Moisture %	Compaction %	CONFORMANCE INDICATED
111		6.8	123.5	0.0	2	128.5	7.5	96		95	YES
112		7.3	123.9	0.0	2	128.5	7.5	96		95	YES
113		5.6	118.5	0.0	2	128.5	7.5	92		95	NO
114		4.8	117.7	0.0	2	128.5	7.5	92		95	NO
115		4.6	116.3	0.0	2	128.5	7.5	91		95	NO
116		4.5	119.1	0.0	2	128.5	7.5	93		95	NO
117		3.7	125.9	0.0	2	128.5	7.5	98		95	YES
118		5.5	117.1	0.0	2	128.5	7.5	91		95	NO
119		7.4	125.3	0.0	2	128.5	7.5	98		95	YES
120		6.2	120.1	0.0	2	128.5	7.5	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	Elevation *	MATERIAL TESTED
111	RETEST 109A	6.0	1001.0	SUBBASE FILL
112	RETEST 110A	6.0	1001.0	SUBBASE FILL
113	STA. 11+00, 150' LEFT OF CENTERLINE	8.0	1002.0	SUBBASE FILL
114	STA. 10+50, 40' RIGHT OF CENTERLINE		1003.0	SUBGRADE
115	STA. 11+50, 30' RIGHT OF CENTERLINE		1003.0	SUBGRADE
116	STA. 11+50, 75' RIGHT OF CENTERLINE		1005.0	SUBGRADE
117	STA. 11+00, 75' RIGHT OF CENTERLINE		1005.0	SUBGRADE
118	STA. 12+20, 60' RIGHT OF CENTERLINE		1005.0	SUBGRADE
119	RETEST 115A		1003.0	SUBGRADE
120	RETEST 114A		1003.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: MOISTURE SPECIFICATION, BID #6-114-134, 143, BID #9-111-113,135-142
* DATUM TOPOGRAPHIC, TEST 133 APPROVED BY KEN SMITH, GREINER ENG.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-07-95
Job No. 2745JC249
Event/Invoice No. 27450485-6
Authorized By WOODY THOMAS Date 08-24-95
Tested By P. LLEWELLYN/WT Date 08-24-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
121		4.2	120.7	0.0	2	128.5	7.5	94		95	NO
122		6.3	118.1	0.0	2	128.5	7.5	92		95	NO
123		7.4	118.0	0.0	2	128.5	7.5	92		95	NO
124		7.4	127.7	0.0	2	128.5	7.5	99		95	YES
125		4.6	118.6	0.0	2	128.5	7.5	92		95	NO
126		7.5	118.3	0.0	2	128.5	7.5	92		95	NO
127		8.2	116.8	0.0	2	128.5	7.5	91		95	NO
128		7.6	125.7	0.0	2	128.5	7.5	98		95	YES
129		4.5	121.8	0.0	2	128.5	7.5	95		95	YES
130		10.0	120.6	0.0	2	128.5	7.5	94		95	NO
131		8.7	120.2	0.0	2	128.5	7.5	94		95	NO
132		5.3	126.1	0.0	2	128.5	7.5	98		95	YES
133		7.6	117.4	0.0	2	128.5	7.5	91		95	NO
134		7.8	126.7	0.0	2	128.5	7.5	99		95	YES
135		6.5	126.9	0.0	2	128.5	7.5	99		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
121	RETEST 116A		1003.0	SUBGRADE
122	RETEST 118A		1003.0	SUBGRADE
123	RETEST 114B		1003.0	SUBGRADE
124	RETEST 116B		1005.0	SUBGRADE
125	RETEST 118B		1005.0	SUBGRADE
126	RETEST 114C		1003.0	SUBGRADE
127	RETEST 118C		1005.0	SUBGRADE
128	STA. 12+50, 140' RIGHT OF CENTERLINE		1007.0	SUBGRADE
129	STA. 10+30, 140' RIGHT OF CENTERLINE		1007.0	SUBGRADE
130	STA 11+20, 175' RIGHT OF CENTERLINE		1009.0	SUBGRADE
131	STA. 12+50, 170' RIGHT OF CENTERLINE		1009.0	SUBGRADE
132	RETEST 118D		1005.0	SUBGRADE
133	RETEST 114D		1003.0	SUBGRADE
134	RETEST 131A		1009.0	SUBGRADE
135	STA. 11+20, 50' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL

Comments: MOISTURE SPECIFICATION, BID #6-114-134, 143, BID #9-111-113,135-142
* DATUM TOPOGRAPHIC, TEST 133 APPROVED BY KEN SMITH, GREINER ENG.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-07-95
Job No. 2745JC249

Event/Invoice No. 27450485-6
Authorized By WOODY THOMAS Date 08-24-95
Tested By P. LLEWELLYN/WT Date 08-24-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
136		7.3	119.6	0.0	2	128.5	7.5	93		95	NO
137		6.8	121.7	0.0	2	128.5	7.5	95		95	YES
138		6.4	121.6	0.0	2	128.5	7.5	95		95	YES
139		5.9	127.1	0.0	2	128.5	7.5	99		95	YES
140		3.3	126.2	0.0	2	128.5	7.5	98		95	YES
141		6.3	126.0	0.0	2	128.5	7.5	98		95	YES
142		6.8	125.8	0.0	2	128.5	7.5	98		95	YES
143		3.2	122.7	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
136	STA. 11+20, 150' LEFT OF CENTERLINE	8.0	1002.0	SUBBASE FILL
137	STA. 10+00, 100' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL
138	STA. 9+50, 50' LEFT OF CENTERLINE	13.0	1006.0	SUBBASE FILL
139	STA. 9+50, 50' LEFT OF CENTERLINE	13.0	1006.0	SUBBASE FILL
140	RETEST 136A	8.0	1002.0	SUBBASE FILL
141	STA. 11+20, 50' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL
142	STA. 11+20, 50' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL
143	STA/ 11+00, 215' RIGHT OF CENTERLINE		1011.0	SUBGRADE

Comments: MOISTURE SPECIFICATION, BID #6-114-134, 143, BID #9-111-113,135-142
• DATUM TOPOGRAPHIC, TEST 133 APPROVED BY KEN SMITH, GREINER ENG.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 TMP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485-5
Authorized By WOODY THOMAS Date 08-23-95
Tested By P. LLEWELLYN/WT Date 08-23-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures. In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
100		7.0	115.4	0.0	2	128.5	7.5	90		95	NO
101		6.6	118.2	0.0	2	128.5	7.5	92		95	NO
102		6.8	118.9	0.0	2	128.5	7.5	93		95	NO
103		8.3	119.9	0.0	2	128.5	7.5	93		95	NO
104		4.6	119.6	0.0	2	128.5	7.5	93		95	NO
105		5.1	120.0	0.0	2	128.5	7.5	93		95	NO
106		8.0	115.9	0.0	2	128.5	7.5	90		95	NO
107		6.8	114.5	0.0	2	128.5	7.5	89		95	NO
108		6.8	113.4	0.0	2	128.5	7.5	88		95	NO
109		4.6	122.7	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
100	STA. 10+00, 75' LEFT OF CENTERLINE	6.0	1001.0	SUBBASE FILL
101	STA. 10+50, 150' LEFT OF CENTERLINE	6.0	1001.0	SUBBASE FILL
102	STA. 9+50, 200' LEFT OF CENTERLINE	6.0	1001.0	SUBBASE FILL
103	RETEST 100A	6.0	1001.0	SUBBASE FILL
104	RETEST 101A	6.0	1001.0	SUBBASE FILL
105	RETEST 102A	6.0	1001.0	SUBBASE FILL
106	STA. 10+50, 35' RIGHT OF CENTERLINE	6.0	1003.0	SUBBASE FILL
107	STA. 10+00, 40' RIGHT OF CENTERLINE	6.0	1003.0	SUBBASE FILL
108	STA. 10+50, 80' RIGHT OF CENTERLINE		1005.0	SUBBASE FILL
109	50' LEFT OF PT #455	6.0	1001.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: MOISTURE SPECIFICATION, BID #6, 100-105, 109 & 110,/ BID 9, 106-108
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485-5
Authorized By WOODY THOMAS Date 08-23-95
Tested By P. LLEWELLYN/WT Date 08-23-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
110		7.3	121.1	0.0	2	128.5	7.5	94		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
110	45.5 LEFT (S.), 50' EAST OF PT #455	6.0	1001.0	SUBBASE FILL

Comments: MOISTURE SPECIFICATION, BID #6, 100-105, 109 & 110,/ BID 9, 106-108
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MP
GREINER, INC.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-4
Authorized By WOODY THOMAS Date 08-22-95
Tested By P. LLEWELLYN/WT Date 08-22-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
94		5.2	77.1	0.0	2	128.5	7.5	60		95	NO
95		4.1	113.5	0.0	2	128.5	7.5	88		95	NO
96		3.4	117.3	0.0	2	128.5	7.5	91		95	NO
97		3.0	119.0	0.0	2	128.5	7.5	93		95	NO
98		7.9	122.6	0.0	2	128.5	7.5	95		95	YES
99		8.1	121.7	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
94	STA 11+00, 150' LEFT OF CENTERLINE	5.5	1000.0	SUBBASE FILL
95	STA 11+00, 170' LEFT OF CENTERLINE	5.5	1000.0	SUBBASE FILL
96	RETEST 94A	5.5	1000.0	SUBBASE FILL
97	RETEST 95A	5.5	1000.0	SUBBASE FILL
98	RETEST 94B	5.5	1000.0	SUBBASE FILL
99	RETEST 95B	5.5	1000.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: MOISTURE SPECIFICATION, BID #9
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249 Page 1 of 2
Event/Invoice No. 27450485-2
Authorized By WOODY THOMAS Date 08-18-95
Tested By P. LLEWELLYN/WT Date 08-18-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 5430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
68		7.0	121.9	0.0	2	128.5	7.5	95		95	YES
69		6.9	119.9	0.0	2	128.5	7.5	93		95	NO
70		6.6	122.9	0.0	2	128.5	7.5	96		95	YES
71		7.2	122.3	0.0	2	128.5	7.5	95		95	YES
72		7.2	121.9	0.0	2	128.5	7.5	95		95	YES
73		7.0	120.1	0.0	2	128.5	7.5	93		95	NO
74		7.3	120.8	0.0	2	128.5	7.5	94		95	NO
75		6.9	124.0	0.0	2	128.5	7.5	96		95	YES
76		6.7	123.7	0.0	2	128.5	7.5	96		95	YES
77		7.3	122.6	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
68	RETEST 67A	1.0	1064.0	SUBBASE FILL
69	STATION 5+50, 60' RIGHT OF CENTERLINE	3.0	1063.0	SUBBASE FILL
70	STATION 4+50, 60' RIGHT OF CENTERLINE	4.0	1065.0	SUBBASE FILL
71	RETEST 69A	3.0	1063.0	SUBBASE FILL
72	STATION 5+00, 65' LEFT OF CENTERLINE	5.0	1078.0	SUBBASE FILL
73	STATION 4+00, 60' LEFT OF CENTERLINE	6.0	1069.0	SUBBASE FILL
74	STATION 3+00, 40' RIGHT OF CENTERLINE	8.0	1074.0	SUBBASE FILL
75	STATION 4+50, 60' RIGHT OF CENTERLINE	16.5	1077.5	SUBBASE FILL
76	RETEST 73A	6.0	1069.0	SUBBASE FILL
77	RETEST 74A	8.0	1074.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 68-79 BID #9,/80-83 BID #10
* DATUM TOPOGRAPHIC

95
MP

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-2
Authorized By WOODY THOMAS Date 08-18-95
Tested By P. LLEWELLYN/WT Date 08-18-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
78		7.6	123.4	0.0	2	128.5	7.5	96		95	YES
79		7.9	125.4	0.0	2	128.5	7.5	98		95	YES
80		5.6	123.5	0.0	3	137.4	1.0	90		90	YES
81		7.2	136.2	0.0	3	137.4	1.0	99		90	YES
82		6.4	127.5	0.0	3	137.4	1.0	93		90	YES
83		6.9	133.7	0.0	3	137.4	1.0	97		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
78	STATION 4+00, 60' LEFT OF CENTERLINE	11.0	1074.0	SUBBASE FILL
79	STATION 5+00, 60' RIGHT OF CENTERLNE	11.5	1082.5	SUBBASE FILL
80	STATION 11+50, 180' LEFT OF CENTERLINE, STRIP DRAIN	3.0	997.0	SUBBASE FILL
81	STATION 11+00, 130' LEFT OF CENTERLINE, STRIP DRAIN	3.0	998.0	SUBBASE FILL
82	STATION 10+00, 75' LEFT OF CENTERLINE, STRIP DRAIN	3.0	999.0	SUBBASE FILL
83	STATION 11+50, 280' LEFT OF CENTERLINE, STRIP DRAIN	3.0	995.0	SUBBASE FILL

Comments: 68-79 BID #9,/80-83 BID #10
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
49		5.8	119.9	0.0	2	128.5	7.5	93		95	NO
50		6.1	120.8	0.0	2	128.5	7.5	94		95	NO
51		7.0	122.5	0.0	2	128.5	7.5	95		95	YES
52		7.3	123.1	0.0	2	128.5	7.5	96		95	YES
53		6.7	122.0	0.0	2	128.5	7.5	95		95	YES
54		8.5	122.7	0.0	2	128.5	7.5	95		95	YES
55		7.2	122.9	0.0	2	128.5	7.5	96		95	YES
56		8.1	122.6	0.0	2	128.5	7.5	95		95	YES
57		6.9	125.4	0.0	2	128.5	7.5	98		95	YES
58		7.2	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
49	STATION 4+00, 10' LEFT OF CENTERLINE	12.0	1075.0	SUBBASE FILL
50	STATION 5+50, 7' RIGHT OF CENTERLINE	12.0	1071.0	SUBBASE FILL
51	RETEST 49A	12.0	1075.0	SUBBASE FILL
52	RETEST 50A	12.0	1071.0	SUBBASE FILL
53	STATION 7+00, 15' RIGHT OF DAM CENTERLINE		1059.0	SUBGRADE
54	STATION 11+10, 270' LEFT OF DAM CENTERLINE		987.0	SUBGRADE
55	STATION 3+50, 12' LEFT OF DAM CENTERLINE	5.5	1076.0	SUBBASE FILL
56	STATION 5+50, 18' RIGHT OF DAM CENTERLINE	13.0	1071.0	SUBBASE FILL
57	STATION 4+00, 6' LEFT OF DAM CENTERLINE	13.0	1076.0	SUBBASE FILL
58	STATION 5+00, 12' RIGHT OF DAM CENTERLINE	15.0	1074.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10./64-66 BID#13
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP

GREINER, INC.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
59		7.8	122.4	0.0	2	128.5	7.5	95		95	YES
60		7.6	122.9	0.0	2	128.5	7.5	96		95	YES
61		6.4	126.5	0.0	3	137.4	1.0	92		90	YES
62		5.4	124.3	0.0	3	137.4	1.0	90		90	YES
63		5.9	123.9	0.0	3	137.4	1.0	90		90	YES
64		6.5	121.6	0.0	2	128.5	7.5	95		95	YES
65		6.7	122.3	0.0	2	128.5	7.5	95		95	YES
66		7.0	122.0	0.0	2	128.5	7.5	95		95	YES
67		6.3	120.5	0.0	2	128.5	7.5	94		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
59	STATION 6+00, 8' LEFT OF DAM CENTERLINE	9.0	1070.0	SUBBASE FILL
60	STATION 6+25, 10' RIGHT OF DAM CENTERLINE	7.0	1069.0	SUBBASE FILL
61	STATION 9+50, 130' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
62	STATION 11+50, 140' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
63	STATION 12+00, 110' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
64	STATION 0+50, RIGHT OF OULET CENTERLINE	1.0	1002.0	SUBBASE FILL
65	STATION 1+00, RIGHT OF OUTLET CENTERLINE	2.0	1001.0	SUBBASE FILL
66	STATION 1+20, RIGHT OF OUTLET CENTERLINE	1.0	999.0	SUBBASE FILL
67	STATION 4+00, 60' RIGHT OF CENTERLINE	1.0	1064.0	SUBBASE FILL

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10./64-66 BID#13
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MP
GREINER, INC.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485
Authorized By WOODY THOMAS Date 08-16-95
Tested By P. LLEWELLYN/WT Date 08-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
36		3.7	123.3	0.0	2	128.5	7.5	96		95	YES
37		6.5	122.2	0.0	2	128.5	7.5	95		95	YES
38		7.2	124.4	0.0	2	128.5	7.5	97		95	YES
39		7.9	126.0	0.0	2	128.5	7.5	98		95	YES
40		8.4	122.0	0.0	2	128.5	7.5	95		95	YES
41		8.6	125.1	0.0	2	128.5	7.5	97		95	YES
42		7.8	123.1	0.0	2	128.5	7.5	96		95	YES
43		7.5	123.8	0.0	2	128.5	7.5	96		95	YES
44		7.2	121.6	0.0	2	128.5	7.5	95		95	YES
45		5.8	119.7	0.0	2	128.5	7.5	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
36	STATION 11+25, 125' LEFT OF DAM CENTERLINE		1007.0	SUBGRADE
37	STATION 11+20, 150' LEFT OF DAM CENTERLINE		1005.0	SUBGRADE
38	STATION 2+50, 20' LEFT OF DAM CENTERLINE	4.0	1077.0	SUBBASE FILL
39	STATION 4+00, 22' RIGHT OF DAM CENTERLINE	7.0	1070.0	SUBBASE FILL
40	STATION 4+00, 20' RIGHT OF DAM CENTERLINE	10.0	1073.0	SUBBASE FILL
41	STATION 5+00, 15' LEFT OF DAM CENTERLINE	9.0	1068.0	SUBBASE FILL
42	STATION 5+00, 6' RIGHT OF DAM CENTERLINE	12.0	1071.0	SUBBASE FILL
43	STATION 6+00, 18' LEFT OF DAM CENTERLINE	2.5	1063.5	SUBBASE FILL
44	STATION 6+00, 20' RIGHT OF DAM CENTERLINE	5.5	1066.5	SUBBASE FILL
45	STATION 10+00, 125' LEFT OF DAM CENTERLINE, STRIP DRAIN		994.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 36,37, 45-47 BID #6,/38,39, 40-44, BID #9,/48 BID #10, MAX RELATIVE
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

95 MP
GREINER, INC.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485
Authorized By WOODY THOMAS Date 08-16-95
Tested By P. LLEWELLYN/WT Date 08-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
46		6.6	122.5	0.0	2	128.5	7.5	95		95	YES
47		6.9	123.1	0.0	2	128.5	7.5	96		95	YES
48		5.0	125.9	0.0	3	137.4	1.0	92		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
46	RETEST 45A		994.0	SUBGRADE
47	STATION 10+50, 130' LEFT OF DAM CENTERLINE, STRIP DRAIN		994.0	SUBGRADE
48	STATION 10+15, 70' LEFT OF DAM CENTERLINE, STRIP DRAIN	2.0	999.0	SUBBASE FILL

Comments: 36,37, 45-47 BID #6,/38,39, 40-44, BID #9,/48 BID #10, MAX RELATIVE
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

9S
MAP
GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450450-4
Authorized By WOODY THOMAS Date 08-14-95
Tested By P. LLEWELLYN/WT Date 08-14-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3155 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
27		5.6	121.7	0.0	2	128.5	7.5	95		95	YES
28		7.3	119.4	0.0	2	128.5	7.5	93		95	NO
29		5.2	116.9	0.0	2	128.5	7.5	91		95	NO
30		3.5	121.5	0.0	2	128.5	7.5	95		95	YES
31		6.2	121.7	0.0	2	128.5	7.5	95		95	YES
32		6.6	122.2	0.0	2	128.5	7.5	95		95	YES
33		4.9	124.1	0.0	2	128.5	7.5	97		95	YES
34		6.4	131.2	0.0	3	137.4	1.0	95		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
27	STATION 10+50, 20' LEFT OF CENTERLINE		1000.0	SUBGRADE
28	STATION 10+30, 65' LEFT OF CENTERLINE		995.0	SUBGRADE
29	STATION 11+30, 85' LEFT OF CENTERLINE		995.0	SUBGRADE
30	RETEST 29A		995.0	SUBGRADE
31	RETEST 28A		995.0	SUBGRADE
32	STATION 3+10, 10' RIGHT OF CENTERLINE		1072.0	SUBBASE FILL
33	STATION 5+00, 12' RIGHT OF CENTERLINE		1067.C	SUBBASE FILL
34	STATION 5+50, 12' LEFT OF CENTERLINE		1063.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 27-31 BID #6,/32 & 33 BID #9,/34 BID #10
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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GREINER, INC.

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REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

B1#1

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LABORATORY REPORT

PHYSICAL PROPERTIES OF SOILS

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450583
Date of Report 11/13/95
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location	Laughlin, Nevada	Sampled By	R. Nickerson/WT	Date	11/08/95
Type of Material	Sand w/gravel trace of silt	Submitted By	R. Nickerson/WT	Date	11/08/95
Source of Material	Top of East bank at basin	Authorized By	K. Smith	Date	11/08/95

Sieve Analysis, ASTM D422-

Sieve Size	% Passing Accumulative	Specification
3″	96	
2½″		
2″	94	
1½″		
1″	93	
¾″	92	
½″	89	
⅜″	88	
¼″	82	
No. 4	75	
8	56	
10	52	
16	37	
30	21	
40	16	
50	12	
100	7	
200	3.9	
Finer than 200 ASTM D1140-		

Soil Classification

Liquid Limit and Plasticity of Soils
ASTM D4318- LL = ______ PI = ______

Moisture - Density Relations
☐ ASTM D698- ; ☒ ASTM D1557- ; Method B
Maximum Dry Density, pcf 126.0
Optimum Moisture, % 10.0

Specific Gravity of Soils (minus No. 4 material)
ASTM D854- Specific Gravity ______

Resistance 'R' Value of Compacted Soils
ASTM D2844- 'R' Value ______

Other:

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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PDQ FORM #55

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SOIL / AGGREGATE – MOISTURE DENSITY RELATIONS

Job No. 27455C249

Client Greiner, Inc. Project Hiko Springs

Event / Invoice No. ______

Type of Material Silty sand w/gravel Sampled By Pllewellyn Date 11/8/95

Source of Material top of east bank @ basin Submitted By 〃 Date 〃

Tested / Calc. By ______ Date ______

Test Procedure ASTM D1557 / METHOD B Reviewed By ______ Date ______

Trial No.	1	2	3	4	5	6	7
Water, Estimated %							
Water, cc	150	200	250	300			
Sample + Mold Weight, gms	3955	4003	4050	4050			
Mold Weight, gms	2015						
Wet Sample Weight, gms	1940	1983	2035	2035			
Wet Sample Weight, lbs	4.277	4.383	4.486	4.486			
Wet Density, pcf	128.4	131.6	134.7	134.7			
Moisture Sample Wet, gms	251.7	256.3	276.8	268.9			
Moisture Sample Dry, gms	234.2	236.6	251.9	241.2			
Weight of Water, gms	17.5	19.7	24.9	27.7			
Moisture, %	7.2	8.3	9.9	11.5			
Dry Density, pcf	119.8	121.5	122.6	120.8			

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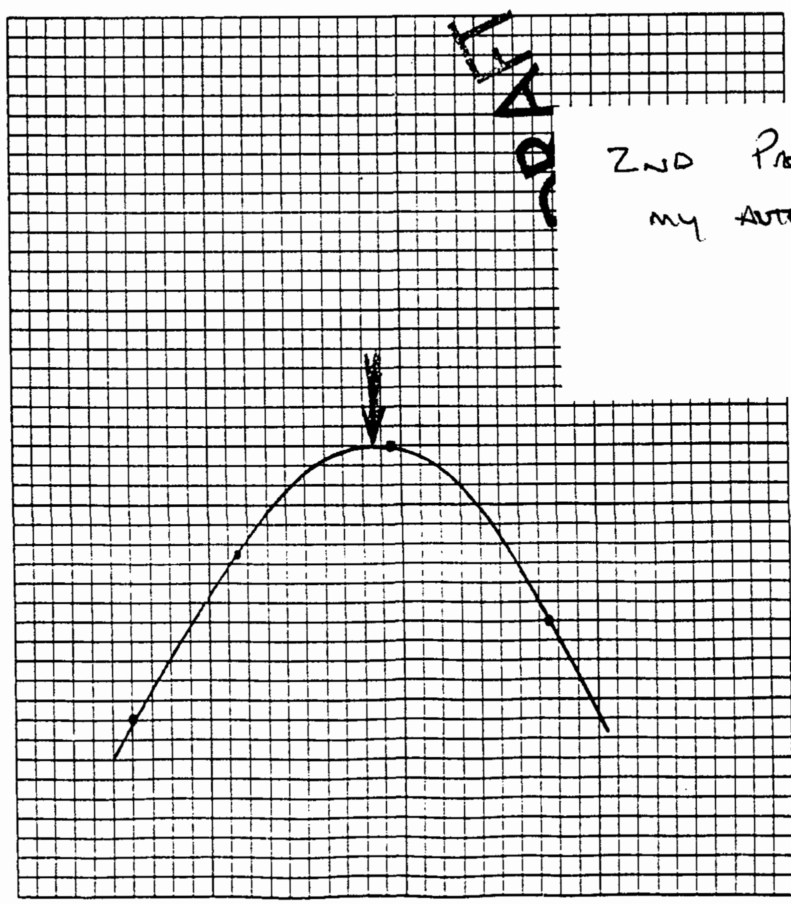
124

122

120

DRY DENSITY – PCF



MOISTURE CONTENT, % DRY WEIGHT

6 10 12

2ND PROCTOR
my AUTHORIZATION

Maximum Dry Density, pcf 123.0

Moisture Content, % ~~9.7~~ 10.0

ed Density, pcf ~~129.0~~ 126.0

of Mold, in. 4"

Mold, in. 4.584

No. of Layers 5

Blows Per Layer 25

Weight of Hammer, lbs 10

Height of Drop 18"

Material Used -3/8"

% Oversize 21%

~~Total #4~~

53.6 grams/lb

SOIL / AGGREGATE – MOISTURE DENSITY RELATIONS

Job No. 774SJ2249

Client Gruner Inc   Project Hiko Springs

Event / Invoice

Type of Material   Sampled By   Date 8-24

Source of Material Sta #12+50 170' Rt ℄ 1009' elev   Submitted   Date

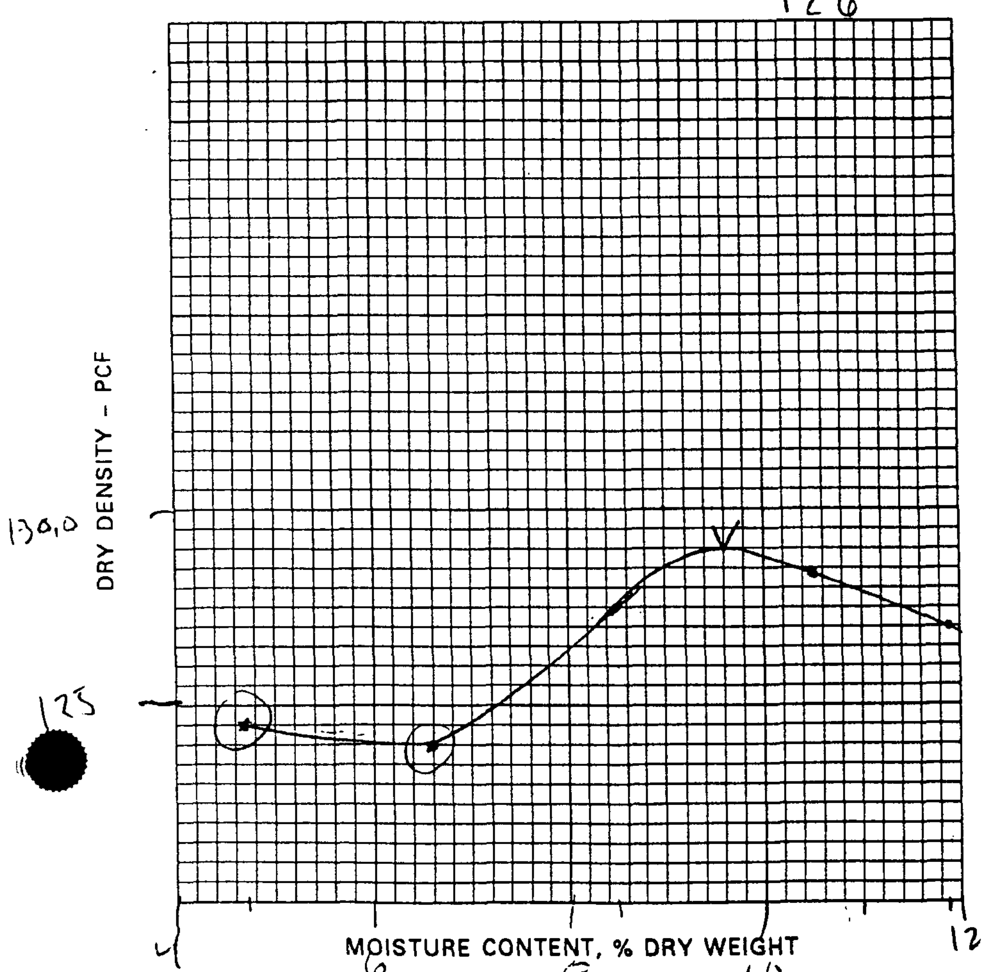
Date

Test Procedure ASTM D1557   Date

3/4 Proctors (line #6) billed = 6 (paid 4) 2 on 8/25 Holding need 3 more to do

Trial No.	1	2	3				7
Water, Estimated %	6	8	10	1			
Water, cc	256	350	450	55			
Sample + Mold Weight, gms	10980.6	11038.0	11248.1	11364.6	11456.4		
Mold Weight, gms	6544.0						
Wet Sample Weight, gms	4436.6	4494	4704.1	4820.6	4912.4		
Wet Sample Weight, lbs	9.781	9.907	10.37	10.63	10.83		
Wet Density, pcf	130.41	132.1	138.3	141.7	144.4		
Moisture Sample Wet, gms	4349.0	4480.0	4670.9	4794.7	4820.9		
Moisture Sample Dry, gms	4153.6	4203.1	4303.3	4339.5	4307.8		
Weight of Water, gms							
Moisture, %	4.7	6.6	8.5	10.5	11.9		
Dry Density, pcf	124.5	124.0	127.4 (126)	128.3	129.0		

COPY



Maximum Dry Density, pcf 129.0

Optimum Moisture Content, % ~~9.0~~ 9.5

Corrected Density, pcf N/A

Diameter of Mold, in. 6"

Height of Mold, in. 4.58

No. of Layers 5

Blows Per Layer 56

Weight of Hammer, lbs 10

Height of Drop 18

Material Used -3/4"

% Oversize

Total #4

SOIL / AGGREGATE – MOISTURE DENSITY RELATIONS

Job No. 2745JC232-2

Client American Asphalt Project Hiko Wash

Event / Invoice No.

Type of Material Sand w/ gravel/trace silt — Sampled By [illegible] — Date 8-10-9[illegible]

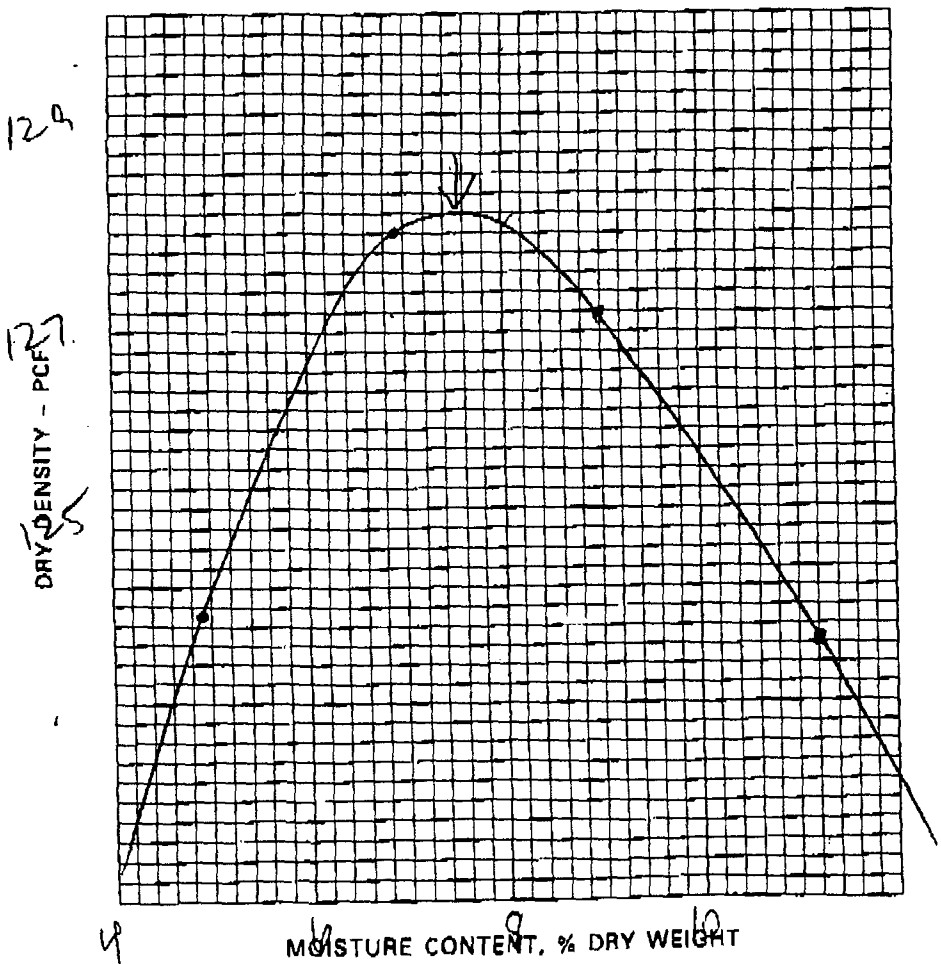
Source of Material Bid #6 embankment over-excavation sta# 4+05 15' Rt of ℄ — Submitted By — Date

Tested / Calc. By — Date

Test Procedure ASTM D1557 C — Reviewed By — Date

Trial No.	1	2	3	4	5	6	7
Water, Estimated %	0	2%	4%	6%			
Water, cc	4515	110	220	330			
Sample + Mold Weight, gms	9941.8	10161.7	10222.8	10189.2			95 MW
Mold Weight, gms	5513.4	5513.4	5513.4	5513.4			
Wet Sample Weight, gms	4428.4	4648.3	4709.4	4675.8			
Wet Sample Weight, lbs	9.76	10.25	10.38	10.31			
Wet Density, pcf	130.2	136.6	138.4	137.4			
Moisture Sample Wet, gms	675.8	547.8	624.9	613.0			
Moisture Sample Dry, gms	644.3	512.4	573.3	551.3			
Weight of Water, gms	31.5	35.4	51.6	61.7			
Moisture, %	4.9	6.9	9.0	11.2			
Dry Density, pcf	124.1	127.8	127.0	123.6			

DRAFT



Maximum Dry Density, pcf 128.0

Optimum Moisture Content, % 7.5

Corrected Density, pcf 128.6 128.5

Diameter of Mold, in. 6"

Height of Mold, in. 4.584"

No. of Layers 5

Blows Per Layer 56

Weight of Hammer, lbs 10#

Height of Drop 18"

Material Used -3/4"

% Oversize 2.6% +#4

Total #4 94.7%

124053.8g TTL

120856.6 TTL #4

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LABORATORY REPORT

PHYSICAL PROPERTIES OF SOILS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450527
Date of Report 10/04/95
Reviewed By [signature]

Project Hiko Springs Wash Dentention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 09/22/95

Type of Material Sand w/gravel — Submitted By J. Waddell/WT — Date 09/22/95

Source of Material Native/Sta. 11+50, 800' Right of centerline — Authorized By K. Smith — Date 09/22/95

Sieve Analysis, ASTM D422-

Sieve Size	% Passing Accumulative	Specification
3"		
2½"		
2"		
1½"		
1"		
¾"	100	
½"	97	
⅜"	93	
¼"	84	
No. 4	76	
8	51	
10	49	
16	29	
30	16	
40	12	
50	10	
100	7	
200	5.1	
Finer than 200 ASTM D1140-		

Soil Classification

Liquid Limit and Plasticity of Soils — LL =
ASTM D4318- — PI =

Moisture - Density Relations — Maximum Dry Density, pcf
☐ ASTM D698- ; ☐ ASTM D1557- ; Method — Optimum Moisture, %

Specific Gravity of Soils (minus No. 4 material)
ASTM D854- — Specific Gravity

Resistance 'R' Value of Compacted Soils
ASTM D2844- — 'R' Value

Other:

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/ Wayne Phelps (2)

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[illegible] WT [illegible] 10/9/95 p1

Embankment Overexcavation

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-18-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-17
Authorized By KEN SMITH Date 09-11-95
Tested By P. LLEWELLYN/WT Date 09-11-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3089** H_2O **618**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
237		3.4	126.6	0.0	2	128.5	7.5	99		95	YES
238		5.0	123.0	0.0	2	128.5	7.5	96		95	YES
239		6.0	123.7	0.0	2	128.5	7.5	96		95	YES
240		6.2	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	TEST LOCATION, VERTICAL: Elevation *	MATERIAL TESTED
237	RETEST 187A	2.0	993.0	SUBBASE FILL
238	STA. 13+00, HORIZONTAL STRIP DRAIN		992.0	SUBGRADE
239	STA. 11+00, 125' LEFT OF CENTERLINE	15.0	1009.0	SUBBASE FILL
240	STA. 11+50, 175' LEFT OF CENTERLINE	17.5	1009.5	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #6, 238, BID #9, 239 & 240, BID #10, 237**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

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REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-13-95
Job No. 2745JC249
Event/Invoice No. 27450485-16
Authorized By KEN SMITH Date 09-08-95
Tested By P. LLEWELLYN/WT Date 09-08-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
227		6.8	123.2	0.0	2	128.5	7.5	96		95	YES
228		7.0	119.8	0.0	2	128.5	7.5	93		95	NO
229		4.7	119.4	0.0	2	128.5	7.5	93		95	NO
230		7.2	122.3	0.0	2	128.5	7.5	95		95	YES
231		5.6	123.6	0.0	2	128.5	7.5	96		95	YES
232		4.9	115.2	0.0	2	128.5	7.5	90		95	NO
233		5.0	116.7	0.0	2	128.5	7.5	91		95	NO
234		8.2	121.7	0.0	2	128.5	7.5	95		95	YES
235		5.3	122.5	0.0	2	128.5	7.5	95		95	YES
236		5.6	122.1	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
227	STA. 10+60, 70' LEFT OF CENTERLINE	18.0	1013.0	SUBBASE FILL
228	STA. 11+00, 140' LEFT OF CENTERLINE	17.0	1011.5	SUBBASE FILL
229	STA. 11+20, 225' LEFT OF CENTERLINE	16.0	1006.5	SUBBASE FILL
230	RETEST 228A	17.0	1011.5	SUBBASE FILL
231	RETEST 229A	16.0	1006.5	SUBBASE FILL
232	STA. 14+25, 165' RIGHT OF CENTERLINE		1008.0	SUBGRADE
233	STA. 14+50, 125' RIGHT OF CENTERLINE		1005.0	SUBGRADE
234	STA. 14+30, 75' RIGHT OF CENTERLINE		1003.0	SUBGRADE
235	RETEST 232A		1008.0	SUBGRADE
236	RETEST 233A		1005.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 232-236, BID #9, 227-231
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95 WAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-11
Authorized By WOODY THOMAS Date 08-31-95
Tested By P. LLEWELLYN/WT Date 08-31-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
173		3.4	125.0	0.0	2	128.5	7.5	97		95	YES
174		5.7	120.1	0.0	2	128.5	7.5	93		95	NO
175		6.3	122.3	0.0	2	128.5	7.5	95		95	YES
176		5.7	125.5	0.0	2	128.5	7.5	98		95	YES
177		5.8	120.9	0.0	2	128.5	7.5	94		95	NO
178		5.5	124.4	0.0	2	128.5	7.5	97		95	YES
179		7.0	125.1	0.0	2	128.5	7.5	97		95	YES
180		5.4	125.7	0.0	2	128.5	7.5	98		95	YES
181		5.6	125.9	0.0	3	137.4	1.0	92		90	YES
182		2.8	128.0	0.0	3	137.4	1.0	93		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
173	STA. 11+00, 125' LEFT OF CENTERLINE	13.0	1007.0	SUBBASE FILL
174	TRANSVERSE STRIP DRAIN, STA. 13+00, 260' LEFT OF CL		991.0	SUBGRADE
175	TRANSVERSE STRIP DRAIN, STA. 13+50, 250' LEFT OF CL		991.0	SUBGRADE
176	TRANSVERSE STRIP DRAIN, STA. 14+00, 260' LEFT OF CL		991.0	SUBGRADE
177	RETEST 174A		991.0	SUBGRADE
178	RETEST 174B		991.0	SUBGRADE
179	STA. 11+50, 75' RIGHT OF CENTERLINE	6.0	1010.0	SUBBASE FILL
180	STA. 11+10, 60' LEFT OF CENTERLINE	12.0	1007.0	SUBBASE FILL
181	TRANSVERSE STRIP DRAIN, STA. 12+00, 260' LEFT OF CL	2.0	993.0	SUBBASE FILL
182	DRAIN BLANKET, STA. 6+75, 55' LEFT OF CL	2.0	1063.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #6, 174-178, BID #9, 173, 179-182
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
IMP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249
Event/Invoice No. 27450485-10
Authorized By WOODY THOMAS Date 08-30-95
Tested By P. LLEWELLYN/WT Date 08-30-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
167		5.5	121.7	0.0	2	128.5	7.5	95		95	YES
168		6.3	122.2	0.0	2	128.5	7.5	95		95	YES
169		7.1	111.3	0.0	2	128.5	7.5	87		95	NO
170		5.5	122.8	0.0	2	128.5	7.5	96		95	YES
171		6.1	121.9	0.0	2	128.5	7.5	95		95	YES
172		3.1	123.9	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
167	RETEST 157B		991.0	SUBGRADE
168	RETEST 158B		991.0	SUBGRADE
169	STA. 10+00, 285' LEFT OF CENTERLINE	7.0	999.0	SUBBASE FILL
170	STA. 10+50, 230' LEFT OF CENTERLINE	5.0	1001.0	SUBBASE FILL
171	RETEST 169A	7.0	999.0	SUBBASE FILL
172	STA. 11+90, 80' RIGHT OF CENTERLINE	4.0	1008.5	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 167, 168, BID #9, 169-172
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

9/5 MP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249

Event/Invoice No. 27450485-9
Authorized By WOODY THOMAS Date 08-29-95
Tested By P. LLEWELLYN/WT Date 08-29-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
151		4.7	117.4	0.0	2	128.5	7.5	91		95	NO
152		5.3	121.6	0.0	2	128.5	7.5	95		95	YES
153		4.1	119.8	0.0	2	128.5	7.5	93		95	NO
154		5.5	122.7	0.0	2	128.5	7.5	95		95	YES
155		3.2	122.1	0.0	2	128.5	7.5	95		95	YES
156		3.2	123.6	0.0	2	128.5	7.5	96		95	YES
157		4.2	113.6	0.0	2	128.5	7.5	88		95	NO
158		4.9	116.5	0.0	2	128.5	7.5	91		95	NO
159		3.8	119.5	0.0	2	128.5	7.5	93		95	NO
160		4.5	119.0	0.0	2	128.5	7.5	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
151	STA. 10+80, 100' LEFT OF CENTERLINE	12.0	1005.5	SUBBASE FILL
152	STA. 10+00, 150' LEFT OF CENTERLINE	10.0	1004.0	SUBBASE FILL
153	STA. 9+50, 200' LEFT OF CENTERLINE	8.0	1003.0	SUBBASE FILL
154	RETEST ~~157A~~ 151A	12.0	1005.5	SUBBASE FILL
155	RETEST 153A	8.0	1003.0	SUBBASE FILL
156	HORIZONTAL STRIP DRAIN, STA. 12+50		991.0	SUBGRADE
157	HORIZONTAL STRIP DRAIN, STA. 12+00		991.0	SUBGRADE
158	HORIZONTAL STRIP DRAIN, STA. 11+50		991.0	SUBGRADE
159	STA. 10+25, 200' RIGHT OF CENTERLINE	3.0	1012.0	SUBBASE FILL
160	STA. 10+50, 80' RIGHT OF CENTERLINE	5.0	1010.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 156-158, 162,163, BID #9, 151-155, 159-161, 164-166
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAT

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-07-95
Job No. 2745JC249 Page 2 of 2
Event/Invoice No. 27450485-9
Authorized By WOODY THOMAS Date 08-29-95
Tested By P. LLEWELLYN/WT Date 08-29-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
161		8.5	115.9	0.0	2	128.5	7.5	90		95	NO
162		10.2	118.5	0.0	2	128.5	7.5	92		95	NO
163		7.5	115.0	0.0	2	128.5	7.5	89		95	NO
164		4.4	121.6	0.0	2	128.5	7.5	95		95	YES
165		2.5	121.5	0.0	2	128.5	7.5	95		95	YES
166		4.4	125.0	0.0	2	128.5	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
161	STA. 12+50, 125' RIGHT OF CENTERLINE	4.0	1008.0	SUBBASE FILL
162	RETEST 157A		991.0	SUBGRADE
163	RETEST 158A		991.0	SUBGRADE
164	RETEST 159A	3.0	1012.0	SUBBASE FILL
165	RETEST 160A	5.0	1010.0	SUBBASE FILL
166	RETEST 161A	4.0	1008.0	SUBBASE FILL

Comments: BID #6, 156-158, 162,163, BID #9, 151-155, 159-161, 164-166
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-07-95
Job No. 2745JC249
Event/Invoice No. 27450485-6
Authorized By WOODY THOMAS Date 08-24-95
Tested By P. LLEWELLYN/WT Date 08-24-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
111		6.8	123.5	0.0	2	128.5	7.5	96		95	YES
112		7.3	123.9	0.0	2	128.5	7.5	96		95	YES
113		5.6	118.5	0.0	2	128.5	7.5	92		95	NO
114		4.8	117.7	0.0	2	128.5	7.5	92		95	NO
115		4.6	116.3	0.0	2	128.5	7.5	91		95	NO
116		4.5	119.1	0.0	2	128.5	7.5	93		95	NO
117		3.7	125.9	0.0	2	128.5	7.5	98		95	YES
118		5.5	117.1	0.0	2	128.5	7.5	91		95	NO
119		7.4	125.3	0.0	2	128.5	7.5	98		95	YES
120		6.2	120.1	0.0	2	128.5	7.5	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
111	RETEST 109A	6.0	1001.0	SUBBASE FILL
112	RETEST 110A	6.0	1001.0	SUBBASE FILL
113	STA. 11+00, 150' LEFT OF CENTERLINE	8.0	1002.0	SUBBASE FILL
114	STA. 10+50, 40' RIGHT OF CENTERLINE		1003.0	SUBGRADE
115	STA. 11+50, 30' RIGHT OF CENTERLINE		1003.0	SUBGRADE
116	STA. 11+50, 75' RIGHT OF CENTERLINE		1005.0	SUBGRADE
117	STA. 11+00, 75' RIGHT OF CENTERLINE		1005.0	SUBGRADE
118	STA. 12+20, 60' RIGHT OF CENTERLINE		1005.0	SUBGRADE
119	RETEST 115A		1003.0	SUBGRADE
120	RETEST 114A		1003.0	SUBGRADE

RETEST 113, PASSING RETEST 114? GM

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: MOISTURE SPECIFICATION, BID #6-114-134, 143, BID #9-111-113,135-142
* DATUM TOPOGRAPHIC, TEST 133 APPROVED BY KEN SMITH, GREINER ENG.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MAP.
GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-07-95
Job No. 2745JC249
Event/Invoice No. 27450485-6
Authorized By WOODY THOMAS Date 08-24-95
Tested By P. LLEWELLYN/WT Date 08-24-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
121		4.2	120.7	0.0	2	128.5	7.5	94		95	NO
122		6.3	118.1	0.0	2	128.5	7.5	92		95	NO
123		7.4	118.0	0.0	2	128.5	7.5	92		95	NO
124		7.4	127.7	0.0	2	128.5	7.5	99		95	YES
125		4.6	118.6	0.0	2	128.5	7.5	92		95	NO
126		7.5	118.3	0.0	2	128.5	7.5	92		95	NO
127		8.2	116.8	0.0	2	128.5	7.5	91		95	NO
128		7.6	125.7	0.0	2	128.5	7.5	98		95	YES
129		4.5	121.8	0.0	2	128.5	7.5	95		95	YES
130		10.0	120.6	0.0	2	128.5	7.5	94		95	NO
131		8.7	120.2	0.0	2	128.5	7.5	94		95	NO
132		5.3	126.1	0.0	2	128.5	7.5	98		95	YES
133		7.6	117.4	0.0	2	128.5	7.5	91		95	NO
134		7.8	126.7	0.0	2	128.5	7.5	99		95	YES
135		6.5	126.9	0.0	2	128.5	7.5	99		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
121	RETEST 116A		1003.0	SUBGRADE
122	RETEST 118A		1003.0	SUBGRADE
123	RETEST 114B		1003.0	SUBGRADE
124	RETEST 116B		1005.0	SUBGRADE
125	RETEST 118B		1005.0	SUBGRADE
126	RETEST 114C		1003.0	SUBGRADE
127	RETEST 118C		1005.0	SUBGRADE
128	STA. 12+50, 140' RIGHT OF CENTERLINE		1007.0	SUBGRADE
129	STA. 10+30, 140' RIGHT OF CENTERLINE		1007.0	SUBGRADE
130	STA 11+20, 175' RIGHT OF CENTERLINE		1009.0	SUBGRADE
131	STA. 12+50, 170' RIGHT OF CENTERLINE		1009.0	SUBGRADE
132	RETEST 118D		1005.0	SUBGRADE
133	RETEST 114D		1003.0	SUBGRADE
134	RETEST 131A		1009.0	SUBGRADE
135	STA. 11+20, 50' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL

Comments: **MOISTURE SPECIFICATION, BID #6-114-134, 143; BID #9-111-113,135-142**
• DATUM TOPOGRAPHIC, TEST 133 APPROVED BY KEN SMITH, GREINER ENG.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

95 ANP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 09-07-95
Job No. 2745JC249
Event/Invoice No. 27450485-6
Authorized By WOODY THOMAS Date 08-24-95
Tested By P. LLEWELLYN/WT Date 08-24-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
136		7.3	119.6	0.0	2	128.5	7.5	93		95	NO
137		6.8	121.7	0.0	2	128.5	7.5	95		95	YES
138		6.4	121.6	0.0	2	128.5	7.5	95		95	YES
139		5.9	127.1	0.0	2	128.5	7.5	99		95	YES
140		3.3	126.2	0.0	2	128.5	7.5	98		95	YES
141		6.3	126.0	0.0	2	128.5	7.5	98		95	YES
142		6.8	125.8	0.0	2	128.5	7.5	98		95	YES
143		3.2	122.7	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
136	STA. 11+20, 150' LEFT OF CENTERLINE	8.0	1002.0	SUBBASE FILL
137	STA. 10+00, 100' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL
138	STA. 9+50, 50' LEFT OF CENTERLINE	13.0	1006.0	SUBBASE FILL
139	STA. 9+50, 50' LEFT OF CENTERLINE	13.0	1006.0	SUBBASE FILL
140	RETEST 136A	8.0	1002.0	SUBBASE FILL
141	STA. 11+20, 50' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL
142	STA. 11+20, 50' LEFT OF CENTERLINE	11.0	1005.0	SUBBASE FILL
143	STA/ 11+00, 215' RIGHT OF CENTERLINE		1011.0	SUBGRADE

Comments: MOISTURE SPECIFICATION, BID #6-114-134, 143, BID #9-111-113,135-142
• DATUM TOPOGRAPHIC, TEST 133 APPROVED BY KEN SMITH, GREINER ENG.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95mp

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-08-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-15
Authorized By KEN SMITH Date 12-04-95
Tested By P. LLEWELLYN/WT Date 12-04-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3088 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
569		6.2	123.5	0.0	2	128.5	7.5	96		95	YES
570		6.0	121.9	0.0	2	128.5	7.5	95		95	YES
571		7.2	122.2	0.0	2	128.5	7.5	95		95	YES
572		7.5	122.5	0.0	2	128.5	7.5	95		95	YES
573		7.3	122.8	0.0	2	128.5	7.5	96		95	YES
574		7.0	123.6	0.0	2	128.5	7.5	96		95	YES
575		6.7	123.2	0.0	2	128.5	7.5	96		95	YES
576		6.5	123.1	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
569	2200' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
570	2600' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
571	3200' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
572	3900' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
573	4200' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
574	4800' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
575	1400' WEST OF EAST END OF ACCESS ROAD #1		100.0	SUBGRADE
576	2000' WEST OF EAST END OF ACCESS ROAD #1		100.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

RECEIVED

DEC 12 1995

GREINER, INC.

Comments: BID #24
* DATUM 100 = FINISH SUBGRADE ELEV.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-08-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-13
Authorized By KEN SMITH Date 12-01-95
Tested By P. LLEWELLYN/WT Date 12-01-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3088 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
562		6.7	126.4	0.0	2	128.5	7.5	98		95	YES
563		7.1	126.9	0.0	2	128.5	7.5	99		95	YES
564		7.5	126.7	0.0	2	128.5	7.5	99		95	YES
565		8.1	127.1	0.0	2	128.5	7.5	99		95	YES
566		7.2	126.0	0.0	2	128.5	7.5	98		95	YES
567		6.8	122.6	0.0	2	128.5	7.5	95		95	YES
568		6.3	122.2	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
562	400' WEST OF EAST END OF ACCESS ROAD #1		100.0	SUBGRADE
563	500' WEST OF EAST END OF ACCESS ROAD #1		100.0	SUBGRADE
564	500' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
565	1100' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
566	1900' NORTHWEST OF SOUTHEAST END OF ACCESS ROAD #2		100.0	SUBGRADE
567	STA. 16+00, 10' RIGHT OF CL, SEDEMENT BERM		1003.0	SUBGRADE
568	STA. 13+50, 12' LEFT OF CL, SEDEMENT BERM		1003.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

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DEC 12 1995
GREINER, INC.

Comments: BID #7-567 & 568, BID #24-562-566
* DATUM 100=FINISH SUBGRADE ELEV.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-06-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 2745632-11
Authorized By KEN SMITH Date 11-30-95
Tested By P. LLEWELLYN/WT Date 11-30-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
97		7.0	129.9	0.0	6	133.6	7.6	97		96	YES
91		7.2	130.7	0.0	6	133.6	7.6	98		96	YES
92		7.5	129.7	0.0	6	133.6	7.6	97		96	YES
93		7.0	129.3	0.0	6	133.6	7.6	97		96	YES
101		6.8	131.3	0.0	6	133.6	7.6	98		96	YES
102		7.4	128.8	0.0	6	133.6	7.6	96		96	YES
103		7.6	129.6	0.0	6	133.6	7.6	97		96	YES
104		7.2	129.3	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
97	STA. 11+00, UPSTREAM SLOPE	2.5	1064.0	SOIL CEMENT
91	STA. 16+75, UPSTREAM SLOPE	2.5	1065.0	SOIL CEMENT
92	STA. 10+00, UPSTREAM SLOPE	2.5	1066.0	SOIL CEMENT
93	STA. 14+50, UPSTREAM SLOPE	2.5	1067.0	SOIL CEMENT
101	STA. 13+25, UPSTREAM SLOPE	2.5	1068.0	SOIL CEMENT
102	STA. 17+00, UPSTREAM SLOPE	2.5	1069.0	SOIL CEMENT
103	STA. 21+50, UPSTREAM SLOPE	2.5	1070.0	SOIL CEMENT
104	STA. 15+50, UPSTREAM SLOPE	2.5	1071.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-28-95
Job No. 2745JC249
Event/Invoice No. 27450527-5
Authorized By KEN SMITH Date 09-25-95
Tested By P. LLEWELLYN/WT Date 09-25-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
301		2.9	130.9	0.0	3	137.4	1.0	95		90 ~~95~~	YES
302		4.3	132.3	0.0	3	137.4	1.0	96		90 ~~95~~	YES
303		3.9	131.2	0.0	3	137.4	1.0	95		90 ~~95~~	YES
304		4.8	131.5	0.0	3	137.4	1.0	96		90 ~~95~~	YES
305		5.3	122.5	0.0	2	128.5	7.5	95		95	YES
306		6.0	122.9	0.0	2	128.5	7.5	96		95	YES
307		4.9	123.0	0.0	2	128.5	7.5	96		95	YES
308		6.2	122.6	0.0	2	128.5	7.5	95		95	YES
309		6.0	122.2	0.0	2	128.5	7.5	95		95	YES
310		6.3	122.6	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
301	STA. 15+50, 130' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	996.0	SUBBASE FILL
302	STA. 15+30, 75' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	994.0	SUBBASE FILL
303	STA. 15+60, 120' LEFT OF CENTERLINE, BLANKET DRAIN	4.0	996.0	SUBBASE FILL
304	STA. 15+50, 125' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	996.0	SUBBASE FILL
305	STA. 15+50, 130' LEFT OF CENTERLINE		992.0	SUBGRADE
306	STA. 16+15, 150' LEFT OF CENTERLINE		1000.0	SUBGRADE
307	STA. 16+50, 175' LEFT OF CENTERLINE		1002.0	SUBGRADE
308	STA. 17+00, 150' LEFT OF CENTERLINE		1004.0	SUBGRADE
309	STA. 10+00, 100' LEFT OF CENTERLINE	29.0	1021.0	SUBBASE FILL
310	STA. 12+00, 200' LEFT OF CENTERLINE	22.0	1016.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 305-308, BID #9, 309-312, BID #10, 301-304
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MMP

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-28-95
Job No. 2745JC249
Event/Invoice No. 27450527-5
Authorized By KEN SMITH Date 09-25-95
Tested By P. LLEWELLYN/WT Date 09-25-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
311		5.8	122.0	0.0	2	128.5	7.5	95		95	YES
312		5.3	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
311	STA. 13+00, 150' LEFT OF CENTERLINE	23.0	1012.0	SUBBASE FILL
312	STA. 14+50, 100' LEFT OF CENTERLINE	19.0	1009.0	SUBBASE FILL

Comments: BID #6, 305-308, BID #9, 309-312, BID #10, 301-304
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-18-95
Job No. 2745JC249
Event/Invoice No. 27450485-18
Authorized By KEN SMITH Date 09-12-95
Tested By P. LLEWELLYN/WT Date 09-12-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
241		2.2	119.4	0.0	2	128.5	7.5	93		95	NO
242		6.5	122.1	0.0	2	128.5	7.5	95		95	YES
243		5.2	123.7	0.0	2	128.5	7.5	96		95	YES
244		6.0	122.5	0.0	2	128.5	7.5	95		95	YES
245		5.1	126.4	0.0	2	128.5	7.5	98		95	YES
246		5.6	123.5	0.0	2	128.5	7.5	96		95	YES
247		5.2	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
241	STA. 1+20, 50' RIGHT OF OUTLET WORKS CENTERLINE	2.0	1013.0	SUBBASE FILL
242	RETEST 241A	2.0	1013.0	SUBBASE FILL
243	STA. 2+30, 15' RIGHT OF OUTLET WORKS CENTERLINE	2.0	1000.0	SUBBASE FILL
244	STA. 2+25, 15' RIGHT OF OUTLET WORKS CENTERLINE	4.0	1002.0	SUBBASE FILL
245	STA. 16+00 AT CENTERLINE		1013.0	SUBGRADE
246	STA. 2+30, 15' LEFT OF OUTLET WORKS CENTERLINE	3.0	1001.0	SUBBASE FILL
247	STA. 2+40, 15' LEFT OF OUTLET WORKS CENTERLINE	5.0	1003.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 245, BID #8, 241-244, 246 & 247
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-5
Authorized By WOODY THOMAS Date 08-23-95
Tested By P. LLEWELLYN/WT Date 08-23-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
100		7.0	115.4	0.0	2	128.5	7.5	90		95	NO
101		6.6	118.2	0.0	2	128.5	7.5	92		95	NO
102		6.8	118.9	0.0	2	128.5	7.5	93		95	NO
103		8.3	119.9	0.0	2	128.5	7.5	93		95	NO
104		4.6	119.6	0.0	2	128.5	7.5	93		95	NO
105		5.1	120.0	0.0	2	128.5	7.5	93		95	NO
106		8.0	115.9	0.0	2	128.5	7.5	90		95	NO
107		6.8	114.5	0.0	2	128.5	7.5	89		95	NO
108		6.8	113.4	0.0	2	128.5	7.5	88		95	NO
109		4.6	122.7	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
100	STA. 10+00, 75' LEFT OF CENTERLINE	6.0	1001.0	SUBBASE FILL
101	STA. 10+50, 150' LEFT OF CENTERLINE	6.0	1001.0	SUBBASE FILL
102	STA. 9+50, 200' LEFT OF CENTERLINE	6.0	1001.0	SUBBASE FILL
103	RETEST 100A	6.0	1001.0	SUBBASE FILL
104	RETEST 101A	6.0	1001.0	SUBBASE FILL
105	RETEST 102A	6.0	1001.0	SUBBASE FILL
106	STA. 10+50, 35' RIGHT OF CENTERLINE	6.0	1003.0	SUBBASE FILL
107	STA. 10+00, 40' RIGHT OF CENTERLINE	6.0	1003.0	SUBBASE FILL
108	STA. 10+50, 80' RIGHT OF CENTERLINE		1005.0	SUBBASE FILL
109	50' LEFT OF PT #455	6.0	1001.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: MOISTURE SPECIFICATION, BID #6, 100-105, 109 & 110,/ BID 9, 106-108
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485-5
Authorized By WOODY THOMAS Date 08-23-95
Tested By P. LLEWELLYN/WT Date 08-23-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
110		7.3	121.1	0.0	2	128.5	7.5	94		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
110	45.5 LEFT (S.), 50' EAST OF PT #455	6.0	1001.0	SUBBASE FILL

Comments: MOISTURE SPECIFICATION, BID #6, 100-105, 109 & 110,/ BID 9, 106-108
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-25-95
Job No. 2745JC249
Event/Invoice No. 27450485-3
Authorized By WOODY THOMAS Date 08-21-95
Tested By P. LLEWELLYN/WT Date 08-21-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
84		2.6	118.2	0.0	2	128.5	7.5	92	6.5 TO 11.5	95	NO
85		3.7	120.2	0.0	2	128.5	7.5	94	6.5 TO 11.5	95	NO
86		4.8	120.3	0.0	2	128.5	7.5	94	6.5 TO 11.5	95	NO
87		4.9	122.3	0.0	2	128.5	7.5	95	6.5 TO 11.5	95	NO
88		4.6	120.0	0.0	2	128.5	7.5	93		95	NO
89		8.9	121.9	0.0	2	128.5	7.5	95		95	YES
90		6.9	123.2	0.0	2	128.5	7.5	96		95	YES
91		7.8	123.6	0.0	2	128.5	7.5	96		95	YES
92		8.6	122.5	0.0	2	128.5	7.5	95		95	YES
93		7.6	123.6	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
84	STATION 10+00, 180' LEFT OF CENTERLINE	4.5	999.0	SUBBASE FILL
85	STATION 10+00, 182' LEFT OF CENTERLINE	4.5	999.0	SUBBASE FILL
86	STATION 10+50, 220' LEFT OF CENTERLINE	4.5	998.0	SUBBASE FILL
87	STATION 10+50, 220' LEFT OF CENTERLINE	4.5	998.0	SUBBASE FILL
88	STATION 9+50, 270' LEFT OF CENTERLINE	4.5	997.0	SUBBASE FILL
89	RETEST 84A	4.5	999.0	SUBBASE FILL
90	RETEST 85A	4.5	999.0	SUBBASE FILL
91	RETEST 86A	4.5	998.0	SUBBASE FILL
92	RETEST 87A	4.5	998.0	SUBBASE FILL
93	RETEST 88A	4.5	997.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #9, MOISTURE SPECIFICATION
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

9 95 MAP

GREINER, INC.

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(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
49		5.8	119.9	0.0	2	128.5	7.5	93		95	NO
50		6.1	120.8	0.0	2	128.5	7.5	94		95	NO
51		7.0	122.5	0.0	2	128.5	7.5	95		95	YES
52		7.3	123.1	0.0	2	128.5	7.5	96		95	YES
53		6.7	122.0	0.0	2	128.5	7.5	95		95	YES
54		8.5	122.7	0.0	2	128.5	7.5	95		95	YES
55		7.2	122.9	0.0	2	128.5	7.5	96		95	YES
56		8.1	122.6	0.0	2	128.5	7.5	95		95	YES
57		6.9	125.4	0.0	2	128.5	7.5	98		95	YES
58		7.2	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
49	STATION 4+00, 10' LEFT OF CENTERLINE	12.0	1075.0	SUBBASE FILL
50	STATION 5+50, 7' RIGHT OF CENTERLINE	12.0	1071.0	SUBBASE FILL
51	RETEST 49A	12.0	1075.0	SUBBASE FILL
52	RETEST 50A	12.0	1071.0	SUBBASE FILL
53	STATION 7+00, 15' RIGHT OF DAM CENTERLINE		1059.0	SUBGRADE
54	STATION 11+10, 270' LEFT OF DAM CENTERLINE		987.0	SUBGRADE
55	STATION 3+50, 12' LEFT OF DAM CENTERLINE	5.5	1076.0	SUBBASE FILL
56	STATION 5+50, 18' RIGHT OF DAM CENTERLINE	13.0	1071.0	SUBBASE FILL
57	STATION 4+00, 6' LEFT OF DAM CENTERLINE	13.0	1076.0	SUBBASE FILL
58	STATION 5+00, 12' RIGHT OF DAM CENTERLINE	15.0	1074.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10./64-66 BID#13
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
59		7.8	122.4	0.0	2	128.5	7.5	95		95	YES
60		7.6	122.9	0.0	2	128.5	7.5	96		95	YES
61		6.4	126.5	0.0	3	137.4	1.0	92		90	YES
62		5.4	124.3	0.0	3	137.4	1.0	90		90	YES
63		5.9	123.9	0.0	3	137.4	1.0	90		90	YES
64		6.5	121.6	0.0	2	128.5	7.5	95		95	YES
65		6.7	122.3	0.0	2	128.5	7.5	95		95	YES
66		7.0	122.0	0.0	2	128.5	7.5	95		95	YES
67		6.3	120.5	0.0	2	128.5	7.5	94		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
59	STATION 6+00, 8' LEFT OF DAM CENTERLINE	9.0	1070.0	SUBBASE FILL
60	STATION 6+25, 10' RIGHT OF DAM CENTERLINE	7.0	1069.0	SUBBASE FILL
61	STATION 9+50, 130' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
62	STATION 11+50, 140' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
63	STATION 12+00, 110' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
64	STATION 0+50, RIGHT OF OULET CENTERLINE	1.0	1002.0	SUBBASE FILL
65	STATION 1+00, RIGHT OF OUTLET CENTERLINE	2.0	1001.0	SUBBASE FILL
66	STATION 1+20, RIGHT OF OUTLET CENTERLINE	1.0	999.0	SUBBASE FILL
67	STATION 4+00, 60' RIGHT OF CENTERLINE	1.0	1064.0	SUBBASE FILL

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10./64-66 BID#13
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MMP

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Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485
Authorized By WOODY THOMAS Date 08-16-95
Tested By P. LLEWELLYN/WT Date 08-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
36		3.7	123.3	0.0	2	128.5	7.5	96		95	YES
37		6.5	122.2	0.0	2	128.5	7.5	95		95	YES
38		7.2	124.4	0.0	2	128.5	7.5	97		95	YES
39		7.9	126.0	0.0	2	128.5	7.5	98		95	YES
40		8.4	122.0	0.0	2	128.5	7.5	95		95	YES
41		8.6	125.1	0.0	2	128.5	7.5	97		95	YES
42		7.8	123.1	0.0	2	128.5	7.5	96		95	YES
43		7.5	123.8	0.0	2	128.5	7.5	96		95	YES
44		7.2	121.6	0.0	2	128.5	7.5	95		95	YES
45		5.8	119.7	0.0	2	128.5	7.5	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
36	STATION 11+25, 125' LEFT OF DAM CENTERLINE		1007.0	SUBGRADE
37	STATION 11+20, 150' LEFT OF DAM CENTERLINE		1005.0	SUBGRADE
38	STATION 2+50, 20' LEFT OF DAM CENTERLINE	4.0	1077.0	SUBBASE FILL
39	STATION 4+00, 22' RIGHT OF DAM CENTERLINE	7.0	1070.0	SUBBASE FILL
40	STATION 4+00, 20' RIGHT OF DAM CENTERLINE	10.0	1073.0	SUBBASE FILL
41	STATION 5+00, 15' LEFT OF DAM CENTERLINE	9.0	1068.0	SUBBASE FILL
42	STATION 5+00, 6' RIGHT OF DAM CENTERLINE	12.0	1071.0	SUBBASE FILL
43	STATION 6+00, 18' LEFT OF DAM CENTERLINE	2.5	1063.5	SUBBASE FILL
44	STATION 6+00, 20' RIGHT OF DAM CENTERLINE	5.5	1066.5	SUBBASE FILL
45	STATION 10+00, 125' LEFT OF DAM CENTERLINE, STRIP DRAIN		994.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 36,37, 45-47 BID #6,/38,39, 40-44, BID #9,/48 BID #10, MAX RELATIVE
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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The Quality People
Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485
Authorized By WOODY THOMAS Date 08-16-95
Tested By P. LLEWELLYN/WT Date 08-16-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
46		6.6	122.5	0.0	2	128.5	7.5	95		95	YES
47		6.9	123.1	0.0	2	128.5	7.5	96		95	YES
48		5.0	125.9	0.0	3	137.4	1.0	92		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
46	RETEST 45A		994.0	SUBGRADE
47	STATION 10+50, 130' LEFT OF DAM CENTERLINE, STRIP DRAIN		994.0	SUBGRADE
48	STATION 10+15, 70' LEFT OF DAM CENTERLINE, STRIP DRAIN	2.0	999.0	SUBBASE FILL

Comments: 36,37, 45-47 BID #6,/38,39, 40-44, BID #9,/48 BID #10, MAX RELATIVE
• DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450450-4
Authorized By WOODY THOMAS Date 08-14-95
Tested By P. LLEWELLYN/WT Date 08-14-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3155 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
27		5.6	121.7	0.0	2	128.5	7.5	95		95	YES
28		7.3	119.4	0.0	2	128.5	7.5	93		95	NO
29		5.2	116.9	0.0	2	128.5	7.5	91		95	NO
30		3.5	121.5	0.0	2	128.5	7.5	95		95	YES
31		6.2	121.7	0.0	2	128.5	7.5	95		95	YES
32		6.6	122.2	0.0	2	128.5	7.5	95		95	YES
33		4.9	124.1	0.0	2	128.5	7.5	97		95	YES
34		6.4	131.2	0.0	3	137.4	1.0	95		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
27	STATION 10+50, 20' LEFT OF CENTERLINE		1000.0	SUBGRADE
28	STATION 10+30, 65' LEFT OF CENTERLINE		995.0	SUBGRADE
29	STATION 11+30, 85' LEFT OF CENTERLINE		995.0	SUBGRADE
30	RETEST 29A		995.0	SUBGRADE
31	RETEST 28A		995.0	SUBGRADE
32	STATION 3+10, 10' RIGHT OF CENTERLINE		1072.0	SUBBASE FILL
33	STATION 5+00, 12' RIGHT OF CENTERLINE		1067.0	SUBBASE FILL
34	STATION 5+50, 12' LEFT OF CENTERLINE		1063.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 27-31 BID #6,/32 & 33 BID #9,/34 BID #10
* DATUM TOPOGRAPHIC
This engagement does <u>NOT</u> include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
(FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450450-2
Authorized By W. THOMAS Date 08-10-95
Tested By P. LLEWELLYN Date 08-10-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3155 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
18		7.8	123.8	0.0	2	128.5	7.5	96		95	YES
19		5.3	123.8	0.0	2	128.5	7.5	96		95	YES
20		6.5	123.3	0.0	2	128.5	7.5	96		95	YES
21		5.9	119.6	0.0	2	128.5	7.5	93		95	NO
22		1.7	118.4	0.0	3	137.4	1.0	86		95	NO
23		5.1	128.4	0.0	1	132.0	7.5	97		95	YES

5/602

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	TEST LOCATION, VERTICAL: Elevation •	MATERIAL TESTED
18	RETEST 13A		1063.0	SUBGRADE
19	RETEST 13B		1063.0	SUBGRADE
20	STATION 0+20, 15' RIGHT OF CENTERLINE		1083.0	SUBGRADE
21	STATION 1+05, 10' RIGHT OF CENTERLINE		1077.0	SUBGRADE
22	DRAIN ROCK, STATION 3+45, 5' RIGHT OF CENTERLINE	1.0	990.0	SUBBASE FILL
23	RETEST 21A		1077.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B
1	27450450	SAND W/SILT & FEW GRAVEL	OUTLET WORK TRENCH	7.5	132.0	D1557-B

Comments: #18-21,[illegible] BID #6,/22 BID #10
• DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP
GREINER, INC

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450450-1
Authorized By W. THOMAS Date 08-09-95
Tested By P. LLEWELLYN Date 08-09-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3155 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
11		7.1	124.7	0.0	1	132.0	7.5	94		95	NO
12		7.2	126.1	0.0	1	132.0	7.5	96		95	YES
13		8.3	121.2	0.0	1	132.0	7.5	92		95	NO
14		5.7	125.0	0.0	1	132.0	7.5	95		95	YES
15		7.8	124.8	0.0	1	132.0	7.5	95		95	YES
16		4.3	128.3	0.0	1	132.0	7.5	97		95	YES
17		6.3	128.5	0.0	1	132.0	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
11	STATION 21+00, 25' RIGHT OF CENTERLINE		1075.0	SUBGRADE
12	STATION 3+20, 20' LEFT OF CENTERLINE		1071.0	SUBGRADE
13	STATION 4+05, 15' RIGHT OF CENTERLINE		1063.0	SUBGRADE
14	STATION 4+00, 45' RIGHT OF CENTERLINE		1063.0	SUBGRADE
15	STATION 5+00, 35' RIGHT OF CENTERLINE		1058.0	SUBGRADE
16	STATION 6+00, 30' RIGHT OF CENTERLINE		1061.0	SUBGRADE
17	STATION 6+00, 12' LEFT OF CENTERLINE		1063.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
1	27450450	SAND W/SILT & FEW GRAVEL	OUTLET WORK TRENCH	7.5	132.0	D1557-B

Comments: BID #6 EMBANKMENT OVEREXCAVATION
• DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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GREINER, INC

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LABORATORY REPORT

PHYSICAL PROPERTIES OF SOILS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450432
Date of Report 09/26/95
Reviewed By C Andrus

Project Hiko Springs Wash Detnetion Basin (CCBD Bid #3476094)

Location Laughlin, Nevada Sampled By J. Waddell/WT Date 07/31/95

Type of Material Sand w/gravel, trace silt Submitted By J. Waddell/WT Date 07/31/95

Source of Material Outlet works Sta. 0+00-5+93 Authorized By K. Smith Date 07/31/95

Sieve Analysis, ASTM D422-

Sieve Size	% Passing Accumulative	Specification
3"		
2½"		
2"		
1½"		
1"		
¾"		
½"		
⅜"		
¼"		
No. 4		
8		
10		
16		
30		
40		
50		
100		
Finer than 200 ASTM D1140-		

Soil Classification

Liquid Limit and Plasticity of Soils LL =
ASTM D4318- PI =

Moisture - Density Relations Maximum Dry Density, pcf 132.0
☐ ASTM D698- ; ☒ ASTM D1557- ; Method B Optimum Moisture, % 7.5

Specific Gravity of Soils (minus No. 4 material)
ASTM D854- Specific Gravity

Resistance 'R' Value of Compacted Soils
ASTM D2844- 'R' Value

Other:

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Rec'd 9/27/95 MAP

SOIL / AGGREGATE – MOISTURE DENSITY RELATIONS

Client Greiner, Inc Project Hiko Springs Job No. 274SJC249-1

Event / Invoice No. ______

Type of Material Sand w/gravel trace silt Sampled By J. Waddell Date 7/31/95

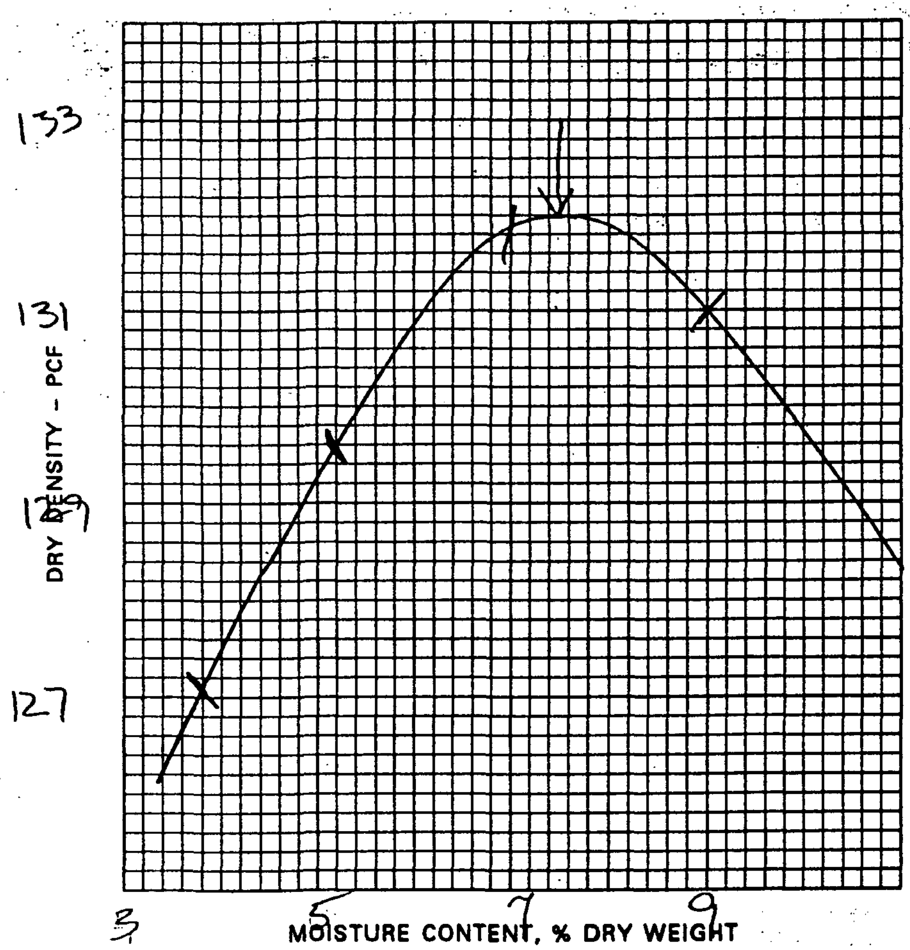
Source of Material Outlet works Sta 0+00 - 5+93 Submitted By ↓ Date ↓

Tested / Calc. By ↓ Date ↓

Test Procedure ASTM D1557 B Reviewed By ______ Date ______

Trial No.	1	2	3	4	5	6	7
Water, Estimated %	0	2%	4%	6%			
Water, cc	As is	60	120	180			
Sample + Mold Weight, gms	4009.8	4076.4	4148.8	4173.8			
Mold Weight, gms	2017.0	2017.0	2017.0	2017.0			
Wet Sample Weight, gms	1992.8	2059.4	2131.8	2156.8			
Wet Sample Weight, lbs	4.39	4.54	4.70	4.75			
Wet Density, pcf	131.9	136.3	141.1	142.8			
Moisture Sample Wet, gms	213.2	217.4	228.8	252.6			
Moisture Sample Dry, gms	205.4	206.7	213.8	231.7			
Weight of Water, gms	7.8	10.7	15.0	20.9			
Moisture, %	3.8	5.2	7.0	9.0			
Dry Density, pcf	127.1	129.6	131.9	131.0			

COPY



Maximum Dry Density, pcf 132.0

Optimum Moisture Content, % 7.5

Corrected Density, pcf ______

Diameter of Mold, in. 4.0

Height of Mold, in. 4.584

No. of Layers 5

Blows Per Layer 25

Weight of Hammer, lbs 10#

Height of Drop 18"

Material Used -3/8

% Oversize 1%

Total #4 14%

Rec'd 8/21/95 MP

Scour Hole Fill

Western Technologies Inc.
The Quality People
Since 1955

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Bullhead City, Arizona 86442
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 02-01-96
Job No. 2745JC249 — Page 1 of 2
Event/Invoice No. 27460021
Authorized By KEN SMITH — Date 01-19-96
Tested By P. LLEWELLYN/WT — Date 01-19-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
589		6.8	115.1	0.0	2	128.5	7.5	90		85	YES
590		6.5	119.6	0.0	2	128.5	7.5	93		85	YES
591		7.2	117.8	0.0	2	128.5	7.5	92		85	YES
592		7.0	115.9	0.0	2	128.5	7.5	90		85	YES
593		7.3	116.2	0.0	2	128.5	7.5	90		85	YES
594		6.3	118.3	0.0	2	128.5	7.5	92		85	YES
595		6.5	117.0	0.0	2	128.5	7.5	91		85	YES
596		6.9	116.3	0.0	2	128.5	7.5	91		85	YES
598		7.0	119.8	0.0	2	128.5	7.5	93		85	YES
599		7.3	119.0	0.0	2	128.5	7.5	93		85	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
589	SCOUR HOLE, STA. 17+00	8.0	968.0	TRENCH BACKFILL
590	SCOUR HOLE, STA. 15+00	16.0	976.0	TRENCH BACKFILL
591	SCOUR HOLE, STA. 11+50	10.0	970.0	TRENCH BACKFILL
592	SCOUR HOLE, STA. 16+50	10.0	970.0	TRENCH BACKFILL
593	SCOUR HOLE, STA. 13+25	20.0	980.0	TRENCH BACKFILL
594	SCOUR HOLE, STA. 11+50	12.0	972.0	TRENCH BACKFILL
595	SCOUR HOLE, STA. 11+00	14.0	974.0	TRENCH BACKFILL
596	SCOUR HOLE, STA. 14+10	24.0	984.0	TRENCH BACKFILL
598	SCOUR HOLE, STA. 17+25	15.0	975.0	TRENCH BACKFILL
599	SCOUR HOLE, STA. 11+50	18.0	978.0	TRENCH BACKFILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 1[illegible] RT OF CL	7.5	128.5	D1557-C

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GREINER, INC.

Comments: MOISTURE SPECIFICATION, BID #12
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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The Quality People
Since 1955

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 02-01-96
Job No. 2745JC249
Event/Invoice No. 27460021
Authorized By KEN SMITH Date 01-19-96
Tested By P. LLEWELLYN/WT Date 01-19-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
600		6.8	118.7	0.0	2	128.5	7.5	92		85	YES
601		6.5	117.2	0.0	2	128.5	7.5	91		85	YES
602		6.5	121.0	0.0	2	128.5	7.5	94		85	YES
603		6.8	119.0	0.0	2	128.5	7.5	93		85	YES
604		7.0	119.3	0.0	2	128.5	7.5	93		85	YES
605		7.0	117.5	0.0	2	128.5	7.5	91		85	YES
606		6.5	118.6	0.0	2	128.5	7.5	92		85	YES
607		6.8	119.0	0.0	2	128.5	7.5	93		85	YES
608		7.0	117.2	0.0	2	128.5	7.5	91		85	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
600	SCOUR HOLE, STA. 17+00	20.0	980.0	TRENCH BACKFILL
601	SCOUR HOLE, STA. 11+00	23.0	983.0	TRENCH BACKFILL
602	SCOUR HOLE, STA. 14+50	27.0	987.0	TRENCH BACKFILL
603	SCOUR HOLE, STA. 16+50	22.0	982.0	TRENCH BACKFILL
604	SCOUR HOLE, STA. 11+50	24.0	984.0	TRENCH BACKFILL
605	SCOUR HOLE, STA. 16+50	26.0	986.0	TRENCH BACKFILL
606	SCOUR HOLE, STA. 14+00	30.0	990.0	TRENCH BACKFILL
607	SCOUR HOLE, STA. 11+25	30.0	990.0	TRENCH BACKFILL
608	SCOUR HOLE, STA. 17+00	30.0	990.0	TRENCH BACKFILL

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GREINER, INC.

Comments: MOISTURE SPECIFICATION, BID #12
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 01-22-96
Job No. 2745JC249
Event/Invoice No. 27450684-1
Authorized By KEN SMITH Date 01-12-96
Tested By P. LLEWELLYN/WT Date 01-12-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
586		6.5	117.3	0.0	2	128.5	7.5	91		85	YES
587		7.0	114.6	0.0	2	128.5	7.5	89		85	YES
588		7.3	115.8	0.0	2	128.5	7.5	90		85	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
586	BID #12, SCOUR HOLE FILL, STA. 14+00	2.0	962.0	TRENCH BACKFILL
587	BID #12, SCOUR HOLE FILL, STA. 13+00	8.0	968.0	TRENCH BACKFILL
588	BID #12, SCOUR HOLE FILL, STA. 15+00	12.0	972.0	TRENCH BACKFILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: MOISTURE SPECIFICATION
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 11-15-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-18
Authorized By KEN SMITH Date 11-09-95
Tested By P. LLEWELLYN/WT Date 11-09-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 613

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
510		8.2	123.1	0.0	2	128.5	7.5	96		95	YES
511		8.9	124.5	0.0	5	126.0	10.0	99		95	YES
512		9.2	120.0	0.0	5	126.0	10.0	95		95	YES
513		9.5	120.6	0.0	5	126.0	10.0	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
510	RETEST 507B		960.0	SUBGRADE
511	STA. 5+00, 12' RIGHT OF CENTERLINE	15.0	1074.0	EMBANKMENT FILL
512	STA. 18+00, 15' LEFT OF CENTERLINE	71.0	1082.0	EMBANKMENT FILL
513	STA. 21+00, 5' RIGHT OF CENTERLINE	15.0	1082.0	EMBANKMENT FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
5	27450583	SAND W/GRAVEL, TRACE SILT	ON SITE	10.0	126.0	D1557-B

Comments: TEST 510-BID #12, TEST 511-513-BID #9
• DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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Scour Hole Overexcavation

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **11-13-95**
Job No. **2745JC249**

Event/Invoice No. **27450583-16**
Authorized By **KEN SMITH** Date **11-08-95**
Tested By **J. WADDELL/WT** Date **11-08-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3073** H_2O **613**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
507		4.8	115.5	0.0	2	128.5	7.5	90		95	NO
508		5.3	121.9	0.0	2	128.5	7.5	95		95	YES
509		4.6	120.8	0.0	2	128.5	7.5	94		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
507	STA. 13+00		960.0	SUBGRADE
508	STA. 14+75		960.0	SUBGRADE
509	RETEST 507A		960.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **SCOUR HOLE EXCAVATION BID #11**
*** DATUM TOPOGRAPHIC**

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GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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REVIEWED BY **CORWIN ANDEREGG**
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Drain Rock Fill

Western Tech density tests on Bid #10
drain rock

Ken & Matthew:

# of tests	location	date
1	outlet works	8-10-95
1	sta 5+50	8-14-95
1	sta 11+30	8-15-95
1	sta 10+15	8-16-95
3	sta 9+50, 11+50, 12+00	8-17-95
4	sta 11+50, 11+00, 10+00, 11+50	8-18-95
2	sta 12+00, 6+75	8-31-95
1	sta 13+00	9-1-95
1	retest	9-11-95
2	sta 13+50, 14+00	9-19-95
2	sta 15+00, 15+50	9-21-95
4	sta 15+50, 15+30, 15+60, 15+50	9-25-95
5	sta 15+50, 16+15, 16+50, 17+50, 16+75	9-27-95
3	sta 16+15, 16+50, 17+50	9-28-95
1	sta 14+50	10-12-95
3	sta 19+00, 21+00, 22+00	10-26-95
1	sta 14+50	12-12-95

See File 56.06

36 total including all retests

Hiko Springs Wash Detention Basin 2745JC249

Let me know if you need anything else — Patsy

fax# 1-702-368-6961

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **12-29-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450684**
Authorized By **KEN SMITH** Date **12-12-95**
Tested By **P. LLEWELLYN/WT** Date **12-12-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3088** H_2O **621**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
585		4.6	129.5	0.0	3	137.4	1.0	94		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
585	400A RETEST (STA. 14+50)	3.0	987.0	DRAIN ROCK

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: **BID #10**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-17-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450583-9
Authorized By KEN SMITH Date 10-26-95
Tested By P. LLEWELLYN/WT Date 10-26-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA REVISED REPORT: 11/17/95
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3082 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
464		7.0	124.9	0.0	2	128.5	7.5	97		95	YES
465		7.5	122.5	0.0	2	128.5	7.5	95		95	YES
466		6.7	122.3	0.0	2	128.5	7.5	95		95	YES
467		6.9	122.0	0.0	2	128.5	7.5	95		95	YES
468		4.6	125.5	0.0	3	137.4	1.0	91		90	YES
469		5.0	129.4	0.0	3	137.4	1.0	94		90	YES
470		4.9	130.3	0.0	3	137.4	1.0	95		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
464	STA. 8+50, 20' RIGHT OF CENTERLINE	50.0	1062.0	EMBANKMENT FILL
465	STA. 11+00, 60' LEFT OF CENTERLINE	61.0	1061.0	EMBANKMENT FILL
466	STA. 15+00, 90' RIGHT OF CENTERLINE	61.0	1061.0	EMBANKMENT FILL
467	STA. 16+50, 50' LEFT OF CENTERLINE	61.0	1061.0	EMBANKMENT FILL
468	STA. 19+00, 70' LEFT OF CENTERLINE	2.0	1057.0	DRAIN ROCK
469	STA. 21+00, 40' LEFT OF CENTERLINE	2.0	1069.0	DRAIN ROCK
470	STA. 22+00, 35' LEFT OF CENTERLINE	5.0	1071.0	DRAIN ROCK

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #9-TEST #464-467, BID #10-TEST 468-470
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-18
Authorized By KEN SMITH Date 10-12-95
Tested By J. WADDELL/WT Date 10-12-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA REVISED REPORT: 11/03/95
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3076 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
395		7.3	124.8	0.0	2	128.5	7.5	97		95	YES
396		5.2	117.6	0.0	2	128.5	7.5	92		95	NO
397		5.4	117.7	0.0	2	128.5	7.5	92		95	NO
398		6.5	123.1	0.0	2	128.5	7.5	96		95	YES
399		6.6	124.2	0.0	2	128.5	7.5	97		95	YES
400		2.2	117.0	0.0	3	137.4	1.0	85		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
395	STA. 16+90, 250' LEFT OF CENTERLINE	22.0	1024.0	EMBANKMENT FILL
396	STA. 10+00, 100' RIGHT OF CENTERLINE	39.0	1047.0	EMBANKMENT FILL
397	STA. 12+50, 175' RIGHT OF CENTERLINE	39.0	1047.0	EMBANKMENT FILL
398	RETEST #396, DATED 10/12/95	39.0	1047.0	EMBANKMENT FILL
399	RETEST #397, DATED 10/12/95	39.0	1047.0	EMBANKMENT FILL
400	STA. 14+50, ON CENTERLINE, STRIP DRAIN	3.0	987.0	DRAIN ROCK

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: * DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG

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The Quality People
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1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 10-15-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450527-18
Authorized By KEN SMITH Date 10-12-95
Tested By J. WADDELL/WT Date 10-12-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3076 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
395		7.3	124.8	0.0	2	128.5	7.5	97		95	YES
396		5.2	117.6	0.0	2	128.5	7.5	92		95	NO
397		5.4	117.7	0.0	2	128.5	7.5	92		95	NO
398		6.5	123.1	0.0	2	128.5	7.5	96		95	YES
399		6.6	124.2	0.0	2	128.5	7.5	97		95	YES
400		2.2	117.0	0.0	3	137.4	1.0	85		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
395	STA. 16+90, 250' LEFT OF CENTERLINE	22.0	1024.0	EMBANKMENT FILL
396	STA. 10+00, 100' RIGHT OF CENTERLINE	39.0	1047.0	EMBANKMENT FILL
397	STA. 12+50, 175' RIGHT OF CENTERLINE	39.0	1047.0	EMBANKMENT FILL
398	RETEST #396, DATED 10/12/95	39.0	1047.0	EMBANKMENT FILL
399	RETEST #397, DATED 10/12/95	~~39.0~~	~~1047.0~~	EMBANKMENT FILL
400	STA. 14+50, ON CENTERLINE ? ~~NO WAY~~	3.0	987.0	~~BASE COURSE~~ DRAIN ROCK

VOID

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: • DATUM TOPOGRAPHIC

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NOV 3 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **10-02-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450527-8**
Authorized By **KEN SMITH** Date **09-28-95**
Tested By **P. LLEWELLYN/WT** Date **09-29-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS: Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	LAB CHARACTERISTICS: ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	COMPACTION: % of Maximum Dry Unit Weight	REQUIREMENTS: Moisture %	Compaction %	CONFORMANCE INDICATED
335		6.0	122.6	0.0	2	128.5	7.5	95		95	YES
336		5.8	123.5	0.0	2	128.5	7.5	96		95	YES
337		6.3	122.3	0.0	2	128.5	7.5	95		95	YES
338		6.7	122.8	0.0	2	128.5	7.5	96		95	YES
339		5.8	122.5	0.0	2	128.5	7.5	95		95	YES
340		6.7	122.1	0.0	2	128.5	7.5	95		95	YES
341		3.1	130.9	0.0	3	137.4	1.0	95		90 ~~95~~	YES
342		2.8	130.5	0.0	3	137.4	1.0	95		3 90 ~~95~~	YES
343		3.5	132.5	0.0	3	137.4	1.0	96		90 ~~95~~	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	Elevation •	MATERIAL TESTED
335	STA. 10+25, 200' LEFT OF CENTERLINE	27.0	1019.0	SUBBASE FILL
336	STA. 11+00, 150' LEFT OF CENTERLINE	29.0	1022.0	SUBBASE FILL
337	STA. 12+50, 50' LEFT OF CENTERLINE	28.0	1021.0	SUBBASE FILL
338	STA. 14+50, 100' LEFT OF CENTERLINE	20.0	1017.0	SUBBASE FILL
339	STA. 16+00, 100' LEFT OF CENTERLINE	5.0	1009.0	SUBBASE FILL
340	STA. 17+50, 100' LEFT OF CENTERLINE	3.5	1012.0	SUBBASE FILL
341	STA. 16+15, 160' LEFT OF CENTERLINE, DRAIN ROCK	3.0	1003 0	SUBBASE FILL
342	STA. 16+50, 200' LEFT OF CENTERLINE, DRAIN ROCK	3.0	1005.0	SUBBASE FILL
343	STA. 17+50, 175' LEFT OF CENTERLINE, DRAIN ROCK	3.0	1010.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: **BID #9, 335-340, BID #10, 341-343**
• DATUM TOPOGRAPHIC

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/4/95
MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-28-95
Job No. 2745JC249
Event/Invoice No. 27450527-7
Authorized By KEN SMITH Date 09-27-95
Tested By P. LLEWELLYN/WT Date 09-27-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
318		6.0	124.4	0.0	2	128.5	7.5	97		95	YES
319		5.4	122.9	0.0	2	128.5	7.5	96		95	YES
320		5.1	123.4	0.0	2	128.5	7.5	96		95	YES
321		5.8	122.5	0.0	2	128.5	7.5	95		95	YES
322		2.7	133.5	0.0	3	137.4	1.0	97		90 ~~95~~	YES
323		3.9	131.0	0.0	3	137.4	1.0	95		~~95~~	YES
324		3.5	131.9	0.0	3	137.4	1.0	96		~~95~~	YES
325		4.1	130.6	0.0	3	137.4	1.0	95		~~95~~	YES
326		6.0	122.5	0.0	2	128.5	7.5	95		95	YES
327		7.1	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
318	STA. 15+25, 75' LEFT OF CENTERLINE	4.0	998.0	SUBBASE FILL
319	STA. 15+60, 130' LEFT OF CENTERLINE	7.0	999.0	SUBBASE FILL
320	STA. 15+45, 80' LEFT OF CENTERLINE	7.0	1001.0	SUBBASE FILL
321	STA. 15+65, 125' LEFT OF CENTERLINE	9.0	1001.0	SUBBASE FILL
322	STA. 15+50, 140' LEFT OF CENTERLINE, DRAIN ROCK	4.0	996.0	SUBBASE FILL
323	STA. 16+15, 160' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1002.0	SUBBASE FILL
324	STA. 16+50, 200' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1004.0	SUBBASE FILL
325	STA. 17+50, 175' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1009.0	SUBBASE FILL
326	STA. 11+00, 50' LEFT OF CENTERLINE	28.0	1019.0	SUBBASE FILL
327	STA. 12+50, 200' LEFT OF CENTERLINE	24.0	1017.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #9, 318-321, 326-333, BID #10,322-325 & 334
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MAP

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report **09-28-95**
Job No. **2745JC249**
Event/Invoice No. **27450527-7**
Authorized By **KEN SMITH** Date **09-27-95**
Tested By **P. LLEWELLYN/WT** Date **09-27-95**

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
328		6.8	122.6	0.0	2	128.5	7.5	95		95	YES
329		5.9	123.7	0.0	2	128.5	7.5	96		95	YES
330		5.4	123.5	0.0	2	128.5	7.5	96		95	YES
331		6.1	122.6	0.0	2	128.5	7.5	95		95	YES
332		5.4	122.5	0.0	2	128.5	7.5	95		95	YES
333		5.0	121.9	0.0	2	128.5	7.5	95		95	YES
334		3.0	132.2	0.0	3	137.4	1.0	96		90 ~~95~~	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	TEST LOCATION, VERTICAL: Elevation *	MATERIAL TESTED
328	STA. 14+00, 100' LEFT OF CENTERLINE	18.0	1014.0	SUBBASE FILL
329	STA. 11+50, 100' LEFT OF CENTERLINE	27.0	1019.0	SUBBASE FILL
330	STA. 12+50, 150' LEFT OF CENTERLINE	24.0	1017.0	SUBBASE FILL
331	STA. 14+60, 75' LEFT OF CENTERLINE	16.0	1013.0	SUBBASE FILL
332	STA. 15+30, 80' LEFT OF CENTERLINE	10.0	1004.0	SUBBASE FILL
333	STA. 15+60, 125' LEFT OF CENTERLINE	11.0	1003.0	SUBBASE FILL
334	STA. 16+75, 75' LEFT OF CENTERLINE, DRAIN ROCK	2.0	1006.6	SUBBASE FILL

Comments: **BID #9, 318-321, 326-333, BID #10,322-325 & 334**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95 MAP

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report **09-28-95**
Job No. **2745JC249**

Event/Invoice No. **27450527-5**
Authorized By **KEN SMITH** Date **09-25-95**
Tested By **P. LLEWELLYN/WT** Date **09-25-95**

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
301		2.9	130.9	0.0	3	137.4	1.0	95		90 ~~95~~	YES
302		4.3	132.3	0.0	3	137.4	1.0	96		90 ~~95~~	YES
303		3.9	131.2	0.0	3	137.4	1.0	95		90 ~~95~~	YES
304		4.8	131.5	0.0	3	137.4	1.0	96		90 ~~95~~	YES
305		5.3	122.5	0.0	2	128.5	7.5	95		95	YES
306		6.0	122.9	0.0	2	128.5	7.5	96		95	YES
307		4.9	123.0	0.0	2	128.5	7.5	96		95	YES
308		6.2	122.6	0.0	2	128.5	7.5	95		95	YES
309		6.0	122.2	0.0	2	128.5	7.5	95		95	YES
310		6.3	122.6	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
301	STA. 15+50, 130' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	996.0	SUBBASE FILL
302	STA. 15+30, 75' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	994.0	SUBBASE FILL
303	STA. 15+60, 120' LEFT OF CENTERLINE, BLANKET DRAIN	4.0	996.0	SUBBASE FILL
304	STA. 15+50, 125' LEFT OF CENTERLINE, BLANKET DRAIN	2.0	996.0	SUBBASE FILL
305	STA. 15+50, 130' LEFT OF CENTERLINE		992.0	SUBGRADE
306	STA. 16+15, 150' LEFT OF CENTERLINE		1000.0	SUBGRADE
307	STA. 16+50, 175' LEFT OF CENTERLINE		1002.0	SUBGRADE
308	STA. 17+00, 150' LEFT OF CENTERLINE		1004.0	SUBGRADE
309	STA. 10+00, 100' LEFT OF CENTERLINE	29.0	1021.0	SUBBASE FILL
310	STA. 12+00, 200' LEFT OF CENTERLINE	22.0	1016.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS						
LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #6, 305-308, BID #9, 309-312, BID #10, 301-304**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MMP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 09-28-95
Job No. 2745JC249
Event/Invoice No. 27450527-5
Authorized By KEN SMITH Date 09-25-95
Tested By P. LLEWELLYN/WT Date 09-25-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
311		5.8	122.0	0.0	2	128.5	7.5	95		95	YES
312		5.3	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
311	STA. 13+00, 150' LEFT OF CENTERLINE	23.0	1012.0	SUBBASE FILL
312	STA. 14+50, 100' LEFT OF CENTERLINE	19.0	1009.0	SUBBASE FILL

Comments: BID #6, 305-308, BID #9, 309-312, BID #10, 301-304
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MBP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG

Western Technologies Inc.
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1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **09-27-95**
Job No. **2745JC249**
Event/Invoice No. **27450527-2**
Authorized By **KEN SMITH** Date **09-20-95**
Tested By **P. LLEWELLYN/WT** Date **09-20-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA** **REVISED REPORT: 09/28/95**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3085** H_2O **614**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
285		4.2	130.9	0.0	3	137.4	1.0	95		90 ~~95~~	YES
286		3.8	133.0	0.0	3	137.4	1.0	97		90 ~~95~~	YES
287		6.4	124.1	0.0	2	128.5	7.5	97		95	YES
288		4.1	122.9	0.0	2	128.5	7.5	96		95	YES
289		5.0	122.6	0.0	2	128.5	7.5	95		95	YES
290		6.2	123.5	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	TEST LOCATION, VERTICAL: Elevation *	MATERIAL TESTED
285	STA. 13+50, 75' LEFT OF CENTERLINE	2.0	996.0	SUBBASE FILL
286	STA. 14+00, 120' LEFT OF CENTERLINE	2.0	994.0	SUBBASE FILL
287	STA. 10+00, 100' RIGHT OF CENTERLINE	27.0	1030.0	SUBBASE FILL
288	STA. 13+50, 80' LEFT OF CENTERLINE	4.0	998.0	SUBBASE FILL
289	STA. 14+50, 150' RIGHT OF CENTERLINE	24.0	1031.0	SUBBASE FILL
290	STA. 16+50, 50' RIGHT OF CENTERLINE	14.0	1027.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: **BID #9, 287-290, BID #10, 285 & 286**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/29/95

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-26-95
Job No. 2745JC249

Event/Invoice No. 27450527-3
Authorized By KEN SMITH Date 09-21-95
Tested By P. LLEWELLYN/WT Date 09-21-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 614

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
291		5.2	123.0	0.0	2	128.5	7.5	96		95	YES
292		5.0	122.5	0.0	2	128.5	7.5	95		95	YES
293		5.5	123.7	0.0	2	128.5	7.5	96		95	YES
294		4.9	124.9	0.0	2	128.5	7.5	97		95	YES
295		3.8	130.4	0.0	3	137.4	1.0	95		90 ~~95~~	YES
296		4.1	130.9	0.0	3	137.4	1.0	95		96 ~~95~~	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
291	STA. 10+00, 125' LEFT OF CENTERLINE	26.0	1019.0	SUBBASE FILL
292	STA. 11+50, 200' LEFT OF CENTERLINE	25.0	1014.0	SUBBASE FILL
293	STA. 12+50, 75' LEFT OF CENTERLINE	20.0	1009.0	SUBBASE FILL
294	STA. 14+00, 150' LEFT OF CENTERLINE	15.0	1004.0	SUBBASE FILL
295	STA. 15+00, 250' LEFT OF CENTERLINE, STRIP DRAINS	2.0	991.0	SUBBASE FILL
296	STA. 15+50, 225' LEFT OF CENTERLINE, STRIP DRAINS	2.0	991.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: **BID #9, 291-294, BID #10, 295 & 296**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/28/95
MF

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-18-95
Job No. 2745JC249
Event/Invoice No. 27450485-17
Authorized By KEN SMITH Date 09-11-95
Tested By P. LLEWELLYN/WT Date 09-11-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3089 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
237		3.4	126.6	0.0	2	128.5	7.5	99		95	YES
238		5.0	123.0	0.0	2	128.5	7.5	96		95	YES
239		6.0	123.7	0.0	2	128.5	7.5	96		95	YES
240		6.2	122.8	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
237	RETEST 187A	2.0	993.0	SUBBASE FILL
238	STA. 13+00, HORIZONTAL STRIP DRAIN		992.0	SUBGRADE
239	STA. 11+00, 125' LEFT OF CENTERLINE	15.0	1009.0	SUBBASE FILL
240	STA. 11+50, 175' LEFT OF CENTERLINE	17.5	1009.5	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C

Comments: BID #6, 238, BID #9, 239 & 240, BID #10, 237
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/19/95 MAP

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 09-08-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450485-14
Authorized By WOODY THOMAS Date 09-01-95
Tested By P. LLEWELLYN/WT Date 09-01-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3079 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
183		5.9	122.3	0.0	2	128.5	7.5	95		95	YES
184		6.0	125.2	0.0	2	128.5	7.5	97		95	YES
185		6.0	121.6	0.0	2	128.5	7.5	95		95	YES
186		4.3	123.7	0.0	2	128.5	7.5	96		95	YES
187		4.4	122.4	0.0	3	137.4	1.0	89		90	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
183	STA. 9+50, 270' LEFT OF CENTERLINE	4.0	1009.0	SUBBASE FILL
184	STA. 11+50, 280' LEFT OF CENTERLINE	3.0	989.0	SUBBASE FILL
185	STA. 11+50, 270' RIGHT OF CENTERLINE	7.0	1015.0	SUBBASE FILL
186	STA. 10+60, 50' LEFT OF CENTERLINE	5.0	1008.0	SUBBASE FILL
187	TRANSVERSE STRIP DRAIN, STA. 13+00, 260' LEFT OF CL	2.0	993.0	SUBBASE FILL
	RETEST 187?			

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #9, 183-186, BID #10, 187
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95MP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-2
Authurized By WOODY THOMAS Date 08-18-95
Tested By P. LLEWELLYN/WT Date 08-18-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 5430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
68		7.0	121.9	0.0	2	128.5	7.5	95		95	YES
69		6.9	119.9	0.0	2	128.5	7.5	93		95	NO
70		6.6	122.9	0.0	2	128.5	7.5	96		95	YES
71		7.2	122.3	0.0	2	128.5	7.5	95		95	YES
72		7.2	121.9	0.0	2	128.5	7.5	95		95	YES
73		7.0	120.1	0.0	2	128.5	7.5	93		95	NO
74		7.3	120.8	0.0	2	128.5	7.5	94		95	NO
75		6.9	124.0	0.0	2	128.5	7.5	96		95	YES
76		6.7	123.7	0.0	2	128.5	7.5	96		95	YES
77		7.3	122.6	0.0	2	128.5	7.5	95		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
68	RETEST 67A	1.0	1064.0	SUBBASE FILL
69	STATION 5+50, 60' RIGHT OF CENTERLINE	3.0	1063.0	SUBBASE FILL
70	STATION 4+50, 60' RIGHT OF CENTERLINE	4.0	1065.0	SUBBASE FILL
71	RETEST 69A	3.0	1063.0	SUBBASE FILL
72	STATION 5+00, 65' LEFT OF CENTERLINE	5.0	1078.0	SUBBASE FILL
73	STATION 4+00, 60' LEFT OF CENTERLINE	6.0	1069.0	SUBBASE FILL
74	STATION 3+00, 40' RIGHT OF CENTERLINE	8.0	1074.0	SUBBASE FILL
75	STATION 4+50, 60' RIGHT OF CENTERLINE	16.5	1077.5	SUBBASE FILL
76	RETEST 73A	6.0	1069.0	SUBBASE FILL
77	RETEST 74A	8.0	1074.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 68-79 BID #9,/80-83 BID #10
* DATUM TOPOGRAPHIC

95
MP

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2) GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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Since 1955

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-2
Authorized By WOODY THOMAS Date 08-18-95
Tested By P. LLEWELLYN/WT Date 08-18-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
78		7.6	123.4	0.0	2	128.5	7.5	96		95	YES
79		7.9	125.4	0.0	2	128.5	7.5	98		95	YES
80		5.6	123.5	0.0	3	137.4	1.0	90		90	YES
81		7.2	136.2	0.0	3	137.4	1.0	99		90	YES
82		6.4	127.5	0.0	3	137.4	1.0	93		90	YES
83		6.9	133.7	0.0	3	137.4	1.0	97		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
78	STATION 4+00, 60' LEFT OF CENTERLINE	11.0	1074.0	SUBBASE FILL
79	STATION 5+00, 60' RIGHT OF CENTERLNE	11.5	1082.5	SUBBASE FILL
80	STATION 11+50, 180' LEFT OF CENTERLINE, STRIP DRAIN	3.0	997.0	SUBBASE FILL
81	STATION 11+00, 130' LEFT OF CENTERLINE, STRIP DRAIN	3.0	998.0	SUBBASE FILL
82	STATION 10+00, 75' LEFT OF CENTERLINE, STRIP DRAIN	3.0	999.0	SUBBASE FILL
83	STATION 11+50, 280' LEFT OF CENTERLINE, STRIP DRAIN	3.0	995.0	SUBBASE FILL

Comments: 68-79 BID #9,/80-83 BID #10
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
49		5.8	119.9	0.0	2	128.5	7.5	93		95	NO
50		6.1	120.8	0.0	2	128.5	7.5	94		95	NO
51		7.0	122.5	0.0	2	128.5	7.5	95		95	YES
52		7.3	123.1	0.0	2	128.5	7.5	96		95	YES
53		6.7	122.0	0.0	2	128.5	7.5	95		95	YES
54		8.5	122.7	0.0	2	128.5	7.5	95		95	YES
55		7.2	122.9	0.0	2	128.5	7.5	96		95	YES
56		8.1	122.6	0.0	2	128.5	7.5	95		95	YES
57		6.9	125.4	0.0	2	128.5	7.5	98		95	YES
58		7.2	123.2	0.0	2	128.5	7.5	96		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
49	STATION 4+00, 10' LEFT OF CENTERLINE	12.0	1075.0	SUBBASE FILL
50	STATION 5+50, 7' RIGHT OF CENTERLINE	12.0	1071.0	SUBBASE FILL
51	RETEST 49A	12.0	1075.0	SUBBASE FILL
52	RETEST 50A	12.0	1071.0	SUBBASE FILL
53	STATION 7+00, 15' RIGHT OF DAM CENTERLINE		1059.0	SUBGRADE
54	STATION 11+10, 270' LEFT OF DAM CENTERLINE		987.0	SUBGRADE
55	STATION 3+50, 12' LEFT OF DAM CENTERLINE	5.5	1076.0	SUBBASE FILL
56	STATION 5+50, 18' RIGHT OF DAM CENTERLINE	13.0	1071.0	SUBBASE FILL
57	STATION 4+00, 6' LEFT OF DAM CENTERLINE	13.0	1076.0	SUBBASE FILL
58	STATION 5+00, 12' RIGHT OF DAM CENTERLINE	15.0	1074.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10,/64-66 BID#13
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485-1
Authorized By WOODY THOMAS Date 08-17-95
Tested By P. LLEWELLYN/WT Date 08-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
59		7.8	122.4	0.0	2	128.5	7.5	95		95	YES
60		7.6	122.9	0.0	2	128.5	7.5	96		95	YES
61		6.4	126.5	0.0	3	137.4	1.0	92		90	YES
62		5.4	124.3	0.0	3	137.4	1.0	90		90	YES
63		5.9	123.9	0.0	3	137.4	1.0	90		90	YES
64		6.5	121.6	0.0	2	128.5	7.5	95		95	YES
65		6.7	122.3	0.0	2	128.5	7.5	95		95	YES
66		7.0	122.0	0.0	2	128.5	7.5	95		95	YES
67		6.3	120.5	0.0	2	128.5	7.5	94		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
59	STATION 6+00, 8' LEFT OF DAM CENTERLINE	9.0	1070.0	SUBBASE FILL
60	STATION 6+25, 10' RIGHT OF DAM CENTERLINE	7.0	1069.0	SUBBASE FILL
61	STATION 9+50, 130' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
62	STATION 11+50, 140' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
63	STATION 12+00, 110' LEFT OF DAM CENTERLINE, STRIP DRAIN	1.0	995.0	SUBBASE FILL
64	STATION 0+50, RIGHT OF OULET CENTERLINE	1.0	1002.0	SUBBASE FILL
65	STATION 1+00, RIGHT OF OUTLET CENTERLINE	2.0	1001.0	SUBBASE FILL
66	STATION 1+20, RIGHT OF OUTLET CENTERLINE	1.0	999.0	SUBBASE FILL
67	STATION 4+00, 60' RIGHT OF CENTERLINE	1.0	1064.0	SUBBASE FILL

Comments: 49-52, 55-60 & 67 BID #9,/53 & 54 BID #6,/61-63 BID #10./64-66 BID#13
• DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450485
Authorized By WOODY THOMAS Date 08-16-95
Tested By P. LLEWELLYN/WT Date 08-16-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3085 H_2O 611

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
36		3.7	123.3	0.0	2	128.5	7.5	96		95	YES
37		6.5	122.2	0.0	2	128.5	7.5	95		95	YES
38		7.2	124.4	0.0	2	128.5	7.5	97		95	YES
39		7.9	126.0	0.0	2	128.5	7.5	98		95	YES
40		8.4	122.0	0.0	2	128.5	7.5	95		95	YES
41		8.6	125.1	0.0	2	128.5	7.5	97		95	YES
42		7.8	123.1	0.0	2	128.5	7.5	96		95	YES
43		7.5	123.8	0.0	2	128.5	7.5	96		95	YES
44		7.2	121.6	0.0	2	128.5	7.5	95		95	YES
45		5.8	119.7	0.0	2	128.5	7.5	93		95	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
36	STATION 11+25, 125' LEFT OF DAM CENTERLINE		1007.0	SUBGRADE
37	STATION 11+20, 150' LEFT OF DAM CENTERLINE		1005.0	SUBGRADE
38	STATION 2+50, 20' LEFT OF DAM CENTERLINE	4.0	1077.0	SUBBASE FILL
39	STATION 4+00, 22' RIGHT OF DAM CENTERLINE	7.0	1070.0	SUBBASE FILL
40	STATION 4+00, 20' RIGHT OF DAM CENTERLINE	10.0	1073.0	SUBBASE FILL
41	STATION 5+00, 15' LEFT OF DAM CENTERLINE	9.0	1068.0	SUBBASE FILL
42	STATION 5+00, 6' RIGHT OF DAM CENTERLINE	12.0	1071.0	SUBBASE FILL
43	STATION 6+00, 18' LEFT OF DAM CENTERLINE	2.5	1063.5	SUBBASE FILL
44	STATION 6+00, 20' RIGHT OF DAM CENTERLINE	5.5	1066.5	SUBBASE FILL
45	STATION 10+00, 125' LEFT OF DAM CENTERLINE, STRIP DRAIN		994.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 36,37, 45-47 BID #6,/38,39, 40-44, BID #9,/48 BID #10, MAX RELATIVE
• DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MP
GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 08-31-95
Job No. 2745JC249

Event/Invoice No. 27450485
Authorized By WOODY THOMAS Date 08-16-95
Tested By P. LLEWELLYN/WT Date 08-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN. NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
46		6.6	122.5	0.0	2	128.5	7.5	95		95	YES
47		6.9	123.1	0.0	2	128.5	7.5	96		95	YES
48		5.0	125.9	0.0	3	137.4	1.0	92		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
46	RETEST 45A		994.0	SUBGRADE
47	STATION 10+50, 130' LEFT OF DAM CENTERLINE, STRIP DRAIN		994.0	SUBGRADE
48	STATION 10+15, 70' LEFT OF DAM CENTERLINE, STRIP DRAIN	2.0	999.0	SUBBASE FILL

Comments: 36,37, 45-47 BID #6,/38,39, 40-44, BID #9,/48 BID #10, MAX RELATIVE
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

9S MAP

GREINER, INC.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450450-5
Authorized By WOODY THOMAS Date 08-15-95
Tested By P. LLEWELLYN/WT Date 08-15-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3411B Serial No. 12873 Standard Count: Unit Weight 2709 H_2O 626

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
35		4.2	124.5	0.0	3	137.4	1.0	91		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
35	STATION 11+30, DRAIN ROCK FILL AT DAM EMBANKMENT	1.0	998.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #10
• DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MW

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450450-4
Authorized By WOODY THOMAS Date 08-14-95
Tested By P. LLEWELLYN/WT Date 08-14-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3155 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
27		5.6	121.7	0.0	2	128.5	7.5	95		95	YES
28		7.3	119.4	0.0	2	128.5	7.5	93		95	NO
29		5.2	116.9	0.0	2	128.5	7.5	91		95	NO
30		3.5	121.5	0.0	2	128.5	7.5	95		95	YES
31		6.2	121.7	0.0	2	128.5	7.5	95		95	YES
32		6.6	122.2	0.0	2	128.5	7.5	95		95	YES
33		4.9	124.1	0.0	2	128.5	7.5	97		95	YES
34		6.4	131.2	0.0	3	137.4	1.0	95		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
27	STATION 10+50, 20' LEFT OF CENTERLINE		1000.0	SUBGRADE
28	STATION 10+30, 65' LEFT OF CENTERLINE		995.0	SUBGRADE
29	STATION 11+30, 85' LEFT OF CENTERLINE		995.0	SUBGRADE
30	RETEST 29A		995.0	SUBGRADE
31	RETEST 28A		995.0	SUBGRADE
32	STATION 3+10, 10' RIGHT OF CENTERLINE		1072.0	SUBBASE FILL
33	STATION 5+00, 12' RIGHT OF CENTERLINE		1067.0	SUBBASE FILL
34	STATION 5+50, 12' LEFT OF CENTERLINE		1063.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: 27-31 BID #6,/32 & 33 BID #9,/34 BID #10
• DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95
MAP
GREINER, INC.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249
Event/Invoice No. 27450450-3
Authorized By W. THOMAS Date 08-11-95
Tested By P. LLEWELLYN Date 08-11-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3155 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
24		9.3	127.5	0.0	3	137.4	1.0	93		90	YES
25		8.6	123.9	0.0	3	137.4	1.0	90		90	YES
26		4.1	124.6	0.0	3	137.4	1.0	91		90	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
24	RETEST 22A	1.0	990.0	SUBBASE FILL
25	OUTLET WORKS, STA. 3+75	1.0	991.0	SUBBASE FILL
26	DAM EMBANKMENT, STA.5+30, 50' LEFT OF CENTERLINE	1.0	1060.0	SUBBASE FILL

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B

Comments: BID #10
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 08-31-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450450-2
Authorized By W. THOMAS Date 08-10-95
Tested By P. LLEWELLYN Date 08-10-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3155 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
18		7.8	123.8	0.0	2	128.5	7.5	96		95	YES
19		5.3	123.8	0.0	2	128.5	7.5	96		95	YES
20		6.5	123.3	0.0	2	128.5	7.5	96		95	YES
21		5.9	119.6	0.0	2	128.5	7.5	93		95	NO
22		1.7	118.4	0.0	3	137.4	1.0	86		95	NO
23		5.1	128.4	0.0	1	132.0	7.5	97		95	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
18	RETEST 13A		1063.0	SUBGRADE
19	RETEST 13B		1063.0	SUBGRADE
20	STATION 0+20, 15' RIGHT OF CENTERLINE		1083.0	SUBGRADE
21	STATION 1+05, 10' RIGHT OF CENTERLINE		1077.0	SUBGRADE
22	DRAIN ROCK, STATION 3+45, 5' RIGHT OF CENTERLINE	1.0	990.0	SUBBASE FILL
23	RETEST 21A		1077.0	SUBGRADE

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
2	27450485	SAND W/GRAVEL, TRACE SILT	STA 4+05, 15' RT OF CL	7.5	128.5	D1557-C
3	27450450	DRAIN ROCK	WMK MATERIALS	1.0	137.4	D4253-B
1	27450450	SAND W/SILT & FEW GRAVEL	OUTLET WORK TRENCH	7.5	132.0	D1557-B

Comments: #18-21, 23 BID #6,/22 BID #10
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

95 MAP

GREINER, INC

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG

FULL TIME ___

ON CALL X

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
NUCLEAR METHOD (TROXLER)

Job No. 2745C249 Page 1 of 1

PROCEDURE / SPECIFICATIONS

In-Place Unit Weight: ☒ ASTM D2922 ☐ AASHTO T238 ☐ ______ Event/Invoice No. ______ Lab No. ______

In-Place Moisture %: ☐ ASTM D3017 ☐ AASHTO T239 ☐ AASHTO T217 Authorized By Wesley Thomas Date 8-11-95

Rock Correction: ☐ ASTM D4718 ☐ AASHTO T224 ☐ ______ Tested By PHuellen Date ↓

Visual Soil Classification per ASTM D2488 drain rock Test Locations Designated By WTT Date ↓

Gauge: Make Troxler Model 3430 Serial No. 24742 Standard Count: (1) Unit Weight 3155 (2) H_2O 666

Test Hole No.		24	25	26	~~23~~
Horizontal Location of Test Hole		ret est 22 A	outlet works Sta # 3+25	dam embankment Sta #5+22 50 Lt ℄	
	95 MDP				
Vertical Distance From Elevation Datum, ft. †		990	991	1060	
Depth of Fill		1'	1'	1'	
DENSITY	Probe Depth	6"	6"	10"	
	Counts				
	(3) Count Average				
	Density Ratio				
MOISTURE	Counts				
	(4) Count Average				
	Moisture Ratio				
(5) Wet Unit Weight, lbf / cu. ft. from Calibration Chart or Readout		139.4	134.6	129.7	
(6) Water, lbf / cu. ft. from Calibration Chart or Readout		11.9	10.7	5.1	
Specific Gravity of +No. 4 Material ☐ Assumed ☐ Tested					
(7) Wet Weight of Sample, lbf					
(8) Wet Weight of +No. 4 Material					
% of +No. 4 Material – Lab / Field	[(8) ÷ (7)] x 100				
ID. No. – Lab Maximum Unit Weight & Optimum Moisture		/	/	/	/
Optimum Moisture (Lab), % of Dry Unit Weight					
Maximum Dry Unit Weight (Lab), lbf / cu. ft.					
(9) Corrected Maximum Dry Unit Weight, lbf / cu. ft.	(See Chart)	137.4	137.4	137.4	
(10) Corrected Optimum Moisture, %	(See Chart)	9.1	9.1	9.1	
(11) Dry Unit Weight, lbf / cu. ft.	Readout or (5) – (6)	127.5	123.9	124.6	
(12) Report % Moisture, Total Sample	Readout or [(6) ÷ (11)] x 100	9.3	8.6	4.1	
Relative Compaction, %	Readout or [(11) ÷ (9)] x 100	93	90	91	
Conformance Indicated?		YES / NO / 15	YES / NO / 15	YES / NO / 15	YES / NO / 15
Comments*		7, 13, 19, 20			

DRAFT

White – File After Processing Final Report; Yellow – Preliminary Field Copy, Subject To Review

*Circle Applicable Data

1. Subgrade
2. Subbase Fill
3. Base Course
4. Structure Backfill
5. Trench Backfill
6. Pipe Bedding
7. Embankment Fill
8. Below Footing Bottom
9. Above Footing Bottom
10. ______

11. 100% minimum required
12. 95% minimum required
13. 90% minimum required
14. ___ minimum required
15. Specification Unknown
16. Moisture Specification
17. Test Locations Shown on Accompanying Site Plan

18. Maximum Dry Unit Weight: ☐ ASTM D698 ☐ AASHTO T99 ☐ ASTM D1557 ☐ AASHTO T180 METHOD ☐A ☐B ☐C ☐

19. bid # drain rock fill

20. relative density

† Datum ______

REVIEWED BY ______

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LABORATORY REPORT

Client	20449 **Greiner, Inc., Southwest** 3650 South Pointe Circle, Suite 203 Laughlin, Arizona 89028
Job No.	2745JC249
Lab./Invoice No.	27450450
Date of Report	08/14/95
Reviewed By	C Anderson

Project	Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)				
Location	Laughlin, Nevada				
Material/Specimen	Drainage Rock BID ITEM * 10	Sampled By	P. Llewellyn/WT	Date	08/01/95
Source	WMK Materials	Submitted By	P. Llewellyn/WT	Date	08/01/95
Test Procedure	ASTM D4253	Authorized By	K. Smith	Date	08/01/95

RESULTS

Relative Density

Minimum Density, PCF	106.2
Maximum Density, PCF	137.4

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Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

DRAWING NO. B1 #10

ASTM D4253-93   @ 2M25C244 → J.WADDELL 8/1/95

MAXIMUM γ DETERMINATION (100% RELATIVE γ)

		DRY METHOD	WET METHOD
SPECIMEN NUMBER			1
(12) LEFT DIAL READING	IN		−.06
(13) RIGHT DIAL READING	IN		−.76
(14) AVERAGE DIAL READING $\frac{(12)+(13)}{2}$	IN		−.41
(15) SPECIMEN HEIGHT @ ZERO DIAL	IN		6.00
(16) SPECIMEN HEIGHT (14)+(15)	IN		5.59
(17) VOLUME CONSTANT	CU FT/IN		.0163
(18) SPECIMEN VOLUME (16)×(17)	CU FT		.0911
(19) WT OF MEASURE + SOIL (WET or DRY)	LBS		25.56
(20) WT OF MEASURE	LBS		11.90
(21) WT OF DRY SOIL	LBS		N/A
(22) WT OF WET SOIL	LBS		13.66
(23) WT OF DRY SOIL $\frac{(22)}{1+\frac{W\%}{100}}$	LBS		12.52
(24) MAXIMUM γ $\frac{21}{18}$ OR $\frac{23}{18}$	PCF		137.4

137.4

RELATIVE γ COMPUTATION		
SPECIMEN NUMBER		
(25) IN PLACE γ	PCF	
(26) MAXIMUM γ	PCF	
(27) MINIMUM γ	PCF	
(28) (26) × (25)-(27)		
(29) (25) × (26-27)		
(30) RELATIVE γ $\left(\frac{28}{29}\right)\times 100$		%

MINIMUM γ ________ PCF

MAXIMUM γ ________ PCF

RELATIVE γ ________ %

____% RELATIVE γ ________ PCF

95

137.4
128.0

KGS

ASTM-D4253-75

27HSJC249
J. WADDELL
8/1/95

RELATIVE DENSITY TEST
MINIMUM & MAXIMUM DENSITY TEST DATA

TEST — LOCATION — MAX SIZE 3" — DATE 8/3
PROJECT — ELEV. — MAX SIZE TESTED 3" — TESTED BY JW
SOURCE OF MATL — ZONE — COMPUTED BY JW
C Anderegg CHECKED BY CA

MINIMUM DENSITY DETERMINATION (0% OF RELATIVE γ)	
SPECIMEN #	
(1) WT OF SOIL + MEASURE	21.38
(2) WT OF MEASURE	.53
(3) WT OF SOIL (1)-(2)	20.85
(4) VOL OF MEASURE	.19635
(5) MINIMUM γ $\frac{3}{4}$	106.2

WATER CONTENT (MAXIMUM γ SPECIMEN)		
SPECIMEN #		1 FIELD
PAN #		X
(6) WT OF PAN + WT SOIL	LBS	14.48
(7) WT OF PAN + DRY SOIL	LBS	13.35
(8) WT OF PAN	LBS	.91
(9) WT OF H_2O (6)-(7)	LBS	1.13
(10) WT OF DRY SOIL (7)-(8)	LBS	12.44
(11) % H_2O CONTENT $\frac{(9)}{(10)}$ x 100		9.1 %

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

nt 20024
WMK Materials
Post Office Box 31
Bullhead City, Arizona 86430

Job No. 2745JC090
Lab / Invoice No. 27450427
Date of Report 08/01/95
Reviewed By C Anderson
PO #1109095

Project: Quality Control Testing
Location: Bullhead City, Arizona
Type of Aggregate: Drain Rock
Source of Aggregate: WMK Materials

Sampled By: Client — Date: 07/31/95
Submitted By: Client — Date: 07/31/95
Authorized By: B. Swartzman/WMK — Date: 07/31/95

SIEVE ANALYSIS - ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.	100	100
2 in.		
1 1/2 in.	79	40–80
1 1/8 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.	30	20–50
1/4 in.		
No. 4	16	10–30
No. 8	11	5–25
No. 10		
No. 16		
No. 30		
No. 40		
No. 50		
No. 100		
No. 200	2.1	0–5
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		|	|	C235-
Fractured Faces, % By: Weight / Count		|	|	
Liquid Limit / Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

es To: Client/Bob Swartzman (2)

95 MP

G. ... ER, INC.

9 (10/92)

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450485
Date of Report 10/09/95
Reviewed By C Anderegg

Project: Hiko Springs Wash Dentention Basin (CCBD BId #3476-94)

Location: Laughlin, Nevada | Sampled By: C. Anderegg/WT | Date: 09/14/95

Type of Aggregate: Drain Rock | Submitted By: C. Anderegg/WT | Date: 09/14/95

Source of Aggregate: WMK Materials | Authorized By: K. Smith | Date: 09/14/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.	100	100
3 in.		
2 in.		
1 1/2 in.	74	40-80
1 1/8 in.		
1 in.	62	
3/4 in.	51	
1/2 in.	35	
3/8 in.	27	20-50
1/4 in.	14	
No. 4	10	10-30
No. 8	6	5-25
No. 10	6	
No. 16	5	
No. 30	4	
No. 40	4	
No. 50	3	
No. 100	3	
No.200	1.9	0-5
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

es To: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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[illegible]

9 (10/92)

6" Rip Rap

Rip Rap (W)

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Bullhead City, Arizona 86442
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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client: 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27450618
Date of Report 11/02/95
Reviewed By C Anderson

Project: Hiko Springs Detention Basin (CCBC Bid #3476-94)

Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date: 10/24/95

Type of Aggregate: Rip Rap — Submitted By: P. Llewellyn/WT — Date: 10/24/95

Source of Aggregate: Native/On site — Authorized By: W. Phelps/AAG — Date: 10/24/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		
1 1/8 in.		
1 in.		
3/4 in.		
1/2 in.		
3/8 in.		
1/4 in.		
No. 4		
No. 8		
No. 10		
No. 16		
No. 30		
No. 40		
No. 50		
No. 100		
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf		[illegible]		C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions	29	40	Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☒ C127-	
	Bulk (SSD)	2.62	☐ C128-	
	Apparent			

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Greiner, Inc., Southwest/Ken Smith (3)

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RCC Tests

RCC Belt Cuts

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PHYSICAL PROPERTIES OF AGGREGATES

LABORATORY REPORT

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460046
Date of Report 02/26/96
Reviewed By C Anderegg

Project Hiko Springs Detention Basin (CCBD Bid #3476-94

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/22/96

Type of Aggregate Roller Compacted Concrete — Submitted By W. Selseth/WT — Date 02/22/96

Source of Aggregate Belt Cut — Authorized By K. Smith — Date 02/22/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	95	
1 in.	88	
3/4 in.	78	58-72*
1/2 in.	63	
3/8 in.	53	45-57
1/4 in.	43	
No. 4	40	35-47
No. 8	29	24-36
No. 10	26	
No. 16	19	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	3.5	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		/	/	C235-
Fractured Faces, % By: Weight / Count		/	/	
Liquid Limit / Plasticity Index		/	/	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

Copies To: Client (2)
Greiner, Inc., Southwest/Ken Smith (3)

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2/27/96
[initials]

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Bullhead City, Arizona 86442
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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date of Report 02/23/96
Reviewed By C Andu[illegible]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date: 02/21/96

Type of Aggregate: Roller Compacted Concrete — Submitted By: W. Selseth/WT — Date: 02/21/96

Source of Aggregate: Belt Cut — Authorized By: K. Smith — Date: 02/21/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	97	
1 in.	88	
3/4 in.	76*	58-72
1/2 in.	57	
3/8 in.	47	45-57
1/4 in.	42	
No. 4	39	35-47
No. 8	28	24-36
No. 10	25	
No. 16	18	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	3.8	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count				C235-
Fractured Faces, % By: Weight I Count				
Liquid Limit I Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.8		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

Copies To: Client (3)
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2/27/96

* Does not meet specification requirements

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Golfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460046
Date of Report 02/23/96
Reviewed By C Andruzzi

Project Hiko Spring Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/20/96
Type of Aggregate Roller Compacted Concrete — Submitted By P. Llewellyn/WT — Date 02/20/96
Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 02/20/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	93	
1 in.	84	
3/4 in.	73 *	58-72
1/2 in.	57	
3/8 in.	51	45-57
1/4 in.	47	
No. 4	44	35-47
No. 8	31	24-36
No. 10	28	
No. 16	20	13-25
No. 30	12	
No. 40	9	
No. 50	7	5-15
No. 100	5	
no.200	3.6	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.5		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date of Report 02/20/96
Reviewed By C Andeugg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/16/96
Type of Aggregate Roller Compacted Concrete — Submitted By P. Bowen/WT — Date 02/16/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 02/16/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.	100	
1 1/2 in.	99	100
1-1/4	97	
1 in.	85	
3/4 in.	74 *	58-72
1/2 in.	60	
3/8 in.	50	45-57
1/4 in.	42	
No. 4	37	35-47
No. 8	24	24-36
No. 10	21	
No. 16	15	13-25
No. 30	9	
No. 40	7	
No. 50	6	5-15
No. 100	4	
No. 200	2.8 *	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		|	|	C235-
Fractured Faces, % By: Weight / Count		|	|	
Liquid Limit / Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.3		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27460046
Date of Report 02/20/96
Reviewed By C Anderson

Project: Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Aggregate: Roller Compacted Concrete
Source of Aggregate: Belt Cut
Sampled By: P. Llewellyn/WT Date 02/15/96
Submitted By: P. Llewellyn/WT Date 02/15/96
Authorized By: W. Phelps Date 02/15/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	86	
3/4 in.	73*	58-72
1/2 in.	58	
3/8 in.	52	45-57
1/4 in.	45	
No. 4	42	35-47
No. 8	29	24-36
No. 10	27	
No. 16	19	13-25
No. 30	12	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	4.1	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.9		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460061
Date of Report 02/16/96
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/14/96
Type of Aggregate Roller Compacted Aggregate — Submitted By P. Llewellyn/WT — Date 02/14/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 02/14/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	86	
3/4 in.	76 *	58-72
1/2 in.	58	
3/8 in.	49	45-57
1/4 in.	42	
No. 4	38	35-47
No. 8	28	24-36
No. 10	26	
No. 16	18	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	3.8	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.3		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27460046
Date of Report 02/14/96
Reviewed By C Anduzz

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Sampled By P. Llewellyn/WT Date 02/13/96
Type of Aggregate Roller Compacted Concrete
Submitted By P. Llewellyn/WT Date 02/13/96
Source of Aggregate Belt Cut
Authorized By W. Phelps Date 02/13/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	94	
1 in.	83	
3/4 in.	71	58-72
1/2 in.	55	
3/8 in.	47	45-57
1/4 in.	42	
No. 4	38	35-47
No. 8	24	24-36
No. 10	21	
No. 16	14	13-25
No. 30	8	
No. 40	7	
No. 50	5	5-15
No. 100	4	
No. 200	3.6	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.4		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460061
Date of Report 02/13/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/12/96
Type of Aggregate Roller Compacted Concrete — Submitted By W. Selseth/WT — Date 02/12/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 02/12/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	93	
1 in.	84	
3/4 in.	72	58-72
1/2 in.	58	
3/8 in.	51	45-57
1/4 in.	45	
No. 4	41	35-47
No. 8	30	24-36
No. 10	27	
No. 16	19	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	4.2	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.0		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27460046
Date of Report 02/09/96
Reviewed By C Anderegg

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Sampled By P. Llewellyn/WT Date 02/08/96
Type of Aggregate Roller Compacted Concrete
Submitted By R. Nickerson/WT Date 02/08/96
Source of Aggregate Belt Cut
Authorized By W. Phelps Date 02/08/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	82	
3/4 in.	71	58-72
1/2 in.	56	
3/8 in.	48	45-57
1/4 in.	41	
No. 4	37	35-47
No. 8	26	24-36
No. 10	24	
No. 16	17	13-25
No. 30	10	
No. 40	8	
No. 50	7	5-15
No. 100	5	
No. 200	3.4	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count				C235-
Fractured Faces, % By: Weight | Count				
Liquid Limit | Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.0		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460021
Date of Report 02/09/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/07/96

Type of Aggregate Roller Compacted Concrete — Submitted By J. Waddell/WT — Date 02/07/96

Source of Aggregate American Asphalt & Grading — Authorized By K. Smith — Date 02/07/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	88	
3/4 in.	77 *	58-72
1/2 in.	61	
3/8 in.	52	45-57
1/4 in.	46	
No. 4	42	35-47
No. 8	28	24-36
No. 10	26	
No. 16	18	13-25
No. 30	11	
No. 40	9	
No. 50	8	5-15
No. 100	5	
No. 200	3.9	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.9		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460046
Date of Report 02/07/96
Reviewed By C. Anderson

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/06/96
Type of Aggregate Roller Compacted Concrete — Submitted By W. Selseth/WT — Date 02/06/96
Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 02/06/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	94	
1 in.	84	
3/4 in.	71	58-72
1/2 in.	57	
3/8 in.	50	45-57
1/4 in.	44	
No. 4	41	35-47
No. 8	30	24-36
No. 10	27	
No. 16	20	13-25
No. 30	13	
No. 40	10	
No. 50	8	5-15
No. 100	6	
No. 200	4.2	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		|	|	C235-
Fractured Faces, % By: Weight / Count		|	|	
Liquid Limit / Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.7		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460021
Date of Report 02/07/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/05/96
Type of Aggregate Roller Compacted Concrete — Submitted By W. Selseth/WT — Date 02/05/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 02/05/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	94	
1 in.	85	
3/4 in.	74 *	58-72
1/2 in.	60	
3/8 in.	54	45-57
1/4 in.	49	
No. 4	45	35-47
No. 8	34	24-36
No. 10	31	
No. 16	22	13-25
No. 30	13	
No. 40	10	
No. 50	8	5-15
No. 100	5	
No.200	4.2	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.8		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT
Revised Report: 02/07/96

PHYSICAL PROPERTIES OF AGGREGATES

Client
20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460006
Date of Report 02/05/96
Reviewed By C Andungs

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Sampled By P. Llewellyn/WT Date 02/02/96
Type of Aggregate Roller Compacted Concrete
Submitted By P. Llewellyn/WT Date 02/02/96
Source of Aggregate Belt Cut
Authorized By W. Phelps Date 02/02/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	95	
1 in.	87	
3/4 in.	76*	58-72
1/2 in.	59	
3/8 in.	51	45-57
1/4 in.	47	
No. 4	43	35-47
No. 8	31	24-36
No. 10	28	
No. 16	19	13-25
No. 30	12	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	4.0	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count				C235-
Fractured Faces, % By: Weight / Count				
Liquid Limit / Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.9		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

LABORATORY REPORT
Revised Report: 02/07/96

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460006
Date of Report 02/05/96
Reviewed By [signature]

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/02/96

Type of Aggregate Roller Compacted Concrete — Submitted By P. Llewellyn/WT — Date 02/02/96

Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 02/02/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	95	
1 in.	87	
3/4 in.	76*	58-72
1/2 in.	59	
3/8 in.	51	45-57
1/4 in.	47	
No. 4	45	35-47
No. 8	31	24-36
No. 10	28	
No. 16	19	13-25
No. 30	12	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	4.0	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.9		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT
REVISED REPORT: 02/22/96

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date of Report 02/05/96
Reviewed By C Anduzzi

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/01/96
Type of Aggregate Roller Compacted Concrete — Submitted By P. Llewellyn/WT — Date 02/01/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 02/01/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.	100	
1 in.	86	
3/4 in.	74*	58-72
1/2 in.	60	
3/8 in.	51	45-57
1/4 in.	45	
No. 4	41	35-47
No. 8	29	24-36
No. 10	27	
No. 16	19	13-25
No. 30	12	
No. 40	10	
No. 50	8	5-15
No. 100	5	
No. 200	4.1	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count				C235-
Fractured Faces, % By: Weight I Count				
Liquid Limit I Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.3		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460006
Date of Report 02/05/96
Reviewed By

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/31/96

Type of Aggregate Roller Compacted Concrete — Submitted By P. Llewellyn/WT — Date 01/31/96

Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 01/3/196

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	91	
3/4 in.	81	58-72
1/2 in.	66	
3/8 in.	55	45-57
1/4 in.	51	
No. 4	45	35-47
No. 8	34	24-36
No. 10	32	
No. 16	23	13-25
No. 30	14	
No. 40	11	
No. 50	9	5-15
No. 100	6	
No. 200	4.8	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count				C235-
Fractured Faces, % By: Weight I Count				
Liquid Limit I Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.7		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460021
Date of Report 02/01/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Aggregate Blended Aggregates
Source of Aggregate American Asphalt/On site

Sampled By P. Llewellyn/WT Date 01/29/96
Submitted By T. Robbins/WT Date 01/29/96
Authorized By K. Smith Date 01/29/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1-1/4	92	
1 in.	83	
3/4 in.	74	58-72*
1/2 in.	59	
3/8 in.	51	45-57
1/4 in.	45	
No. 4	42	35-47
No. 8	31	24-36
No. 10	28	
No. 16	20	13-25
No. 30	13	
No. 40	10	
No. 50	8	5-15
No. 100	6	
No. 200	4.5	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.2		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT
REVISED REPORT: 02/07/96

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date of Report 01/31/96
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/25/96
Type of Aggregate Roller Compacted Concrete — Submitted By T. Robbins/WT — Date 01/25/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 01/25/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	95	
1 in.	86	
3/4 in.	77	58-72
1/2 in.	62	
3/8 in.	51	45-57
1/4 in.	43	
No. 4	39	35-47
No. 8	28	24-36
No. 10	25	
No. 16	18	13-25
No. 30	10	
No. 40	8	
No. 50	7	5-15
No. 100	4	
No. 200	3.8	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count				C235-
Fractured Faces, % By: Weight / Count				
Liquid Limit / Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.0		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27460006
Date of Report 01/31/96
Reviewed By [signature]

Project Hiko Springs Detention Basin (CCBD BId #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/26/96

Type of Aggregate Roller Compacted Concrete Aggregate — Submitted By J. Waddell/WT — Date 01/26/96

Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 01/26/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	83	
3/4 in.	71	58-72
1/2 in.	57	
3/8 in.	51	45-57
1/4 in.	46	
No. 4	42	35-47
No. 8	30	24-36
No. 10	28	
No. 16	20	13-25
No. 30	12	
No. 40	10	
No. 50	8	5-15
No. 100	6	
No. 200	3.9	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.4		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460021
Date of Report 01/31/96
Reviewed By C Andeuzz

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date 01/30/96
Type of Aggregate: Roller Compacted Concrete — Submitted By: T. Robbins/WT — Date 01/30/96
Source of Aggregate: Belt Cut — Authorized By: K. Smith — Date 01/30/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1½	100	100
1 1/8 in.		
1 in.	86	
3/4 in.	76*	58-72
1/2 in.	60	
3/8 in.	51	45-57
1/4 in.	45	
No. 4	41	35-47
No. 8	30	24-36
No. 10	27	
No. 16	19	13-25
No. 30	12	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	3.6	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.6		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date of Report 01/31/96
Reviewed By C Anduzgo

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Sampled By P. Llewellyn/WT Date 01/27/96
Type of Aggregate Roller Compacted Concrete
Submitted By T. Robbins/WT Date 01/27/96
Source of Aggregate Belt Cut
Authorized By K. Smith Date 01/27/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	83	
3/4 in.	74	58-72
1/2 in.	58	
3/8 in.	51	45-57
1/4 in.	45	
No. 4	41	35-47
No. 8	29	24-36
No. 10	27	
No. 16	20	13-25
No. 30	13	
No. 40	10	
No. 50	8	5-15
No. 100	6	
No. 200	4.5	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.9		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27460006
Date of Report 01/23/96
Reviewed By C Anderegg

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/19/96
Type of Aggregate Roller Compacted Concrete — Submitted By C. Anderegg/WT — Date 01/19/96
Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 01/19/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	92	
1 in.	81	
3/4 in.	68	58-72
1/2 in.	54	
3/8 in.	49	45-57
1/4 in.	46	
No. 4	42	35-47
No. 8	32	24-36
No. 10	29	
No. 16	21	13-25
No. 30	13	
No. 40	10	
No. 50	8	5-15
No. 100	5	
No.200	3.8	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		|	|	C235-
Fractured Faces, % By: Weight / Count		|	|	
Liquid Limit / Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.7		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460006
Date of Report 01/19/96
Reviewed By [signature]

Project: Hiko Springs Detention Basin (CCBD BId #3476-94)

Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date: 01/15/96

Type of Aggregate: Roller Compacted Concrete — Submitted By: P. Llewellyn/WT — Date: 01/15/96

Source of Aggregate: Belt Cut — Authorized By: W. Phelps — Date: 01/15/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	88	
3/4 in.	78*	58-72
1/2 in.	63	
3/8 in.	54	45-57
1/4 in.	46	
No. 4	42	35-47
No. 8	30	24-36
No. 10	28	
No. 16	20	13-25
No. 30	13	
No. 40	10	
No. 50	8	5-15
No. 100	6	
No. 200	4.1	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		3.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client: 20287
American Asphalt & Grading
3624 Goldfield Stree
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27460006
Date of Report 01/19/96
Reviewed By

Project: Hiko Springs Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada	Sampled By: P. Llewellyn/WT	Date: 01/17/96
Type of Aggregate: Roller Compacted Concrete	Submitted By: W. Selseth/WT	Date: 01/17/96
Source of Aggregate: Belt Cut	Authorized By: W. Phelps	Date: 01/17/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	86	
3/4 in.	76	58-72
1/2 in.	61	
3/8 in.	53	45-57
1/4 in.	46	
No. 4	42	35-47
No. 8	32	24-36
No. 10	29	
No. 16	21	13-25
No. 30	12	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No.200	3.4	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.9		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date of Report 01/19/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/18/96
Type of Aggregate Roller Compacted Concrete — Submitted By P. Llewellyn/WT — Date 01/18/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 01/18/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.	100	
1 in.	83	
3/4 in.	73	58-72
1/2 in.	61	
3/8 in.	55	45-57
1/4 in.	49	
No. 4	45	35-47
No. 8	34	24-36
No. 10	31	
No. 16	23	13-25
No. 30	14	
No. 40	10	
No. 50	8	5-15
No. 100	5	
No. 200	3.2	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.6		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date of Report 01/19/96
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada Sampled By P. Llewellyn/WT Date 01/16/96
Type of Aggregate Roller Compacted Concrete Submitted By W. Selseth/WT Date 01/16/96
Source of Aggregate Belt Cut Authorized By K. Smith Date 01/16/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1-1/4	92	
1 in.	82	
3/4 in.	71	58-72
1/2 in.	56	
3/8 in.	49	45-57
1/4 in.	44	
No. 4	40	35-47
No. 8	29	24-36
No. 10	26	
No. 16	18	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	3.6	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		|	|	C235-
Fractured Faces, % By: Weight / Count		|	|	
Liquid Limit / Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.0		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450684
Date of Report 01/15/96
Reviewed By C Anderegg

Project Hiko Springs Wash Dentention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/11/96
Type of Aggregate American Asphalt & Grading — Submitted By C. Anderegg/WT — Date 01/11/96
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 01/11/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/4	92	
1 in.	84	
3/4 in.	75*	58-72
1/2 in.	61	
3/8 in.	51	45-57
1/4 in.	43	
No. 4	39	35-47
No. 8	27	24-36
No. 10	24	
No. 16	17	13-25
No. 30	10	
No. 40	8	
No. 50	6	5-15
No. 100	4	
No.200	3.5	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.9		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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* Does not meet specification requirements

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460006
Date of Report 01/15/96
Reviewed By C Andrezzi

Project Hiko Springs Detention Basin (CCBD BId #3476 94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/10/96

Type of Aggregate Roller Compacted Concrete — Submitted By P. Bowen/WT — Date 01/10/96

Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 01/10/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/4	91	
1 in.	83	
3/4 in.	71	58-72
1/2 in.	58	
3/8 in.	51	45-57
1/4 in.	45	
No. 4	42	35-47
No. 8	29	24-36
No. 10	27	
No. 16	19	13-25
No. 30	12	
No. 40	9	
No. 50	8	5-15
No. 100	5	
No. 200	4.3	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date of Report 01/12/96
Reviewed By C Andugg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/09/96

Type of Aggregate Roller Compacted Concrete — Submitted By P. Bowen/WT — Date 01/09/96

Source of Aggregate Belt Cut — Authorized By K. Smith — Date 01/09/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 -1/4	92	
1 in.	82	
3/4 in.	71	58-72
1/2 in.	57	
3/8 in.	50	45-57
1/4 in.	44	
No. 4	41	35-47
No. 8	29	24-36
No. 10	27	
No. 16	18	13-25
No. 30	12	
No. 40	10	
No. 50	7	5-15
No. 100	6	
No. 200	3.7	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.3		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date of Report 01/11/96
Reviewed By C Andrezzi

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date: 01/08/96
Type of Aggregate: Roller Compacted Concrete — Submitted By: J. Waddell/WT — Date: 01/08/96
Source of Aggregate: Belt Cut — Authorized By: K. Smith — Date: 01/08/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	94	
3/4 in.	90 *	58-72
1/2 in.	81	
3/8 in.	76 *	45-57
1/4 in.	70	
No. 4	65 *	35-47
No. 8	48 *	24-36
No. 10	44	
No. 16	31 *	13-25
No. 30	19	
No. 40	14	
No. 50	11	5-15
No. 100	8	
No. 200	5.9	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		1.8		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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* Does not meet specification requirements

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client: 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460006
Date of Report 01/11/96
Reviewed By C Anderegg

Project: Hiko Springs Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date: 01/08/96

Type of Aggregate: Roller Compacted Concrete — Submitted By: K. Smith — Date: 01/08/96

Source of Aggregate: Belt Cut — Authorized By: W. Phelps — Date: 01/08/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	84	
3/4 in.	78*	58-72
1/2 in.	64	
3/8 in.	54	45-57
1/4 in.	45	
No. 4	41	35-47
No. 8	30	24-36
No. 10	28	
No. 16	20	13-25
No. 30	12	
No. 40	10	
No. 50	8	5-15
No. 100	6	
No. 200	4.3	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27460006
Date of Report 01/09/96
Reviewed By C Anderegg

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/05/96

Type of Aggregate Roller Compacted Concrete Aggregate — Submitted By C. Anderegg/WT — Date 01/05/96

Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 01/05/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	90	
3/4 in.	81*	58-72
1/2 in.	68	
3/8 in.	61*	45-57
1/4 in.	55	
No. 4	50*	35-47
No. 8	36	24-36
No. 10	33	
No. 16	24	13-25
No. 30	15	
No. 40	12	
No. 50	10	5-10
No. 100	7	
No. 200	5.1	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.3		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27460006
Date of Report 01/09/96
Reviewed By C Andueza

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/03/96
Type of Aggregate Roller Compacted Concrete Aggregate — Submitted By T. Robbins/WT — Date 01/03/96
Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 01/03/96

SIEVE ANALYSIS - ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.	100	
1 1/2 in.	99	100
1 1/8 in.	93	
1 in.	85	
3/4 in.	71	58-72
1/2 in.	56	
3/8 in.	49	45-57
1/4 in.	45	
No. 4	41	35-47
No. 8	29	24-36
No. 10	26	
No. 16	18	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-10
No. 100	5	
No.200	3.4	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content %, Blend		2.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date of Report 01/09/96
Reviewed By C Andueza

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 01/04/96

Type of Aggregate Roller Compacted Concrete — Submitted By J. Waddell/WT — Date 01/04/96

Source of Aggregate Belt Cut — Authorized By K. Smith — Date 01/04/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	89	
3/4 in.	76*	58-72
1/2 in.	61	
3/8 in.	54	45-57
1/4 in.	48	
No. 4	45	35-47
No. 8	33	24-36
No. 10	30	
No. 16	22	13-25
No. 30	14	
No. 40	11	
No. 50	9	5-15
No. 100	7	
No. 200	5.2	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %, Blend		2.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date of Report 01/03/96
Reviewed By C Andeugg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location	Laughlin, Nevada	Sampled By P. Llewellyn/WT	Date 01/02/96
Type of Aggregate	Roller Compacted Concrete	Submitted By W. Selseth/WT	Date 01/02/96
Source of Aggregate	Belt Cut	Authorized By K. Smith	Date 01/02/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	82	
3/4 in.	67	58-72
1/2 in.	50	
3/8 in.	44	45-57
1/4 in.	40	
No. 4	37	35-47
No. 8	27	24-36
No. 10	25	
No. 16	18	13-25
No. 30	12	
No. 40	9	
No. 50	8	5-15
No. 100	5	
No.200	4.2	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27450678
Date of Report 12/28/95
Reviewed By [signature]

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By J. Waddell/WT — Date 12/21/95
Type of Aggregate Roller Compacted Concrete — Submitted By W. Selseth/WT — Date 12/21/95
Source of Aggregate Belt Cut — Authorized By W. Phelps — Date 12/21/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	86	
3/4 in.	73	58-72
1/2 in.	56	
3/8 in.	50	45-57
1/4 in.	46	
No. 4	42	35-47
No. 8	29	24-36
No. 10	27	
No. 16	19	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	3.4	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count				C235-
Fractured Faces, % By: Weight | Count				
Liquid Limit | Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, Blend		2.0%		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450684
Date of Report 12/27/95
Reviewed By C Andrugg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By J. Waddell/WT — Date 12/20/95

Type of Aggregate Roller Compacted Concrete — Submitted By T. Robbins/WT — Date 12/20/95

Source of Aggregate Belt Cut — Authorized By K. Smith — Date 12/20/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	82	
3/4 in.	72	58-72
1/2 in.	58	
3/8 in.	49	45-57
1/4 in.	45	
No. 4	42	35-47
No. 8	30	24-36
No. 10	28	
No. 16	20	13-25
No. 30	13	
No. 40	11	
No. 50	9	5-15
No. 100	7	
No.200	5.2	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count				C235-
Fractured Faces, % By: Weight I Count				
Liquid Limit I Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content		2.4		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27450678
Date of Report 12/28/95
Reviewed By C Anderegg

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada Sampled By J. Waddell/WT Date 12/19/95
Type of Aggregate Roller Compacted Concrete Submitted By C. Anderegg/WT Date 12/19/95
Source of Aggregate Belt Cut Authorized By W. Phelps Date 12/19/95

SIEVE ANALYSIS - ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	85	
3/4 in.	75	58-72
1/2 in.	58	
3/8 in.	49	45-57
1/4 in.	44	
No. 4	40	35-47
No. 8	30	24-36
No. 10	28	
No. 16	19	13-25
No. 30	12	
No. 40	10	
No. 50	8	5-15
No. 100	6	
No. 200	4.8	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count				C235-
Fractured Faces, % By: Weight | Count				
Liquid Limit | Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture Content, Blend		2.6%		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date of Report 12/27/95
Reviewed By C Anduizz

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada | Sampled By J. Waddell/WT | Date 12/18/95
Type of Aggregate Roller Compacted Concrete | Submitted By T. Robbins/WT | Date 12/18/95
Source of Aggregate Belt Cut | Authorized By K. Smith | Date 12/18/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.	100	
1 1/2 in.	98*	100
1 1/4	91	
1 in.	84	
3/4 in.	73*	58-72
1/2 in.	59	
3/8 in.	53	45-57
1/4 in.	49	
No. 4	45	35-47
No. 8	34	24-36
No. 10	31	
No. 16	23	13-25
No. 30	15	
No. 40	12	
No. 50	10	5-15
No. 100	7	
No 200	5.5	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, Blend		3.2%		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

Copies To: Client/Ken Smith (3)
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* Denotes out of specification

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LABORATORY REPORT
REVISED REPORT: 12/28/95

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 12/18/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By J. Waddell/WT — Date 12/14/95

Type of Aggregate Roller Compacted Concrete — Submitted By C. Myers/WT — Date 12/14/95

Source of Aggregate Belt Cut — Authorized By K. Smith — Date 12/14/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	91	
3/4 in.	80	58-72*
1/2 in.	69	
3/8 in.	62	45-57*
1/4 in.	55	
No. 4	50	35-47*
No. 8	34	24-36
No. 10	31	
No. 16	22	13-25
No. 30	13	
No. 40	11	
No. 50	9	5-15
No. 100	6	
No.200	4.9	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count				C235-
Fractured Faces, % By: Weight / Count				
Liquid Limit / Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture content, blend %		2.6		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27450678
Date of Report 12/18/95
Reviewed By C Anderegg

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Aggregate Roller Compacted Concrete
Source of Aggregate Belt Cut

Sampled By C. Anderegg/WT Date 12/15/95
Submitted By C. Anderegg/WT Date 12/15/95
Authorized By W. Phelps Date 12/15/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	83	
3/4 in.	75	58–72
1/2 in.	63	
3/8 in.	59	45–57
1/4 in.	55	
No. 4	50	35–47
No. 8	36	24–36
No. 10	33	
No. 16	23	13–25
No. 30	15	
No. 40	12	
No. 50	10	5–15
No. 100	7	
No. 200	5.5	3– 10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture, blend, %		2.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab/Invoice No. 27450632
Date of Report 12/14/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Sampled By J. Waddell/WT Date 12/13/95
Type of Aggregate Roller Compacted Concrete
Submitted By C. Anderegg/WT Date 12/13/95
Source of Aggregate Belt Cut
Authorized By K. Smith Date 12/13/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	83	
3/4 in.	71	58-72
1/2 in.	54	
3/8 in.	47	45-57
1/4 in.	43	
No. 4	39	35-47
No. 8	27	24-36
No. 10	24	
No. 16	18	13-25
No. 30	11	
No. 40	9	
No. 50	7	5-15
No. 100	5	
No. 200	3.9	3-10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture, %		2.6		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 12/14/95
Reviewed By C Andrus

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 12/12/95

Type of Aggregate Roller Compacted Concrete — Submitted By P. Llewellyn/WT — Date 12/12/95

Source of Aggregate Belt Cut — Authorized By K. Smith — Date 12/12/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.		
1 in.	88	
3/4 in.	76*	58–72
1/2 in.	57	
3/8 in.	48	45–57
1/4 in.	43	
No. 4	39	35–47
No. 8	27	25–36
No. 10	24	
No. 16	17	13–25
No. 30	10	
No. 40	8	
No. 50	6	5–15
No. 100	4	
No. 200	3.4	3–10
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture, blend, %		2.5		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/26/96
Reviewed By C Andung

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/22/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
445	02/22/96	Spillway, East abutment, Sta. 11+00	1079
446	02/22/96	Spillway, East abutment, Sta. 11+20	1080
447	02/22/96	Spillway, East abutment, Sta. 11+25	1081
448	02/22/96	Spillway, East abutment, Sta. 11+00	1082
449	02/22/96	Spillway, East abutment, Sta. 10+95	1083
450	02/22/96	Spillway, East abutment, Sta. 11+00	1084

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
445	mix 2	5.7	148.0	6.0	145.9	99	yes	9, 13, 15, 18
446	mix 2	5.7	148.0	6.5	145.5	98	yes	9, 13, 15, 18
447	mix 2	5.7	148.0	6.3	146.6	99	yes	9, 13, 15, 18
448	mix 2	5.7	148.0	6.5	146.3	99	yes	9, 13, 15, 18
449	mix 2	5.7	148.0	6.5	145.4	98	yes	9, 13, 15, 18
450	mix 2	5.7	148.0	6.0	145.1	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Job No. 2745JC249

Invoice No. 27460061

Report No. ________ Date 02/26/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
451	02/22/96	Spillway, East abutment, Sta. 11+25	1086	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
451	mix 2	5.7	148.0	6.1	146.0	99	yes	9, 13, 15, 18

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/26/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/21/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
437	02/21/96	Spillway, Crest, Sta. 16+50	1077
438	02/21/96	Spillway, Crest, Sta. 15+75	1077
439	02/21/96	Spillway, Crest, Sta. 15+00	1077
440	02/21/96	Spillway, Crest, Sta. 14+50	1077
441	02/21/96	Spillway, Crest, Sta. 14+00	1077
442	02/21/96	Spillway, Crest, Sta. 13+50	1077

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. ‡	Comments *
437	mix 2	5.7	148.0	7.3	145.6	98	yes	9, 13, 15, 18
438	mix 2	5.7	148.0	6.5	146.2	99	yes	9, 13, 15, 18
439	mix 2	5.7	148.0	6.8	146.0	99	yes	9, 13,1 5, 18
440	mix 2	5.7	148.0	7.0	145.3	98	yes	9, 13, 15, 18
441	mix 2	5.7	148.0	6.8	145.8	99	yes	9, 13, 15, 18
442	mix 2	5.7	148.0	6.8	145.4	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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2/27/96

Job No. 2745JC249

Invoice No. 27460061

Report No. ________ Date 02/26/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
443	02/21/96	Spillway, Crest, Sta. 12+75	1077	
444	02/21/96	Spillway, Crest, Sta. 12+00	1077	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	Wet Density pcf			
443	mix 2	5.7	148.0	7.1	146.0	99	yes	9, 13, 15, 18
444	mix 2	5.7	148.0	7.2	146.2	99	yes	9, 13, 15, 18

*Comments

1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/26/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/20/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
428	02/20/96	West abutment, Top of spillway, Sta. 17+25	1078
429	02/20/96	West abutment, Top of spillway, Sta. 17+50	1079
430	02/20/96	West abutment, Top of spillway, Sta. 17+40	1080
431	02/20/96	West abutment, Top of spillway, Sta. 17+50	1081
432	02/20/96	West abutment, Top of spillway, Sta. 17+25	1082
433	02/20/96	West abutment, Top of spillway, Sta. 17+50	1083

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
428	mix 2	5.7	148.0	5.2	145.5	98	yes	9, 13, 15, 18
429	mix 2	5.7	148.0	5.0	146.7	99	yes	9, 13, 15, 18
430	mix 2	5.7	148.0	5.4	146.3	99	yes	9, 13, 15, 18
431	mix 2	5.7	148.0	8.3	144.7	98	yes	9, 13, 15, 18
432	mix 2	5.7	148.0	8.3	145.0	98	yes	9, 13, 15, 18
433	mix 2	5.7	148.0	7.0	146.0	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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2/27/96
[initials]

Job No. 2745JC249

Invoice No. 27460061

Report No. ______ Date 02/26/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
434	02/20/96	West abutment, Top of spillway, Sta. 17+25	1084	
435	02/20/96	West abutment, Top of spillway, Sta. 17+10	1085	
436	02/20/96	West abutment, Top of spillway, Sta. 17+50	1086	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	Wet Density pcf			
434	mix 2	5.7	148.0	7.2	145.7	98	yes	9, 13, 15, 18
435	mix 2	5.7	148.0	7.2	146.4	99	yes	9, 13, 15, 18
436	mix 2	5.7	148.0	6.8	146.9	99	yes	9, 13, 15, 18

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/26/96
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/16/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
421	02/16/96	Spillway, Step #43, Sta. 16+00	1075
422	02/16/96	Spillway, Step #43, Sta. 15+50	1076
423	02/16/96	Spillway, Step #43, Sta. 15+00	1075
424	02/16/96	Spillway, Step #43, Sta. 14+00	1075
425	02/16/96	Spillway, Step #43, Sta. 13+50	1076
426	02/16/96	Spillway, Step #43, Sta. 13+00	1075

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. ‡	Comments *
421	mix 2	5.7	148.0	7.0	147.0	99	yes	9, 13, 15, 18
422	mix 2	5.7	148.0	7.3	145.8	99	yes	9, 13, 15, 18
423	mix 2	5.7	148.0	6.9	146.2	99	yes	9, 13, 15, 18
424	mix 2	5.7	148.0	7.2	146.0	99	yes	9, 13, 15, 18
425	mix 2	5.7	148.0	6.2	145.5	98	yes	9, 13, 15, 18
426	mix 2	5.7	148.0	6.8	145.3	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

REC'D
2/27/96

Job No. 2745JC249

Invoice No. 27460061

Report No. ________ Date 02/26/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
427	02/16/96	Spillway, Step #43, Sta. 12+50	1076	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
427	mix 2	5.7	148.0	7.0	146.2	99	yes	9, 13, 15, 18

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT
REVISED REPORT: 02/22/96

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/16/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/15/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
409	02/15/96	Spillway, Step #41, Sta. 16+00	1071
410	02/15/96	Spillway, Step #41, Sta. 15+50	1071
411	02/15/96	Spillway, Step #41, Sta. 15+00	1072
412	02/15/96	Spillway, Step #41, Sta. 14+25	1072
413	02/15/96	Spillway, Step #41, Sta. 13+50	1071
414	02/15/96	Spillway, Step #41, Sta. 12+50	1072

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Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
409	mix 2	5.7	148.0	6.8	146.1	99	yes	9, 13, 15, 18
410	mix 2	5.7	148.0	6.7	146.4	99	yes	9, 13, 15, 18
411	mix 2	5.7	148.0	7.0	146.7	99	yes	9, 13, 15, 18
412	mix 2	5.7	148.0	7.2	145.5	98	yes	9, 13, 15, 18
413	mix 2	5.7	148.0	7.0	146.8	99	yes	9, 13, 15, 18
414	mix 2	5.7	148.0	7.3	145.6	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Job No. 2745JC249

Invoice No. 27460061

Report No. ________ Date 02/16/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
415	02/15/96	Spillway, Step #42, Sta. 15+75	1073	
416	02/15/96	Spillway, Step #42, Sta. 15+00	1074	
417	02/15/96	Spillway, Step #42, Sta. 14+00	1074	
418	02/15/96	Spillway, Step #42, Sta. 13+50	1073	
419	02/15/96	Spillway, Step #42, Sta. 12+75	1073	
420	02/15/96	Spillway, Step #42, Sta. 12+00	1074	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
415	mix 2	5.7	148.0	6.9	145.3	98	yes	9, 13, 15, 18
416	mix 2	5.7	148.0	7.0	147.6	100	yes	9, 13, 15, 18
417	mix 2	5.7	148.0	7.4	147.0	99	yes	9, 13, 15, 18
418	mix 2	5.7	148.0	7.1	145.5	98	yes	9, 13, 15, 18
419	mix 2	5.7	148.0	7.0	145.3	98	yes	9, 13, 15, 18
420	mix 2	5.7	148.0	7.4	146.8	99	yes	9, 13, 15, 18

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*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT
REVISED REPORT: 02/22/96

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/16/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/14/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
403	02/14/96	Spillway, Step #40, Sta. 15+00	1069
404	02/14/96	Spillway, Step #40, Sta. 14+25	1070
405	02/14/96	Spillway, Step #40, Sta. 13+75	1069
406	02/14/96	Spillway, Step #40, Sta. 13+00	1070
407	02/14/96	Spillway, Step #40, Sta. 13+00	1070
408	02/14/96	Spillway, Step #40, Sta. 12+25	1070

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	Wet Density pcf			
403	mix 2	5.7	148.0	7.0	146.8	99	yes	9, 13, 15, 18
404	mix 2	5.7	148.0	7.2	144.9	98	yes	9, 13, 15, 18
405	mix 2	5.7	148.0	6.9	146.1	99	yes	9, 13, 15, 18
406	mix 2	5.7	148.0	7.3	146.5	99	yes	9, 13, 15, 18
407	mix 2	5.7	148.0	6.9	145.5	98	yes	9, 13,1 5, 18
408	mix 2	5.7	148.0	7.2	145.0	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT
REVISED REPORT: 02/22/96

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/14/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/13/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
390	02/13/96	Spillway, Step #38, Sta. 12+25	1065
391	02/13/96	Spillway, Step #38, Sta. 13+00	1066
392	02/13/96	Spillway, Step #38, Sta. 13+75	1066
393	02/13/96	Spillway, Step #38, Sta. 14+50	1065
394	02/13/96	Spillway, Step #38, Sta. 15+25	1065
395	02/13/96	Spillway, Step #38, Sta. 16+00	1066

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Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
390	mix 2	5.7	148.0	7.8	145.3	98	yes	9, 13, 15, 18
391	mix 2	5.7	148.0	8.0	144.7	98	yes	9, 13, 15, 18
392	mix 2	5.7	148.0	7.6	145.0	98	yes	9, 13, 15, 18
393	mix 2	5.7	148.0	7.8	144.9	98	yes	9, 13, 15, 18
394	mix 2	5.7	148.0	7.0	147.0	99	yes	9, 13, 15, 18
395	mix 2	5.7	148.0	6.9	145.5	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Job No. 2745JC249

Invoice No. 27460061

Report No. ________ Date 02/14/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
396	02/13/96	Spillway, Step #39, Sta. 12+00	1067
397	02/13/96	Spillway, Step #39, Sta. 13+00	1067
398	02/13/96	Spillway, Step #39, Sta. 13+50	1068
399	02/13/96	Spillway, Step #39, Sta. 14+25	1068
400	02/13/96	Spillway, Step #39, Sta. 14+75	1067
401	02/13/96	Spillway, Step #39, Sta. 15+00	1067
402	02/13/96	Spillway, Step #39, Sta. 15+75	1068

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	Wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
396	mix 2	5.7	148.0	7.3	146.8	99	yes	9, 13, 15, 18
397	mix 2	5.7	148.0	7.0	146.1	99	yes	9, 13, 15, 18
398	mix 2	5.7	148.0	7.0	146.4	99	yes	9, 13, 15, 18
399	mix 2	5.7	148.0	7.5	145.5	98	yes	9, 13, 15, 18
400	mix 2	5.7	148.0	6.8	145.1	98	yes	9, 13, 15, 18
401	mix 2	5.7	148.0	6.9	146.9	99	yes	9, 13, 15, 18
402	mix 2	5.7	148.0	7.3	147.1	99	yes	9, 13, 15, 18

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*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT
REVISED REPORT: 02/22/96

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061
Date 02/13/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/09/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
377	02/09/96	Spillway, Step #36, Sta. 16+00	1061
378	02/09/96	Spillway, Step #36, Sta. 15+25	1062
379	02/09/96	Spillway, Step #36, Sta. 14+50	1062
380	02/09/96	Spillway, Step #36, Sta. 13+75	1061
381	02/09/96	Spillway, Step #36, Sta. 13+00	1062
382	02/09/96	Spillway, Step #36, Sta. 12+25	1062

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
377	mix 2	5.7	148.0	7.3	145.3	98	yes	9, 13, 15, 18
378	mix 2	5.7	148.0	7.0	146.2	99	yes	9, 13, 15, 18
379	mix 2	5.7	148.0	6.8	146.0	99	yes	9, 13, 15, 18
380	mix 2	5.7	148.0	7.1	145.9	99	yes	9, 13, 15, 18
381	mix 2	5.7	148.0	6.5	147.2	99	yes	9, 13, 15, 18
382	mix 2	5.7	148.0	7.1	146.8	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Job No. 2745JC249

Invoice No. 27460061

Report No. ________ Date 02/13/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
383	02/09/96	Spillway, Step #37, Sta. 16+00	1063	
384	02/09/96	Spillway, Step #37, Sta. 15+75	1064	
385	02/09/96	Spillway, Step #37, Sta. 15+50	1064	
386	02/09/96	Spillway, Step #37, Sta. 15+00	1063	
387	02/09/96	Spillway, Step #37, Sta. 14+75	1064	
388	02/09/96	Spillway, Step #37, Sta. 14+25	1063	
389	02/09/96	Spillway, Step #37, Sta. 13+50	1064	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	Wet Density pcf			
383	mix 2	5.7	148.0	7.0	145.9	99	yes	9, 13, 15, 18
384	mix 2	5.7	148.0	6.4	146.3	99	yes	9, 13, 15, 18
385	mix 2	5.7	148.0	6.9	145.3	99	yes	9, 13, 15, 18
386	mix 2	5.7	148.0	6.8	145.8	99	yes	9, 13, 15, 18
387	mix 2	5.7	148.0	7.0	146.6	99	yes	9, 13, 15, 18
388	mix 2	5.7	148.0	7.3	146.5	99	yes	9, 13, 15, 18
389	mix 2	5.7	148.0	7.0	147.0	99	yes	9, 13, 15, 18

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*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Western Technologies Inc.
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Bullhead City, Arizona 86442
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/09/96
Reviewed By C Ankeny

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada

Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/08/96

Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT

Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
364	02/08/96	Spillway, Step #34, Sta. 15+75	1057
365	02/08/96	Spillway, Step #34, Sta. 15+00	1058
366	02/08/96	Spillway, Step #34, Sta. 14+25	1058
367	02/08/96	Spillway, Step #34, Sta. 13+50	1057
368	02/08/96	Spillway, Step #34, Sta. 12+75	1057
369	02/08/96	Spillway, Step #34, Sta. 12+00	1058

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GREINER, INC.

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
364	mix 2	5.7	148.0	5.6	145.9	99	yes	9, 13, 15, 18
365	mix 2	5.7	148.0	5.8	145.5	98	yes	9, 13, 15, 18
366	mix 2	5.7	148.0	6.0	145.0	98	yes	9, 13, 15, 18
367	mix 2	5.7	148.0	5.9	145.2	98	yes	9, 13, 15, 18
368	mix 2	5.7	148.0	6.4	146.4	99	yes	9, 13, 15, 18
369	mix 2	5.7	148.0	6.6	145.9	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/09/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
370	02/08/96	Spillway, Step #35, Sta. 16+00	1059	
371	02/08/96	Spillway, Step #35, Sta. 15+00	1060	
372	02/08/96	Spillway, Step #35, Sta. 14+25	1060	
373	02/08/96	Spillway, Step #35, Sta. 13+50	1059	
374	02/08/96	Spillway, Step #35, Sta. 12+50	1060	
375	02/08/96	Spillway, Step #35, Sta. 12+00	1059	
376	02/08/96	Spillway, Step #35, Sta. 11+75	1060	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
370	mix 2	5.7	148.0	7.0	146.1	99	yes	9, 13, 15, 18
371	mix 2	5.7	148.0	6.8	145.3	98	yes	9, 13, 15, 18
372	mix 2	5.7	148.0	6.6	146.5	99	yes	9, 13, 15, 18
373	mix 2	5.7	148.0	6.8	144.7	98	yes	9, 13, 15, 18
374	mix 2	5.7	148.0	7.1	146.8	99	yes	9, 13, 15, 18
375	mix 2	5.7	148.0	7.0	147.0	99	yes	9, 13, 15, 18
376	mix 2	5.7	148.0	6.9	145.6	98	yes	9, 13, 15, 18

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GREINER, INC.

*Comments

1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/08/96
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/07/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
351	02/07/96	Spillway, Step #32, Sta. 16+00	1053
352	02/07/96	Spillway, Step #32, Sta. 15+50	1054
353	02/07/96	Spillway, Step #32, Sta. 15+00	1054
354	02/07/96	Spillway, Step #32, Sta. 14+00	1053
355	02/07/96	Spillway, Step #32, Sta. 13+25	1053
356	02/07/96	Spillway, Step #32, Sta. 12+50	1054

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
351	mix 2	5.7	148.0	6.7	146.8	99	yes	9, 13, 15, 18
352	mix 2	5.7	148.0	6.5	147.1	99	yes	9, 13, 15, 18
353	mix 2	5.7	148.0	6.3	145.3	98	yes	9, 13, 15, 18
354	mix 2	5.7	148.0	6.5	145.6	98	yes	9, 13, 15, 18
355	mix 2	5.7	148.0	6.2	146.9	99	yes	9, 13, 15, 18
356	mix 2	5.7	148.0	6.5	146.7	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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GREINER, INC.

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/07/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
357	02/07/96	Spillway, Step #33, Sta. 15+80	1055	
358	02/07/96	Spillway, Step #33, Sta. 15+00	1056	
359	02/07/96	Spillway, Step #33, Sta. 14+75	1056	
360	02/07/96	Spillway, Step #33, Sta. 14+00	1055	
361	02/07/96	Spillway, Step #33, Sta. 13+50	1056	
362	02/07/96	Spillway, Step #33, Sta. 13+00	1055	
363	02/07/96	Spillway, Step #33, Sta. 12+25	1056	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	wet Density pcf			
357	mix 2	5.7	148.0	6.0	145.3	98	yes	9, 13, 15, 18
358	mix 2	5.7	148.0	6.5	146.1	99	yes	9, 13, 15, 18
359	mix 2	5.7	148.0	6.8	145.0	98	yes	9, 13, 15, 18
360	mix 2	5.7	148.0	6.5	144.9	98	yes	9, 13, 15, 18
361	mix 2	5.7	148.0	6.0	147.4	100	yes	9, 13, 15, 18
362	mix 2	5.7	148.0	6.3	146.1	99	yes	9, 13, 15, 18
363	mix 2	5.7	148.0	6.5	145.6	98	yes	9, 13, 15, 18

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GREINER, INC.

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/08/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/06/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
338	02/06/96	Spillway, Step #30, Sta. 16+00	1049
339	02/06/96	Spillway, Step #30, Sta. 15+00	1050
340	02/06/96	Spillway, Step #30, Sta. 14+50	1049
341	02/06/96	Spillway, Step #30, Sta. 13+75	1050
342	02/06/96	Spillway, Step #30, Sta. 13+00	1049
343	02/06/96	Spillway, Step #30, Sta. 12+00	1050

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	wet Density pcf	Relative Compaction %	Within Specs. ?	Comments *
338	mix 2	5.7	148.0	7.5	145.3	98	yes	9, 13, 15, 18
339	mix 2	5.7	148.0	7.2	145.0	98	yes	9, 13, 15, 18
340	mix 2	5.7	148.0	7.0	145.3	98	yes	9, 13, 15, 18
341	mix 2	5.7	148.0	7.3	146.2	99	yes	9, 13, 15, 18
342	mix 2	5.7	148.0	7.0	147.0	99	yes	9, 13, 15, 18
343	mix 2	5.7	148.0	6.8	145.5	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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FEB 12 1996
GREINER, INC.

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/08/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
344	02/06/96	Spillway, Step #31, Sta. 16+00	1051	
345	02/06/96	Spillway, Step #31, Sta. 15+50	1051	
346	02/06/96	Spillway, Step #31, Sta. 14+75	1052	
347	02/06/96	Spillway, Step #31, Sta. 14+00	1051	
348	02/06/96	Spillway, Step #31, Sta. 13+25	1052	
349	02/06/96	Spillway, Step #31, Sta. 12+50	1051	
350	02/06/96	Spillway, Step #31, Sta. 12+00	1052	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	wet Density pcf			
344	mix 2	5.7	148.0	6.5	145.0	98	yes	9, 13, 15, 18
345	mix 2	5.7	148.0	6.8	146.1	99	yes	9, 13, 15, 18
346	mix 2	5.7	148.0	6.9	147.7	100	yes	9, 13, 15, 18
347	mix 2	5.7	148.0	7.0	147.1	99	yes	9, 13, 15, 18
348	mix 2	5.7	148.0	6.3	146.7	99	yes	9, 13, 15, 18
349	mix 2	5.7	148.0	6.5	145.5	98	yes	9, 13, 15, 18
350	mix 2	5.7	148.0	6.5	146.4	99	yes	9, 13, 15, 18

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*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/06/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/05/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
325	02/05/96	Spillway, Step #28, Sta. 16+00	1045
326	02/05/96	Spillway, Step #28, Sta. 15+50	1046
327	02/05/96	Spillway, Step #28, Sta. 15+00	1045
328	02/05/96	Spillway, Step #28, Sta. 14+00	1045
329	02/05/96	Spillway, Step #28, Sta. 13+00	1046
330	02/05/96	Spillway, Step #28, Sta. 11+75	1046

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
325	mix 2	5.7	148.0	6.2	146.3	99	yes	9, 13, 15, 18
326	mix 2	5.7	148.0	6.5	145.2	98	yes	9, 13, 15, 18
327	mix 2	5.7	148.0	6.8	145.9	99	yes	9, 13, 15, 18
328	mix 2	5.7	148.0	6.5	146.0	99	yes	9, 13, 15, 18
329	mix 2	5.7	148.0	5.9	146.9	99	yes	9, 13, 15, 18
330	mix 2	5.7	148.0	6.3	146.0	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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GREINER, INC.

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Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/06/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
331	02/05/96	Spillway, Step #29, Sta. 16+00	1047	
332	02/05/96	Spillway, Step #29, Sta. 15+25	1048	
333	02/05/96	Spillway, Step #29, Sta. 14+50	1047	
334	02/05/96	Spillway, Step #29, Sta. 13+50	1048	
335	02/05/96	Spillway, Step #29, Sta. 12+25	1047	
336	02/05/96	Spillway, Step #29, Sta. 12+00	1047	
337	02/05/96	Spillway, Step #29, Sta. 11+00	1048	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	wet Density pcf			
331	mix 2	5.7	148.0	6.5	145.8	99	yes	9, 13, 15, 18
332	mix 2	5.7	148.0	6.5	146.2	99	yes	9, 13, 15, 18
333	mix 2	5.7	148.0	6.2	145.3	98	yes	9, 13, 15, 18
334	mix 2	5.7	148.0	6.8	145.8	99	yes	9, 13, 15, 18
335	mix 2	5.7	148.0	6.6	146.2	99	yes	9, 13, 15, 18
336	mix 2	5.7	148.0	6.9	147.0	99	yes	9, 13, 15, 18
337	mix 2	5.7	148.0	6.4	147.3	100	yes	9, 13, 15, 18

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GREINER, INC.

*Comments

1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

PDQ 35A

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Bullhead City, Arizona 86442
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/05/96
Reviewed By C Andrzga

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/02/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
312	02/02/96	Spillway, Step #26, Sta. 11+50	1041
313	02/02/96	Spillway, Step #26, Sta. 12+50	1042
314	02/02/96	Spillway, Step #26, Sta. 13+00	1041
315	02/02/96	Spillway, Step #26, Sta. 14+00	1042
316	02/02/96	Spillway, Step #26, Sta. 14+50	1042
317	02/02/96	Spillway, Step #26, Sta. 15+75	1042

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
312	mix 2	5.7	148.0	6.2	147.0	99	yes	9, 13, 15, 18
313	mix 2	5.7	148.0	6.5	144.9	98	yes	9, 13, 15, 18
314	mix 2	5.7	148.0	6.0	145.9	99	yes	9, 13, 15, 18
315	mix 2	5.7	148.0	6.3	147.6	100	yes	9, 13, 15, 18
316	mix 2	5.7	148.0	6.2	146.4	99	yes	9, 13, 15, 18
317	mix 2	5.7	148.0	6.2	145.2	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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GREINER, INC.

PDQ 35

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/05/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
318	02/02/96	Spillway, Step #27, Sta. 11+00	1043	
319	02/02/96	Spillway, Step #27, Sta. 12+50	1044	
320	02/02/96	Spillway, Step #27, Sta. 13+00	1043	
321	02/02/96	Spillway, Step #27, Sta. 14+25	1044	
322	02/02/96	Spillway, Step #27, Sta. 15+00	1044	
323	02/02/96	Spillway, Step #27, Sta. 15+50	1043	
324	02/02/96	Spillway, Step #27, Sta. 16+00	1044	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	wet Density pcf			
318	mix 2	5.7	148.0	6.8	145.5	98	yes	9, 13, 15, 18
319	mix 2	5.7	148.0	6.5	147.0	99	yes	9, 13, 15, 18
320	mix 2	5.7	148.0	6.2	145.1	98	yes	9, 13, 15, 18
321	mix 2	5.7	148.0	6.5	146.1	99	yes	9, 13, 15, 18
322	mix 2	5.7	148.0	6.7	147.7	100	yes	9, 13, 15, 18
323	mix 2	5.7	148.0	6.2	145.6	98	yes	9, 13, 15, 18
324	mix 2	5.7	148.0	6.8	146.4	99	yes	9, 13, 15, 18

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*Comments

1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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Bullhead City, Arizona 86442
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/02/96
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 02/01/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
299	02/01/96	Spillway, Step #24, Sta. 15+75	1037
300	02/01/96	Spillway, Step #24, Sta. 15+00	1038
301	02/01/96	Spillway, Step #24, Sta. 14+50	1037
302	02/01/96	Spillway, Step #24, Sta. 13+00	1038
303	02/01/96	Spillway, Step #24, Sta. 12+00	1038
304	02/01/96	Spillway, Step #24, Sta. 11+50	1038

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
299	mix 2	5.7	148.0	6.9	146.4	99	yes	9, 13, 15, 18
300	mix 2	5.7	148.0	6.6	145.5	98	yes	9, 13, 15, 18
301	mix 2	5.7	148.0	6.5	147.6	100	yes	9, 13, 15, 18
302	mix 2	5.7	148.0	6.8	146.8	99	yes	9, 13, 15, 18
303	mix 2	5.7	148.0	6.5	147.1	99	yes	9, 13, 15, 18
304	mix 2	5.7	148.0	6.8	145.5	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/02/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
305	02/01/96	Spillway, Step #25, Sta. 16+00	1039	
306	02/01/96	Spillway, Step #25, Sta. 15+50	1040	
307	02/01/96	Spillway, Step #25, Sta. 14+50	1039	
308	02/01/96	Spillway, Step #25, Sta. 14+00	1040	
309	02/01/96	Spillway, Step #25, Sta. 13+00	1040	
310	02/01/96	Spillway, Step #25, Sta. 12+50	1039	
311	02/01/96	Spillway, Step #25, Sta. 11+75	1040	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
305	mix 2	5.7	148.0	6.8	147.8	100	yes	9, 13, 15, 18
306	mix 2	5.7	148.0	6.3	146.4	99	yes	9, 13,1 5, 18
307	mix 2	5.7	148.0	6.9	147.0	99	yes	9, 13, 15, 18
308	mix 2	5.7	148.0	6.8	145.5	98	yes	9, 13,15, 18
309	mix 2	5.7	148.0	6.0	145.9	99	yes	9, 13, 15, 18
310	mix 2	5.7	148.0	6.4	146.5	99	yes	9, 13,1 5, 18
311	mix 2	5.7	148.0	6.5	145.6	98	yes	9, 13,1 5, 18

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*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 01/31/96
Reviewed By [signature] 18

Project Hiko Springs Wash Detention Basin (CCBD BId #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/29/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
261	01/29/96	Spillway, Step #18, Sta. 11+50	1025
262	01/29/96	Spillway, Step #18, Sta. 12+00	1026
263	01/29/96	Spillway, Step #18, Sta. 12+50	1025
264	01/29/96	Spillway, Step #18, Sta. 13+50	1026
265	01/29/96	Spillway, Step #18, Sta. 15+50	1025
266	01/29/96	Spillway, Step #18, Sta. 16+00	1026

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
261	mix 2	5.7	148.0	5.9	145.9	99	yes	9, 13, 15, 18
262	mix 2	5.7	148.0	6.2	145.3	98	yes	9, 13, 15, 18
263	mix 2	5.7	148.0	6.3	147.0	99	yes	9, 13, 15, 18
264	mix 2	5.7	148.0	6.0	146.5	99	yes	9, 13, 15, 18
265	mix 2	5.7	148.0	6.5	145.6	98	yes	9, 13, 15, 18
266	mix 2	5.7	148.0	6.0	145.5	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 96% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 01/31/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
267	01/29/96	Spillway, Step #19, Sta. 12+00	1027
268	01/29/96	Spillway, Step #19, Sta. 13+00	1028
269	01/29/96	Spillway, Step #19, Sta. 13+50	1027
270	01/29/96	Spillway, Step #19, Sta. 14+00	1028
271	01/29/96	Spillway, Step #19, Sta. 15+00	1027
272	01/29/96	Spillway, Step #19, Sta. 15+75	1028

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
267	mix 2	5.7	148.0	5.8	146.7	99	yes	9, 13, 15, 18
268	mix 2	5.7	148.0	6.3	145.9	99	yes	9, 13, 15, 18
269	mix 2	5.7	148.0	6.5	147.1	99	yes	9, 13, 15, 18
270	mix 2	5.7	148.0	6.5	146.8	99	yes	9, 13, 15, 18
271	mix 2	5.7	148.0	6.0	146.2	99	yes	9, 13, 15, 18
272	mix 2	5.7	148.0	6.6	146.5	99	yes	9, 13, 15, 18

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*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 01/31/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD BId #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/27/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
249	01/27/96	Spillway, Step #16, Sta. 13+00	1021
250	01/27/96	Spillway, Step #16, Sta. 12+75	1022
251	01/27/96	Spillway, Step #16, Sta. 12+50	1021
252	01/27/96	Spillway, Step #16, Sta. 11+50	1022
253	01/27/96	Spillway, Step #17, Sta. 16+00	1023
254	01/27/96	Spillway, Step #17, Sta. 15+75	1024

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	wet Density pcf			
249	mix 2	5.7	148.0	6.0	145.2	98	yes	9, 13, 15, 18
250	mix 2	5.7	148.0	5.5	145.8	99	yes	9, 13, 15, 18
251	mix 2	5.7	148.0	5.9	145.5	98	yes	9, 13, 15, 18
252	mix 2	5.7	148.0	6.3	144.9	98	yes	9, 13, 15, 18
253	mix 2	5.7	148.0	6.1	145.5	98	yes	9, 13, 15, 18
254	mix 2	5.7	148.0	6.0	145.0	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density, AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 01/31/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
255	01/27/96	Spillway, Step #17, Sta. 15+00	1023	
256	01/27/96	Spillway, Step #17, Sta. 14+75	1024	
257	01/27/96	Spillway, Step #17, Sta. 13+50	1024	
258	01/27/96	Spillway, Step #17, Sta. 12+50	1024	
259	01/27/96	Spillway, Step #17, Sta. 12+00	1023	
260	01/27/96	Spillway, Step #17, Sta. 11+50	1024	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
255	mix 2	5.7	148.0	5.3	146.1	99	yes	9, 13, 15, 18
256	mix 2	5.7	148.0	5.8	146.8	99	yes	9, 13, 15, 18
257	mix 2	5.7	148.0	6.2	145.4	98	yes	9, 13, 15, 18
258	mix 2	5.7	148.0	5.5	147.6	100	yes	9, 13, 15, 18
259	mix 2	5.7	148.0	5.5	147.1	99	yes	9, 13, 15, 18
260	mix 2	5.7	148.0	6.1	145.9	99	yes	9, 13, 15, 18

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*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 01/31/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD BId #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/19/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
243	01/19/96	Spillway, Step #12, Sta. 13+00	1013
244	01/19/96	Spillway, Step #12, Sta. 12+50	1014
245	01/19/96	Spillway, Step #12, Sta. 12+25	1013
246	01/19/96	Spillway, Step #12, Sta. 12+00	1014
247	01/19/96	Spillway, Step #12, Sta. 11+75	1013
248	01/19/96	Spillway, Step #12, Sta. 11+50	1014

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
243	mix 2	5.7	148.0	7.3	145.5	98	yes	9, 13, 15, 18
244	mix 2	5.7	148.0	6.8	144.9	98	yes	9, 13, 15, 18
245	mix 2	5.7	148.0	6.9	146.4	99	yes	9, 13, 15, 18
246	mix 2	5.7	148.0	7.5	147.6	100	yes	9, 13, 15, 18
247	mix 2	5.7	148.0	7.3	145.9	99	yes	9, 13, 15, 18
248	mix 2	5.7	148.0	7.0	146.8	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density, AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/01/96
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/31/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
286	01/31/96	Spillway, Step #22, Sta. 16+00	1033
287	01/31/96	Spillway, Step #22, Sta. 15+00	1034
288	01/31/96	Spillway, Step #22, Sta. 14+25	1033
289	01/31/96	Spillway, Step #22, Sta. 14+00	1034
290	01/31/96	Spillway, Step #22, Sta. 13+00	1034
291	01/31/96	Spillway, Step #22, Sta. 12+00	1034

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
286	mix 2	5.7	148.0	6.0	146.4	99	yes	9, 13, 15, 18
287	mix 2	5.7	148.0	6.3	145.4	98	yes	9, 13, 15, 18
288	mix 2	5.7	148.0	5.9	146.8	99	yes	9, 13, 15, 18
289	mix 2	5.7	148.0	6.5	146.5	99	yes	9, 13, 15, 18
290	mix 2	5.7	148.0	5.7	147.0	99	yes	9, 13, 15, 18
291	mix 2	5.7	148.0	6.2	147.6	100	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry densit AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

RECEIVED
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GREINER, INC.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/01/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
292	01/31/96	Spillway, Step #23, Sta. 11+00	1035	
293	01/31/96	Spillway, Step #23, Sta. 13+00	1036	
294	01/31/96	Spillway, Step #23, Sta. 13+50	1035	
295	01/31/96	Spillway, Step #23, Sta. 14+00	1035	
296	01/31/96	Spillway, Step #23, Sta. 15+00	1036	
297	01/31/96	Spillway, Step #23, Sta. 15+50	1035	
298	01/31/96	Spillway, Step #23, Sta. 16+00	1036	

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Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
292	mix 2	5.7	148.0	6.4	145.6	98	yes	9, 13, 15, 18
293	mix 2	5.7	148.0	6.6	145.3	98	yes	9, 13, 15, 18
294	mix 2	5.7	148.0	6.0	146.4	99	yes	9, 13, 15, 18
295	mix 2	5.7	148.0	6.3	147.4	100	yes	9, 13, 15, 18
296	mix 2	5.7	148.0	6.3	145.5	98	yes	9, 13, 15, 18
297	mix 2	5.7	148.0	6.5	146.5	99	yes	9, 13, 15, 18
298	mix 2	5.7	148.0	6.0	147.1	99	yes	9, 13, 15, 18

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

PDQ 35A

Western Technologies Inc.
The Quality People Since 1955
1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 02/01/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/30/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
273	01/30/96	Spillway, Step #20, Sta. 16+00	1030
274	01/30/96	Spillway, Step #20, Sta. 15+25	1029
275	01/30/96	Spillway, Step #20, Sta. 14+50	1029
276	01/30/96	Spillway, Step #20, Sta. 13+50	1030
277	01/30/96	Spillway, Step #20, Sta. 12+00	1029
278	01/30/96	Spillway, Step #20, Sta. 11+50	1030

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	Wet Density pcf	Relative Compaction %	Within Specs. †	Comments *
273	mix 2	5.7	148.0	6.3	145.2	98	yes	9, 13, 15, 18
274	mix 2	5.7	148.0	6.0	145.6	98	yes	9, 13, 15, 18
275	mix 2	5.7	148.0	5.9	146.8	99	yes	9, 13, 15, 18
276	mix 2	5.7	148.0	6.2	146.5	99	yes	9, 13, 15, 18
277	mix 2	5.7	148.0	6.2	146.9	99	yes	9, 13, 15, 18
278	mix 2	5.7	148.0	6.5	146.5	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

RECEIVED
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GREINER, INC.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 02/01/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
279	01/30/96	Spillway, Step #21, Sta. 16+00	1031	
280	01/30/96	Spillway, Step #21, Sta. 15+50	1032	
281	01/30/96	Spillway, Step #21, Sta. 14+50	1031	
282	01/30/96	Spillway, Step #21, Sta. 13+25	1032	
283	01/30/96	Spillway, Step #21, Sta. 12+75	1032	
284	01/30/96	Spillway, Step #21, Sta. 12+00	1031	
285	01/30/96	Spillway, Step #21, Sta. 11+50	1032	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics wet Density pcf	Relative Compaction %	Within Specs ?	Comments*
279	mix 2	5.7	148.0	6.0	145.6	98	yes	9, 13, 15, 18
280	mix 2	5.7	148.0	5.8	145.9	99	yes	9, 13, 15, 18
281	mix 2	5.7	148.0	6.0	145.0	98	yes	9, 13, 15, 18
282	mix 2	5.7	148.0	6.5	146.3	99	yes	9, 13, 15, 18
283	mix 2	5.7	148.0	6.8	146.5	99	yes	9, 13, 15, 18
284	mix 2	5.7	148.0	5.9	145.4	98	yes	9, 13, 15, 18
285	mix 2	5.7	148.0	6.2	145.8	99	yes	9, 13, 15, 18

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GREINER, INC.

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

PDQ 35A

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The Quality People
Since 1955
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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 01/19/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/18/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
230	01/18/96	Spillway, Step 11, Sta. 14+00	1011
231	01/18/96	Spillway, Step 11, Sta. 14+00	1012
232	01/18/96	Spillway, Step 11, Sta. 13+50	1011
233	01/18/96	Spillway, Step 11, Sta. 13+25	1012
234	01/18/96	Spillway, Step 11, Sta. 12+75	1011
235	01/18/96	Spillway, Step 11, Sta. 12+50	1012

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	Dry Density pcf			
230	mix 2	5.7	148.0	6.5	145.3	98	yes	9, 13, 15, 18
231	mix 2	5.7	148.0	6.8	145.0	98	yes	9, 13, 15, 18
232	mix 2	5.7	148.0	6.3	146.1	99	yes	9, 13, 15, 18
233	mix 2	5.7	148.0	7.0	145.5	98	yes	9, 13, 15, 18
234	mix 2	5.7	148.0	7.2	145.3	98	yes	9, 13, 15, 18
235	mix 2	5.7	148.0	6.9	146.7	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Aspahlt & Grading/Wayne Phelps (2)

?? 27 1996

GREINER, INC.

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 01/19/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
236	01/18/96	Spillway, Step 11, Sta. 12+00	1012	
237	01/18/96	Spillway, Step 12, Sta. 16+00	1013	
238	01/18/96	Spillway, Step 12, Sta. 15+75	1014	
239	01/18/96	Spillway, Step 12, Sta. 15+25	1013	
240	01/18/96	Spillway, Step 12, Sta. 14+50	1014	
241	01/18/96	Spillway, Step 12, Sta. 14+00	1013	
242	01/18/96	Spillway, Step 12, Sta. 13+75	1014	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	Dry Density pcf			
236	mix 2	5.7	148.0	7.0	146.4	99	yes	9, 13, 15, 18
237	mix 2	5.7	148.0	7.3	146.0	99	yes	9, 13, 15, 18
238	mix 2	5.7	148.0	6.8	147.6	100	yes	9, 13, 15, 18
239	mix 2	5.7	148.0	7.3	146.4	99	yes	9, 13, 15, 18
240	mix 2	5.7	148.0	7.0	145.6	98	yes	9, 13, 15, 18
241	mix 2	5.7	148.0	7.0	144.9	98	yes	9, 13, 15, 18
242	mix 2	5.7	148.0	7.3	147.0	99	yes	9, 13, 15, 18

JAN 27 1996

GREINER, INC.

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

PDQ 35A

Western Technologies Inc.
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Bullhead City, Arizona 86442
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20049
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 01/19/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/17/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
219	01/17/96	Spillway, Step 10, Sta. 12+50	1009
220	01/17/96	Spillway, Step 10, Sta. 12+00	1010
221	01/17/96	Spillway, Step 10, Sta. 11+75	1010
222	01/17/96	Spillway, Step ~~10~~ 11, Sta. 16+20	1011
223	01/17/96	Spillway, Step 11, Sta. 16+00	1012
224	01/17/96	Spillway, Step 11, Sta. 15+75	1011

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
210	mix 2	5.7	148.0	5.9	145.5	98	yes	9, 13, 15, 18
220	mix 2	5.7	148.0	6.0	144.7	98	yes	9, 13, 15, 18
221	mix 2	5.7	148.0	6.0	145.2	98	yes	9, 13, 15, 18
222	mix 2	5.7	148.0	6.3	144.9	98	yes	9, 13, 15, 18
223	mix 2	5.7	148.0	6.3	145.2	98	yes	9, 13, 15, 18
224	mix 2	5.7	148.0	6.5	146.1	99	yes	9, 13, 15, 18

6

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

GREINER, INC.

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 01/19/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
225	01/17/96	Spillway, Step 11, Sta. 15+75	1012	
226	01/17/96	Spillway, Step 11, Sta. 15+00	1011	
227	01/17/96	Spillway, Step 11, Sta. 14+75	1012	
228	01/17/96	Spillway, Step 11, Sta. 14+50	1011	
229	01/17/96	Spillway, Step 11, Sta. 14+50	1012	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	Dry Density pcf			
225	mix 2	5.7	148.0	6.5	144.4	98	yes	9, 13, 15, 18
226	mix 2	5.7	148.0	6.8	146.4	99	yes	9, 13, 15, 18
227	mix 2	5.7	148.0	7.0	147.0	99	yes	9, 13, 15, 18
228	mix 2	5.7	148.0	7.2	145.6	98	yes	9, 13, 15, 18
229	mix 2	5.7	148.0	7.0	146.5	99	yes	9, 13, 15, 18

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

PDQ 35A

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Bullhead City, Arizona 86442
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 103
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021
Date 01/18/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/15/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ____ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
212	01/15/96	Spillway, Step 9, Sta. 16+00	1008
213	01/15/96	Spillway, Step 9, Sta. 15+75	1008
214	01/15/96	Spillway, Step 9, Sta. 15+00	1008
215	01/15/96	Spillway, Step 9, Sta. 14+50	1008
216	01/15/96	Spillway, Step 9, Sta. 14+00	1008
217	01/15/96	Spillway, Step 9, Sta. 13+75	1008

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
212	mix 2	5.7	145.0	6.5	142.2	98	yes	9, 13, 15, 18
213	mix 2	5.7	145.0	6.5	142.7	98	yes	9, 13, 15, 18
214	mix 2	5.7	145.0	6.3	143.4	99	yes	9, 13, 15, 18
215	mix 2	5.7	145.0	6.0	143.8	99	yes	9, 13, 15, 18
216	mix 2	5.7	145.0	6.8	142.7	98	yes	9, 13, 15, 18
217	mix 2	5.7	145.0	6.5	144.4	100	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

JAN 27 1996
GREINER, INC.

Job No. 2745JC249

Invoice No. 27460021

Report No. ________ Date 01/18/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
218	01/15/96	Spillway, Step 9, Sta. 13+00	1008	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. Dry Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs ?	Comments*
218	mix 2	5.7	145.0	6.5	142.5	98	yes	9, 13, 15, 18

JAN 27 1996

GREINER, INC.

*Comments

1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

PDQ 35A

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The Quality People
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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/09/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/05/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
162	01/05/96	Spillway, 3rd step, Sta. 15+50	995
163	01/05/96	Spillway, 3rd step, Sta. 14+75	996
164	01/05/96	Spillway, 3rd step, Sta. 13+50	995
165	01/05/96	Spillway, 3rd step, Sta. 13+00	996
166	01/05/96	Spillway, 3rd step, Sta. 12+80	995
167	01/05/96	Spillway, 3rd step, Sta. 12+00	996

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	Dry Density pcf			
162	mix 2	5.7	145.0	6.3	143.7	99	yes	9, 13, 15, 18
163	mix 2	5.7	145.0	6.2	142.4	98	yes	9, 13, 15, 18
164	mix 2	5.7	145.0	6.0	144.7	100	yes	9, 13, 15, 18
165	mix 2	5.7	145.0	6.2	142.5	98	yes	9, 13, 15, 18
166	mix 2	5.7	145.0	6.0	142.3	98	yes	9, 13, 15, 18
167	mix 2	5.7	145.0	6.0	143.4	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/15/96
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/11/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
204	01/11/96	Spillway, Step 8, Sta. 16+50	1005
205	01/11/96	Spillway, Step 8, Sta. 16+00	1006
206	01/11/96	Spillway, Step 8, Sta. 15+00	1005
207	01/11/96	Spillway, Step 8, Sta. 14+50	1006
208	01/11/96	Spillway, Step 8, Sta. 13+50	1005
209	01/11/96	Spillway, Step 8, Sta. 13+00	1006

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
204	mix 2	5.7	145.0	6.2	142.5	98	yes	9, 13, 15, 18
205	mix 2	5.7	145.0	6.4	143.1	99	yes	9, 13, 15, 18
206	mix 2	5.7	145.0	6.4	144.0	99	yes	9, 13, 15, 18
207	mix 2	5.7	145.0	6.0	142.7	98	yes	9, 13, 15, 18
208	mix 2	5.7	145.0	6.4	143.4	99	yes	9, 13, 15, 18
209	mix 2	5.7	145.0	6.2	142.2	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Job No. 2745JC249

Invoice No. 27450684

Report No. ________ Date 01/15/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
210	01/11/96	Spillway, Step 8, Sta. 12+50	1005	
211	01/11/96	Spillway, Step 8, Sta. 12+00	1006	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. Dry Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	Dry Density pcf			
210	mix 2	5.7	145.0	6.0	142.0	98	yes	9, 13, 15, 18
211	mix 2	5.7	145.0	6.3	143.6	99	yes	9, 13, 15, 18

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GREINER, INC.

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/12/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/10/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
192	01/10/96	Spillway, Step 6, Sta. 13+00	1001
193	01/10/96	Spillway, Step 6, Sta. 13+00	1002
194	01/10/96	Spillway, Step 6, Sta. 12+00	1001
195	01/10/96	Spillway, Step 6, Sta. 12+00	1002
196	01/10/96	Spillway, Step 7, Sta. 16+50	1003
197	01/10/96	Spillway, Step 7, Sta. 16+00	1004

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
192	mix 2	5.7	145.0	6.5	143.4	99	yes	9, 13, 15, 18
193	mix 2	5.7	145.0	6.6	144.0	99	yes	9, 13, 15, 18
194	mix 2	5.7	145.0	6.3	142.4	98	yes	9, 13, 15, 18
195	mix 2	5.7	145.0	6.3	142.5	98	yes	9, 13, 15, 18
196	mix 2	5.7	145.0	6.2	144.1	99	yes	9, 13, 15, 18
197	mix 2	5.7	145.0	6.4	143.7	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density, AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphlat & Grading/Wayne Phelps (2)

JAN 16 1996
GREINER, INC.

Job No. 2745JC249

Invoice No. 27450684

Report No. ________ Date 01/10/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
198	01/10/96	Spillway, Step 7, Sta. 15+50	1003	
199	01/10/96	Spillway, Step 7, Sta. 14+75	1004	
200	01/10/96	Spillway, Step 7, Sta. 13+50	1003	
201	01/10/96	Spillway, Step 7, Sta. 13+00	1004	
202	01/10/96	Spillway, Step 7, Sta. 12+50	1003	
203	01/10/96	Spillway, Step 7, Sta. 12+00		

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. Dry Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs ?	Comments*
198	mix 2	5.7	145.0	6.5	142.5	98	yes	9, 13, 15, 18
199	mix 2	5.7	145.0	6.0	142.2	98	yes	9, 13, 15, 18
200	mix 2	5.7	145.0	6.2	143.0	99	yes	9, 13, 15, 18
201	mix 2	5.7	145.0	6.5	142.1	98	yes	9, 13, 15, 18
202	mix 2	5.7	145.0	6.3	143.4	99	yes	9, 13, 15, 18
203	mix 2	5.7	145.0	5.9	142.4	98	yes	9, 13, 15, 18

JAN 16 1996

GREINER, INC.

*Comments

1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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Bullhead City, Arizona 86442
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/12/96
Reviewed By C Andmegs

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/09/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
180	01/09/96	Spillway, Step 5, Sta. 15+50	999
181	01/09/96	Spillway, Step 5, Sta. 15+50	1000
182	01/09/96	Spillway, Step 5, Sta. 14+00	999
183	01/09/96	Spillway, Step 5, Sta. 14+00	1000
184	01/09/96	Spillway, Step 5, Sta. 13+50	999
185	01/09/96	Spillway, Step 5, Sta. 13+50	1000

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. ?	Comments *
180	mix 2	5.7	145.0	5.9	142.5	98	yes	9, 13, 15, 18
181	mix 2	5.7	145.0	6.2	142.7	98	yes	9, 13, 15, 18
182	mix 2	5.7	145.0	6.1	143.4	99	yes	9, 13, 15, 18
183	mix 2	5.7	145.0	6.3	142.0	98	yes	9, 13, 15, 18
184	mix 2	5.7	145.0	6.1	142.1	98	yes	9, 13, 15, 18
185	mix 2	5.7	145.0	5.5	142.4	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density, AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphlat & Grading/Wayne Phelps (2)

JAN 1 6 1996
GREINER, INC.

PDQ 35

Job No. 2745JC249

Invoice No. 27450684

Report No. ________ Date 01/09/96

ROLLAR COMPACTED CONCRETE FIELD DENSITY TESTS

Test No.	Date	Location of Test Hole	Elevation of Test Datum †	
186	01/09/96	Spillway, Step 5, Sta. 12+00	999	
187	01/09/96	Spillway, Step 5, Sta. 12+00	1000	
188	01/09/96	Spillway, Step 6, Sta. 16+00	1001	
189	01/09/96	Spillway, Step 6, Sta. 16+00	1002	
190	01/09/96	Spillway, Step 6, Sta. 15+50	1001	
191	01/09/96	Spillway, Step 6, Sta. 14+00	1002	

Test No.	Moisture Density Lab. No.	Optimum Moisture %	Max. Dry Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs ?	Comments*
				Moisture %	Dry Density pcf			
186	mix 2	5.7	145.0	5.8	141.5	98	yes	9, 13, 15, 18
187	mix 2	5.7	145.0	6.0	143.0	99	yes	9, 13, 15, 18
188	mix 2	5.7	145.0	6.3	143.8	99	yes	9, 13, 15, 18
189	mix 2	5.7	145.0	6.1	144.6	100	yes	9, 13, 15, 18
190	mix 2	5.7	145.0	6.1	142.5	98	yes	9, 13, 15, 18
191	mix 2	5.7	145.0	6.3	143.8	99	yes	9, 13, 15, 18

JAN 16 1996

GREINER, INC.

*Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested ASTM D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock Correction applied to maximum dry density per AASHTO T-224
18. Other Bid #21
19. Test Locations Shown on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

PDQ 35A

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/09/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/08/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
168	01/08/96	Spillway, 4th step, Sta. 14+50	997
169	01/08/96	Spillway, 4th step, Sta. 14+00	998
170	01/08/96	Spillway, 4th step, Sta. 13+50	997
171	01/08/96	Spillway, 4th step, Sta. 13+00	998
172	01/08/96	Spillway, 4th step, Sta. 12+80	997
173	01/08/96	Spillway, 4th step, Sta. 12+00	998

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
168	mix 2	5.7	145.0	6.3	143.0	99	yes	9, 13, 15, 18
169	mix 2	5.7	145.0	6.0	143.8	99	yes	9, 13, 15, 18
170	mix 2	5.7	145.0	6.5	143.3	99	yes	9, 13, 15, 18
171	mix 2	5.7	145.0	6.0	142.8	98	yes	9, 13, 15, 18
172	mix 2	5.7	145.0	5.9	143.8	99	yes	9, 13, 15, 18
173	mix 2	5.7	145.0	6.3	143.0	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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American Asphalt & Grading/Wayne Phelps (2)

JAN 16 1996
GREINER, INC.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

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Greiner, Inc., Southwest
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Lab/Invoice No. 27450684
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Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/08/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
174	01/08/96	Spillway, 5th step, Sta.17+00	999
175	01/08/96	Spillway, 5th step, Sta.16+50	1000
176	01/08/96	Spillway, 5th step, Sta.16+00	999
177	01/08/96	Spillway, 5th step, Sta.16+00	1000
178	01/08/96	Spillway, 5th step, Sta.15+80	999
179	01/08/96	Spillway, 5th step, Sta.15+80	1000

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. ?	Comments *
174	mix 2	5.7	145.0	6.2	142.6	98	yes	9, 13, 15, 18
175	mix 2	5.7	145.0	6.3	143.3	99	yes	9, 13, 15, 18
176	mix 2	5.7	145.0	6.0	142.4	98	yes	9, 13, 15, 18
177	mix 2	5.7	145.0	6.5	142.0	98	yes	9, 13, 15, 18
178	mix 2	5.7	145.0	6.3	142.6	98	yes	9, 13, 15, 18
179	mix 2	5.7	145.0	6.0	144.1	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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GREINER, INC.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/09/96
Reviewed By C Andueg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/05/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
156	01/05/96	Spillway, 4th step, Sta. 16+00	997
157	01/05/96	Spillway, 4th step, Sta. 15+80	997
158	01/05/96	Spillway, 4th step, Sta. 16+25	998
159	01/05/96	Spillway, 4th step, Sta. 15+80	998
160	01/05/96	Spillway, 3rd step, Sta. 16+50	995
161	01/05/96	Spillway, 3rd step, Sta. 15+80	996

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. ?	Comments *
156	mix 2	5.7	145.0	6.2	142.8	99	yes	9, 13, 15, 18
157	mix 2	5.7	145.0	6.1	143.4	99	yes	9, 13, 15, 18
158	mix 2	5.7	145.0	5.9	142.5	98	yes	9, 13, 15, 18
159	mix 2	5.7	145.0	6.2	143.6	99	yes	9, 13, 15, 18
160	mix 2	5.7	145.0	6.0	142.5	98	yes	9, 13, 15, 18
161	mix 2	5.7	145.0	5.8	143.9	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Point Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/09/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD BID #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/04/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ____ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
150	01/04/96	Spillway, 2nd step, Sta. 14+50	993
151	01/04/96	Spillway, 2nd step, Sta. 14+00	993
152	01/04/96	Spillway, 2nd step, Sta. 14+75	994
153	01/04/96	Spillway, 2nd step, Sta. 13+50	994
154	01/04/96	Spillway, 2nd step, Sta. 13+00	993
155	01/04/96	Spillway, 2nd step, Sta. 12+80	994

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
150	mix 2	5.7	145.0	6.3	143.2	99	yes	9, 13, 15, 18
151	mix 2	5.7	145.0	6.5	142.9	99	yes	9, 13, 15, 18
152	mix 2	5.7	145.0	6.3	142.4	98	yes	9, 13, 15, 18
153	mix 2	5.7	145.0	6.0	143.9	99	yes	9, 13, 15, 18
154	mix 2	5.7	145.0	6.2	143.3	99	yes	9, 13, 15, 18
155	mix 2	5.7	145.0	6.2	142.8	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/09/96
Reviewed By C Andruzzi

Project Hiko Springs Wash Detention Basin (CCBD BId #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/04/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
144	01/04/96	Spillway, 1st step, Sta. 12+50	992
145	01/04/96	Spillway, 1st step, Sta. 12+00	992
146	01/04/96	Spillway, 2nd step, Sta. 16+00	993
147	01/04/96	Spillway, 2nd step, Sta. 15+60	993
148	01/04/96	Spillway, 2nd step, Sta. 15+90	994
149	01/04/96	Spillway, 2nd step, Sta. 15+50	994

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
144	mix 2	5.7	145.0	6.0	143.4	99	yes	9, 13, 15, 18
145	mix 2	5.7	145.0	6.2	143.8	99	yes	9, 13, 15, 18
146	mix 2	5.7	145.0	6.3	143.0	99	yes	9, 13, 15, 18
147	mix 2	5.7	145.0	6.5	143.8	99	yes	9, 13, 15, 18
148	mix 2	5.7	145.0	6.0	142.7	98	yes	9, 13, 15, 18
149	mix 2	5.7	145.0	5.9	143.5	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/04/96
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 01/03/96
Source of Material American Asphalt & Grading Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
136	01/03/96	Spillway Apron first step, Sta. 16+25	991
137	01/03/96	Spillway Apron first step, Sta. 15+90	991
138	01/03/96	Spillway Apron first step, Sta. 15+75	992
139	01/03/96	Spillway Apron first step, Sta. 15+35	992
140	01/03/96	Spillway Apron first step, Sta. 14+50	992
141	01/03/96	Spillway Apron first step, Sta. 13+50	992

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
136	mix 2	5.7	145.0	6.5	142.5	98	yes	9, 13, 15, 18
137	mix 2	5.7	145.0	6.2	142.6	98	yes	9, 13, 15, 18
138	mix 2	5.7	145.0	6.0	143.8	99	yes	9, 13, 15, 18
139	mix 2	5.7	145.0	5.9	143.6	99	yes	9, 13, 15, 18
140	mix 2	5.7	145.0	6.3	142.7	98	yes	9, 13, 15, 18
141	mix 2	5.7	145.0	6.0	143.0	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density, AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/04/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Material: Roller Compacted Concrete   Authorized By: K. Smith   Date: 01/03/96
Source of Material: American Asphalt & Grading   Tested.Calc. By: P. Llewellyn/WT
Moisure/Density Relationship: mix 2   Meth. ______   Test Locations Designated By: Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
142	01/03/96	Spillway Apron first step, Sta. 12+80	991
143	01/03/96	SPillway Apron first step, Sta. 12+00	991

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
142	mix 2	5.7	145.0	6.0	143.3	99	yes	9, 13, 15, 18
143	mix 2	5.7	145.0	5.8	142.4	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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RCC TEST SECTION
DETERMINATION OF MAXIMUM FIELD DENSITY

STATION: 13+75 ELEVATION: 1010' DATE: 1/16 TIME: AM/PM

ROLLER PASS	% M	WET DENSITY ASTM D2922	OBSERVATIONS
1	5.3	139.3	
2	6.0	144.1	
3	5.5	144.3	
4	5.5	148.2	
5	5.8	145.3	
6	5.3	142.0	
7			
8			
9			
10			
11			
12			

MAXIMUM FIELD DENSITY = 148.2 INITIALS: PL

TEST PERFORMED BY: PATSY LLEWELLYN

NOTE: From Point A to Point B and back to Point A is two (2) passes.

MAXIMUM FIELD DENSITY IS ACHIEVED WHEN THERE IS NO CHANGE BETWEEN CONSECUTIVE PASSES, OR WHEN THE DIFFERENCE BETWEEN THREE (3) CONSECUTIVE TESTS IS LESS THAN 0.2 LBS/CFT.

RCC TEST SECTION
DETERMINATION OF MAXIMUM FIELD DENSITY

STATION: 11+75 ELEVATION: 1008 DATE: 1/16 TIME: AM/PM

ROLLER PASS	% M	WET DENSITY ASTM D2922	OBSERVATIONS
1	7.4	143.2	
2	7.0	143.5	
3	7.1	149.0	
4	6.0	143.6	
5	7.2	144.9	
6	6.3	144.4	
7			
8			
9			
10			
11			
12			

MAXIMUM FIELD DENSITY = 149.0 INITIALS: PL

TEST PERFORMED BY: PATSY LLEWELLYN

NOTE: From Point A to Point B and back to Point A is two (2) passes.

MAXIMUM FIELD DENSITY IS ACHIEVED WHEN THERE IS NO CHANGE BETWEEN CONSECUTIVE PASSES, OR WHEN THE DIFFERENCE BETWEEN THREE (3) CONSECUTIVE TESTS IS LESS THAN 0.2 LBS/CFT.

FLDDENS.WPD

RCC TEST SECTION
DETERMINATION OF MAXIMUM FIELD DENSITY

STATION: 14+50 ELEVATION: 1010' DATE: 1/16 TIME: ____ AM/PM

ROLLER PASS	% M	WET DENSITY ASTM D2922	OBSERVATIONS
1	5.6	140.2	
2	5.4	141.5	
3	5.6	143.5	
4	5.0	146.2	
5	5.1	147.8	
6	5.4	144.3	
7			
8			
9			
10			
11			
12			

MAXIMUM FIELD DENSITY = 147.8 **INITIALS:** PD

TEST PERFORMED BY: PATSY LLEWELLYN

NOTE: From Point A to Point B and back to Point A is two (2) passes.

MAXIMUM FIELD DENSITY IS ACHIEVED WHEN THERE IS NO CHANGE BETWEEN CONSECUTIVE PASSES, OR WHEN THE DIFFERENCE BETWEEN THREE (3) CONSECUTIVE TESTS IS LESS THAN 0.2 LBS/CFT.

FLDDENS.WPD

RCC TEST SECTION
DETERMINATION OF MAXIMUM FIELD DENSITY

STATION: 16+25 ELEVATION: 1010' DATE: 1/16 TIME: AM/PM

ROLLER PASS	% M	WET DENSITY ASTM D2922	OBSERVATIONS
1	5.4	136.9	
2	5.6	139.8	
3	5.2	142.9	
4	5.5	142.7	
5	4.9	147.1	
6	4.9	144.9	
7			
8			
9			
10			
11			
12			

MAXIMUM FIELD DENSITY = 147.1 INITIALS: PL

TEST PERFORMED BY: PATSY LLEWELLYN

NOTE: From Point A to Point B and back to Point A is two (2) passes.

MAXIMUM FIELD DENSITY IS ACHIEVED WHEN THERE IS NO CHANGE BETWEEN CONSECUTIVE PASSES, OR WHEN THE DIFFERENCE BETWEEN THREE (3) CONSECUTIVE TESTS IS LESS THAN 0.2 LBS/CFT.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 01/03/96
Reviewed By C Arduugg

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Material: Roller Compacted Concrete Authorized By: K. Smith Date: 01/02/96
Source of Material: American Asphalt & Grading Tested.Calc. By: P. Llewellyn/WT
Moisure/Density Relationship: Mix 2 Meth. ______ Test Locations Designated By: Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
132	01/02/96	Downstream Spillway Apron, Sta. 13+00	990
133	01/02/96	Downstream Spillway Apron, Sta. 14+50	990
134	01/02/96	Downstream Spillway Apron, Sta. 14+00	990
135	01/02/96	Downstream Spillway Apron, Sta. 12+95	990

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. ?	Comments *
				Moisture %	Dry Density pcf			
132	Mix 2	5.7	145.0	4.9	142.8	98	yes	9, 13, 15, 18
133	Mix 2	5.7	145.0	5.1	143.1	99	yes	9, 13, 15, 18
134	Mix 2	5.7	145.0	5.3	142.5	98	yes	9, 13, 15, 18
135	Mix 2	5.7	145.0	5.4	143.0	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By C Andeugg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/21/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
108	12/21/95	Scour Hole, Sta. 15+75	985
109	12/21/95	Scour Hole, Sta. 14+25	985
110	12/21/95	Scour Hole, Sta. 13+50	985
111	12/21/95	Scour Hole, Sta. 12+70	985
112	12/21/95	Scour Hole, Sta. 15+75	986
113	12/21/95	Scour Hole, Sta. 14+25	986

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	Density pcf	Relative Compaction %	Within Specs. †	Comments *
108	mix 2	5.7	145.0	5.9	142.8	99	yes	9, 13, 15, 18
109	mix 2	5.7	145.0	5.7	143.0	99	yes	9, 13, 15, 18
110	mix 2	5.7	145.0	5.8	144.0	99	yes	9, 13, 15, 18
111	mix 2	5.7	145.0	5.9	145.1	100	yes	9, 13, 15, 18
112	mix 2	5.7	145.0	6.3	142.0	98	yes	9, 13, 15, 18
113	mix 2	5.7	145.0	5.9	141.8	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/21/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
114	12/21/95	Scour Hole, Sta. 13+50	986
115	12/21/95	Scour Hole, Sta. 12+70	986
116	12/21/95	Scour Hole, Sta. 15+75	987
117	12/21/95	Scour Hole, Sta. 14+25	987
118	12/21/95	Scour Hole, Sta. 13+50	987
119	12/21/95	Scour Hole, Sta. 12+70	987

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
114	mix 2	5.7	145.0	5.7	143.0	99	yes	9, 13, 15, 18
115	mix 2	5.7	145.0	5.2	142.8	99	yes	9, 13, 15, 18
116	mix 2	5.7	145.0	6.2	143.2	99	yes	9, 13, 15, 18
117	mix 2	5.7	145.0	5.4	142.9	99	yes	9, 13, 15, 18
118	mix 2	5.7	145.0	5.6	142.6	98	yes	9, 13, 15, 18
119	mix 2	5.7	145.0	5.9	143.5	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Bullhead City, Arizona 86442
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/21/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
120	12/21/95	Scour Hole, Sta. 15+75	988
121	12/21/95	Scour Hole, Sta. 14+25	988
122	12/21/95	Scour Hole, Sta. 13+50	988
123	12/21/95	Scour Hole, Sta. 12+70	988
124	12/21/95	Scour Hole, Sta. 15+75	989
125	12/21/95	Scour Hole, Sta. 12+70	989

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
120	mix 2	5.7	145.0	5.9	141.8	98	yes	9, 13, 15, 18
121	mix 2	5.7	145.0	6.8	142.1	98	yes	9, 13, 15, 18
122	mix 2	5.7	145.0	5.2	143.0	99	yes	9, 13, 15, 18
123	mix 2	5.7	145.0	5.7	143.6	99	yes	9, 13, 15, 18
124	mix 2	5.7	145.0	5.7	146.8	101	yes	9, 13, 15, 18
125	mix 2	5.7	145.0	6.4	141.8	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By C Andungz

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/21/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix 2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
126	12/21/95	Scour Hole, Sta. 15+75	990
127	12/21/95	Scour Hole, Sta. 12+70	990
128	12/21/95	Spillway Apron Area, Sta. 15+10	989
129	12/21/95	Spillway Apron Area, Sta. 15+60	989
130	12/21/95	Spillway Apron Area, Sta. 15+10	990
131	12/21/95	Spillway Apron Area, Sta. 15+60	990

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	Density pcf			
126	mix 2	5.7	145.0	5.3	141.9	98	yes	9, 13, 15, 18
127	mix 2	5.7	145.0	6.2	142.0	98	yes	9, 13, 15, 18
128	mix 2	5.7	145.0	5.7	144.9	100	yes	9, 13, 15, 18
129	mix 2	5.7	145.0	6.7	142.6	98	yes	9, 13, 15, 18
130	mix 2	5.7	145.0	5.4	141.9	98	yes	9, 13, 15, 18
131	mix 2	5.7	145.0	6.4	142.3	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Material: Roller Compacted Concrete   Authorized By: K. Smith   Date: 12/20/95
Source of Material: On site/Batch Plant   Tested.Calc. By: J. Waddell, WT
Moisure/Density Relationship: Mix #2   Meth. ____   Test Locations Designated By: Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
94	12/20/95	Top of Spillway, Sta. 12+10, 10' Right of centerline	1076
95	12/20/95	Top of Spillway, Sta. 13+10, 20' Right of centerline	1076
96	12/20/95	Top of Spillway, Sta. 14+10, 30' Right of centerline	1076
97	12/20/95	Top of Spillway, Sta. 15+10, 40' Right of centerline	1076
98	12/20/95	Top of Spillway, Sta. 16+10, 35' Right of centerline	1076
99	12/20/95	Top of Spillway, Sta. 17+10, 40' Right of centerline	1076

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
94	mix 2	5.7	145.0	4.7	141.8	98	yes	9, 13, 15, 18
95	mix 2	5.7	145.0	5.2	142.0	98	yes	9, 13, 15, 18
96	mix 2	5.7	145.0	5.7	141.8	98	yes	9, 13, 15, 18
97	mix 2	5.7	145.0	5.9	142.0	98	yes	9, 13, 15, 18
98	mix 2	5.7	145.0	5.9	141.8	98	yes	9, 13, 15, 18
99	mix 2	5.7	145.0	5.8	142.1	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/20/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
100	12/20/95	Scour Hole, Sta. 15+75	983
101	12/20/95	Scour Hole, Sta. 14+25	983
102	12/20/95	Scour Hole, Sta. 13+50	983
103	12/20/95	Scour Hole, Sta. 12+70	983
104	12/20/95	Scour Hole, Sta. 15+75	984
105	12/20/95	Scour Hole, Sta. 14+25	984

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	Density pcf			
100	mix 2	5.7	145.0	5.3	144.3	100	yes	9, 13, 15, 18
101	mix 2	5.7	145.0	5.1	142.3	98	yes	9, 13, 15, 18
102	mix 2	5.7	145.0	5.6	141.7	98	yes	9, 13, 15, 18
103	mix 2	5.7	145.0	6.5	142.0	98	yes	9, 13, 15, 18
104	mix 2	5.7	145.0	5.5	141.8	98	yes	9, 13, 15, 18
105	mix 2	5.7	145.0	5.7	143.0	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/20/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
106	12/20/95	Scour Hole, Sta. 13+50	984
107	12/20/95	Scour Hole, Sta. 12+70	984

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
106	mix 2	5.7	145.0	6.9	143.9	99	yes	9, 13, 15, 18
107	mix 2	5.7	145.0	6.1	141.8	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By C Andruzzi

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/19/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
88	12/19/95	Top of Spillway, Sta. 12+10, 10' Right of centerline	1075
89	12/19/95	Top of Spillway, Sta. 13+10, 25' Right of centerline	1075
90	12/19/95	Top of Spillway, Sta. 14+10, 40' Right of centerline	1075
91	12/19/95	Top of Spillway, Sta. 15+10, 20' Right of centerline	1075
92	12/19/95	Top of Spillway, Sta. 16+10, 20' Right of centerline	1075
93	12/19/95	Top of Spillway, Sta. 17+10, 40' Right of centerline	1075

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
88	mix 2	5.7	145.0	7.1	143.7	99	yes	9, 13, 15 18
89	mix 2	5.7	145.0	6.4	143.3	99	yes	9, 13, 15, 18
90	mix 2	5.7	145.0	6.3	144.1	99	yes	9, 13, 15, 18
91	mix 2	5.7	145.0	5.4	141.8	98	yes	9, 13, 15, 18
92	mix 2	5.7	145.0	5.3	143.3	99	yes	9, 13, 15, 18
93	mix 2	5.7	145.0	6.5	142.6	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/18/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
68	12/18/95	Scour Hole, Sta. 15+75	979
69	12/18/95	Scour Hole, Sta. 14+25	979
70	12/18/95	Scour Hole, Sta. 13+50	979
71	12/18/95	Scour Hole, Sta. 12+70	979
72	12/18/95	Scour Hole, Sta. 15+75	980
73	12/18/95	Scour Hole, Sta. 14+25	980

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	Density pcf			
68	mix 2	5.7	145.0	4.4	143.9	99	yes	9, 13, 15, 18
69	mix 2	5.7	145.0	4.9	142.4	98	yes	9, 13, 15, 18
70	mix 2	5.7	145.0	5.0	143.6	99	yes	9, 13, 15, 18
71	mix 2	5.7	145.0	4.7	142.1	98	yes	9, 13, 15, 18
72	mix 2	5.7	145.0	5.6	141.6	98	yes	9, 13, 15, 18
73	mix 2	5.7	145.0	5.2	141.8	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/18/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
74	12/18/95	Scour Hole, Sta. 13+50	980
75	12/18/95	Scour Hole, Sta. 12+70	980
76	12/18/95	Scour Hole, Sta. 15+75	981
77	12/18/95	Scour Hole, Sta. 14+25	981
78	12/18/95	Scour Hole, Sta. 13+50	981
79	12/18/95	Scour Hole, Sta. 12+70	981

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
74	mix 2	5.7	145.0	5.6	142.1	98	yes	9, 13, 15, 18
75	mix 2	5.7	145.0	5.3	145.2	100	yes	9, 13, 15, 18
76	mix 2	5.7	145.0	5.6	142.0	98	yes	9, 13, 15, 18
77	mix 2	5.7	145.0	5.7	146.8	101	yes	9, 13, 15, 18
78	mix 2	5.7	145.0	5.9	143.9	99	yes	9, 13, 15, 18
79	mix 2	5.7	145.0	5.6	142.1	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Material: Roller Compacted Concrete Authorized By: K. Smith Date: 12/18/95
Source of Material: On site/Batch Plant Tested.Calc. By: J. Waddell, WT
Moisure/Density Relationship: Mix #2 Meth. ______ Test Locations Designated By: Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
80	12/18/95	Scour Hole, Sta. 15+75	982
81	12/18/95	Scour Hole, Sta. 14+25	982
82	12/18/95	Scour Hole, Sta. 13+50	982
83	12/18/95	Scour Hole, Sta. 12+70	982
84	12/18/95	Spillway Apron, Sta. 13+10	988
85	12/18/95	Spillway Apron, Sta. 14+80	988

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
80	mix 2	5.7	145.0	5.3	142.2	98	yes	9, 13, 15, 18
81	mix 2	5.7	145.0	5.2	142.3	98	yes	9, 13, 15, 18
82	mix 2	5.7	145.0	5.4	142.4	98	yes	9, 13, 15, 18
83	mix 2	5.7	145.0	6.0	142.5	98	yes	9, 13, 15, 18
84	mix 2	5.7	145.0	5.1	143.6	99	yes	9, 13, 15, 18
85	mix 2	5.7	145.0	5.0	141.8	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684
Date 12/27/95
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/18/95
Source of Material On site/Batch Plant Tested.Calc. By J. Waddell, WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
86	12/18/95	Spillway Apron, Sta. 13+10	989
87	12/18/95	Spillway Apron, Sta. 14+80	989

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics ✓ Density pcf	Relative Compaction %	Within Specs. †	Comments *
86	mix 2	5.7	145.0	6.9	141.8	98	yes	9, 13, 15, 18
87	mix 2	5.7	145.0	6.5	144.2	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/15/95
Source of Material On Site/Batch Plant Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
52	12/15/95	Scour Hole, Sta. 13+50	976
53	12/15/95	Scour Hole, Sta. 12+70	976
54	12/15/95	Scour Hole, Sta. 15+75	977
55	12/15/95	Scour Hole, Sta. 14+25	977
56	12/15/95	Scour Hole, Sta. 13+50	977
57	12/15/95	Scour Hole, Sta. 12+70	977

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics		Relative Compaction %	Within Specs. †	Comments *
				Moisture %	Density pcf			
52	mix 2	5.7	145.0	5.8	143.6	99	yes	9, 13, 15, 18
53	mix 2	5.7	145.0	4.9	142.3	98	yes	9, 13, 15, 18
54	mix 2	5.7	145.0	5.3	144.2	99	yes	9, 13, 15, 18
55	mix 2	5.7	145.0	4.9	144.7	100	yes	9, 13, 15, 18
56	mix 2	5.7	145.0	5.7	143.2	99	yes	9, 13, 15, 18
57	mix 2	5.7	145.0	6.0	143.1	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C. Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/15/95
Source of Material On Site/Batch Plant Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
46	12/15/95	Scour Hole, Sta. 15+75	975
47	12/15/95	Scour Hole, Sta. 14+25	975
48	12/15/95	Scour Hole, Sta. 13+50	975
49	12/15/95	Scour Hole, Sta. 12+70	975
50	12/15/95	Scour Hole, Sta. 15+75	976
51	12/15/95	Scour Hole, Sta. 14+25	976

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
46	mix 2	5.7	145.0	5.0	143.1	99	yes	9, 13, 15, 18
47	mix 2	5.7	145.0	5.3	145.6	100	yes	9, 13, 15, 18
48	mix 2	5.7	145.0	5.7	144.3	100	yes	9, 13, 15, 18
49	mix 2	5.7	145.0	6.1	142.5	98	yes	9, 13, 15, 18
50	mix 2	5.7	145.0	6.2	144.7	100	yes	9, 13, 15, 18
51	mix 2	5.7	145.0	5.8	144.7	100	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Andereggs

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Material: Roller Compacted Concrete — Authorized By: K. Smith — Date: 12/15/95
Source of Material: On Site/Batch Plant — Tested.Calc. By: J. Waddell/WT
Moisure/Density Relationship: Mix #2 — Meth. ______ — Test Locations Designated By: Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
58	12/15/95	Scour Hole, Sta. !5+75	978
59	12/15/95	Scour Hole, Sta. 14+25	978
60	12/15/95	Scour Hole, Sta. 13+50	978
61	12/15/95	Scour Hole, Sta. 12+70	978
62	12/15/95	Spillway Apron, Sta. 12+85	985
63	12/15/95	Spillway Apron, Sta. 13+85	985

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. ?	Comments *
58	mix 2	5.7	145.0	4.9	144.7	100	yes	9, 13, 15, 18
59	mix 2	5.7	145.0	4.9	142.1	98	yes	9, 13, 15, 18
60	mix 2	5.7	145.0	4.9	143.0	99	yes	9, 13, 15, 18
61	mix 2	5.7	145.0	5.0	141.7	98	yes	9, 13, 15, 18
62	mix 2	5.7	145.0	5.1	142.9	99	yes	9, 13, 15, 18
63	mix 2	5.7	145.0	4.9	142.3	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Andueza

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/15/95
Source of Material On Site/Batch Plant Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
64	12/15/95	Spillway Apron, Sta. 12+85	986
65	12/15/95	Spillway Apron, Sta. 13+85	986
66	12/15/95	Spillway Apron, Sta. 12+85	987
67	12/15/95	Spillway Apron, Sta. 13+50	987

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	Density pcf	Relative Compaction %	Within Specs. †	Comments *
64	mix 2	5.7	145.0	5.0	143.6	99	yes	9, 13, 15, 18
65	mix 2	5.7	145.0	5.6	144.6	100	yes	9, 13, 15, 18
66	mix 2	5.7	145.0	5.4	143.1	99	yes	9, 13, 15, 18
67	mix 2	5.7	145.0	5.9	144.7	100	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/14/95
Source of Material On site Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
32	12/14/95	Scour Hole, Sta. 15+75	973
33	12/14/95	Scour Hole, Sta. 14+25	973
34	12/14/95	Scour Hole, Sta. 13+50	973
35	12/14/95	Scour Hole, Sta. 12+70	973
36	12/14/95	Scour Hole, Sta. 15+75	974
37	12/14/95	Scour Hole, Sta. 14+25	974

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Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments*
32	mix 2	5.7	145.0	5.2	142.4	98	yes	9, 13, 15, 18
33	mix 2	5.7	145.0	6.8	141.8	98	yes	9, 13, 15, 18
34	mix 2	5.7	145.0	7.2	142.7	98	yes	9, 13, 15, 18
35	mix 2	5.7	145.0	6.9	142.2	98	yes	9, 13, 15, 18
36	mix 2	5.7	145.0	5.3	147.6	102	yes	9, 13, 15, 18
37	mix 2	5.7	145.0	5.2	146.5	101	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

Copies to: Client/Ken Smith (3)
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/14/95
Source of Material On site Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
38	12/14/95	Scour Hole, Sta. 13+50	974
39	12/14/95	Scour Hole, Sta. 12+70	974
40	12/14/95	Spillway Apron, Sta. 15+20	986
41	12/14/95	Spillway Apron, Sta. 14+40	986
42	12/14/95	Spillway Apron, Sta. 15+20	987
43	12/14/95	Spillway Apron, Sta. 14+40	987

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
38	mix 2	5.7	145.0	5.2	143.9	99	yes	9, 13, 15, 18
39	mix 2	5.7	145.0	5.3	145.1	100	yes	9, 13, 15, 18
40	mix 2	5.7	145.0	6.7	142.0	98	yes	9, 13, 15, 18
41	mix 2	5.7	145.0	6.2	142.8	98	yes	9, 13, 15, 18
42	mix 2	5.7	145.0	6.1	143.4	99	yes	9, 13, 15, 18
43	mix 2	5.7	145.0	6.2	141.4	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/14/95
Source of Material On site Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
44	12/14/95	Spillway Apron, Sta. 15+20	988
45	12/14/95	Spillway Apron, Sta. 14+40	988

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
44	mix 2	5.7	145.0	5.9	142.3	98	yes	9, 13, 15, 18
45	mix 2	5.7	145.0	6.0	143.1	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bod #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

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Copies to: Client/Ken Smith (3)
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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/13/95
Source of Material On site Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
11	12/13/95	Scour Hole, Sta. 15+75	969
12	12/13/95	Scour Hole, Sta. 14+25	969
13	12/13/95	Scour Hole, Sta. 13+50	969
14	12/13/95	Scour Hole, Sta. 12+70	969
15	12/13/95	Scour Hole, Sta. 15+75	970
16	12/13/95	Scour Hole, Sta. 14+25	970

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
11	mix 2	5.7	145.0	6.1	142.4	98	yes	9, 13, 15, 18
12	mix 2	5.7	145.0	5.6	143.5	99	yes	9, 13, 15, 18
13	mix 2	5.7	145.0	6.2	142.7	98	yes	9, 13, 15, 18
14	mix 2	5.7	145.0	5.3	141.8	98	yes	9, 13, 15, 18
15	mix 2	5.7	145.0	5.7	141.8	98	yes	9, 13, 15, 18
16	mix 2	5.7	145.0	6.2	142.4	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete   Authorized By K. Smith   Date 12/13/95
Source of Material On site   Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2   Meth. ______   Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
17	12/13/95	Scour Hole, Sta. 13+50	970
18	12/13/95	Scour Hole, Sta. 12+70	970
19	12/13/95	Scour Hole, Sta. 15+75	971
20	12/13/95	Scour Hole, Sta. 14+25	971
21	12/13/95	Scour Hole, Sta. 13+50	971
22	12/13/95	Scour Hole, Sta. 12+70	971

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs.	Comments *
17	mix 2	5.7	145.0	6.2	143.0	99	yes	9, 13, 15, 18
18	mix 2	5.7	145.0	5.9	142.1	98	yes	9, 13, 15, 18
19	mix 2	5.7	145.0	5.0	142.3	98	yes	9, 13, 15, 18
20	mix 2	5.7	145.0	6.3	142.2	98	yes	9, 13, 15, 18
21	mix 2	5.7	145.0	6.2	143.8	99	yes	9, 13, 15, 18
22	mix 2	5.7	145.0	7.7	142.6	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C. Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/13/95
Source of Material On site Tested.Calc. By J. Waddell/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
23	12/13/95	Scour Hole, Sta. 15+75	972
24	12/13/95	Scour Hole, Sta. 14+25	972
25	12/13/95	Scour Hole, Sta. 13+50	972
26	12/13/95	Scour Hole, Sta. 12+70	972
27	12/13/95	Scour Hole, Sta. 12+70, Retest #26	972
28	12/13/95	Spillway Apron, Sta. 15+00	985

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Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
23	mix 2	5.7	145.0	5.9	143.1	99	yes	9, 13, 15, 18
24	mix 2	5.7	145.0	6.4	143.5	99	yes	9, 13, 15, 18
25	mix 2	5.7	145.0	5.8	141.6	98	yes	9, 13, 15, 18
26	mix 2	5.7	145.0	4.7	136.2	94	yes	9, 13, 15, 18
27	mix 2	5.7	145.0	4.6	143.8	99	yes	9, 13, 15, 18
28	mix 2	5.9	145.0	6.2	145.0	100	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/18/95
Reviewed By C Anderson

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Material: Roller Compacted Concrete — Authorized By: K. Smith — Date 12/13/95
Source of Material: On site — Tested.Calc. By: J. Waddell/WT
Moisure/Density Relationship: Mix #2 — Meth. ______ — Test Locations Designated By: Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
29	12/13/95	Spillway Apron, Sta. 15+50	985
30	12/13/95	Spillway Apron, Sta. 14+90	985
31	12/13/95	Spillway Apron, Sta. 15+50	985

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max. Wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Density pcf	Relative Compaction %	Within Specs. †	Comments *
29	mix 2	5.9	145.0	5.9	142.8	99	yes	9, 13, 15, 18
30	mix 2	5.9	145.0	6.4	142.6	98	yes	9, 13, 15, 18
31	mix 2	5.9	145.0	5.6	141.5	98	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client: 20449
Greiner, Inc., Southwest
3650 South Point Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/14/95
Reviewed By C Andreozzi

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Type of Material: Roller Compacted Concrete Authorized By: K. Smith Date: 12/12/95
Source of Material: On Site Tested.Calc. By: P. Llewellyn/WT
Moisure/Density Relationship: Mix #2 Meth. ______ Test Locations Designated By: Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
RCC 1	12/12/95	Scour Hole, Sta. 16+00	965
RCC 2	12/12/95	Scour Hole, Sta. 15+00	965
RCC 3	12/12/95	Scour Hole, Sta. 15+50	966
RCC 4	12/12/95	Scour Hole, Sta. 13+50	966
RCC 5	12/12/95	Scour Hole, Sta. 15+50	967
RCC 6	12/12/95	Scour Hole, Sta. 14+50	967

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
RCC 1	Mix #2	5.7	145.0	6.2	142.7	98	yes	9, 13, 15, 18
RCC 2	Mix #2	5.7	145.0	6.8	143.9	99	yes	9, 13, 15, 18
RCC 3	Mix #2	5.7	145.0	5.7	143.6	99	yes	9, 13, 15, 18
RCC 4	Mix #2	5.7	145.0	5.4	143.6	99	yes	9, 13, 15, 18
RCC 5	Mix #2	5.7	145.0	5.2	143.9	99	yes	9, 13, 15, 18
RCC 6	Mix #2	5.7	145.0	5.9	143.9	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid#21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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LABORATORY REPORT

ROLLER COMPACTED CONCRETE FIELD DENSITY TESTS

Client 20449
Greiner, Inc., Southwest
3650 South Point Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date 12/14/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Type of Material Roller Compacted Concrete Authorized By K. Smith Date 12/12/95
Source of Material On Site Tested.Calc. By P. Llewellyn/WT
Moisure/Density Relationship Mix #2 Meth. ______ Test Locations Designated By Western Technologies Inc.

Test No.	Date	Location of Test Hole	Elevation of Test Datum †
RCC 7	12/12/95	Scour Hole, Sta. 13+00	967
RCC 8	12/12/95	Scour Hole, Sta. 15+00	968
RCC 9	12/12/95	Scour Hole, Sta. 13+50	968
RCC 10	12/12/95	Scour Hole, Sta. 16+00	968

Test No.	Moisture Density Lab No.	Optimum Moisture %	Max wet Density pcf	In-Place Characteristics Moisture %	In-Place Characteristics Dry Density pcf	Relative Compaction %	Within Specs. †	Comments *
RCC 7	Mix #2	5.7	145.0	5.7	143.7	99	yes	9, 13, 15, 18
RCC 8	Mix #2	5.7	145.0	5.7	143.6	99	yes	9, 13, 15, 18
RCC 9	Mix #2	5.7	145.0	5.5	143.7	99	yes	9, 13, 15, 18
RCC 10	Mix #2	5.7	145.0	5.7	143.9	99	yes	9, 13, 15, 18

* Comments
1. Subgrade
2. Subbase Fill
3. Base Course
4. Backfill
5. Pavement Area
6. Below Footing Bottom
7. Above Footing Bottom
8. 100% min. req'd.
9. 98% min. req'd.
10. 95% min. req'd.
11. 90% min. req'd.
12. 85% min. req'd.
13. RCC
14. Tested D-1556/AASHTO T-217
15. Tested ASTM D-2922/D-3017
16. Tested ASTM D-2922/AASHTO T-217
17. Rock correction applied to maximum dry density. AASHTO T-224
18. Other Bid #21
19. Test Locations on Accompanying Site Plan
20. Specifications Unknown

† Datum Topographic

Note: Tests reported herein are not part of a continuous monitoring program of compaction operations and accordingly apply only to the actual location tested.

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RCC Cylinder Breaks

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-8
Date of Report 02/28/96
Reviewed By SET

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada

Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch

Source of Sample: Spillway East abutment, Sta. 11+00, Elev. 1082'

Material Supplier: Mixed on site — Measured Slump, in.: NA

Ticket Number: " " — Measure Air Content, %: NA

Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 58

Mix Identification: " " — No. of Specimens Molded: 4

Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6" x 12"

Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 02/22/96

Time in Mixer: 0 hrs. 0 min. — Submitted By: P. Llewellyn/WT — Date: 02/23/96

Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 02/22/96

Test Procedure: ASTM C39

Remarks:
Concrete Temperature 68°
Field Unit Weights PCF
A = 146.9   D = 146.8
B = 147.1
C = 146.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/29/96	7	83000	2940			CS
B	02/29/96	7	78500	2780			CS
C	03/21/96	28	127000	4490			RN
D	03/21/96	28	134000	4740			RN

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-7
Date of Report 02/26/96
Reviewed By NB S/G

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway Crest, Sta. 12+50, Elev. 1077.5'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 60
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 02/21/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: W. Selseth/WT Date: 02/22/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 02/21/96
Test Procedure: ASTM C39

Remarks:

Field Unit Weights PCF   Concrete Temperature 72°

A = 146.5
B = 146.7
C = 147.0
D = 146.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/28/96	7	84000	2970			RN
B	02/28/96	7	80000	2830			RN
C	03/20/96	28	133000	4700			WS
D	03/20/96	28	126000	4460			WS

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4/3/96

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-5
Date of Report 02/22/96
Reviewed By [signature] S.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #43, Sta 13+00, Elev. 1076'
Material Supplier: Mixed on site
Measured Slump, in.: N/A
Ticket Number: " "
Measure Air Content, %: N/A
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 69
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 02/16/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Anderegg/WT Date: 02/20/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 02/16/96
Test Procedure: ASTM C39

Remarks:

Field Unit Weights PCF Concrete Temperature 73°

A = 146.5

B = 146.8

C = 147.1

D - 146.8

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/23/96	7	82000	2900			TR
B	02/23/96	7	80000	2830			TR
C	03/15/96	28	114000	4030			PL
D	03/15/96	28	120000	4250			PL

REC'D 3/28/96 [initials]

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-6
Date of Report 0?/22/96
Reviewed By [signature], S.E.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: West abutment, Top of spillway, Sta. 17+30, Elev. 1081'
Material Supplier: Mixed on site — Measured Slump, in.: N/A
Ticket Number: " " — Measure Air Content, %: N/A
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 67
Mix Identification: " " — No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 02/20/96
Time in Mixer: 0 hrs. 0 min. — Submitted By: W. Selseth/WT — Date: 02/21/96
Water Added on Job, gal.:) — Authorized By: K. Smith — Date: 02/20/96
Test Procedure: ASTM C31

Remarks: Field Unit Weight PCF — Concrete Temperature 72°
A = 146.9
B = 147.1
C = 146.5
D = 146.8

REC'D 3/28/96

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/27/96	7	73000	2580			WS
B	02/27/96	7	75000	2650			WS
C	03/19/96	28	112000	3960			RN
D	03/19/96	28	116500	4120			RN

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American Asphalt & Grading/Wayne Phelps (2)

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Bullhead City, Arizona 86442
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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-5
Date of Report 02/22/96
Reviewed By [signature] S.E.T.

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #43, Sta 13+00, Elev. 1076'
Material Supplier Mixed on site Measured Slump, in. N/A
Ticket Number " " Measure Air Content, % N/A
Batch Size, cu. yds. " " Ambient Air Temperature, °F 69
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/16/96
Time in Mixer 0 hrs. 0 min. Submitted By C. Anderegg/WT Date 02/20/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 02/16/96
Test Procedure ASTM C39

Remarks:

Field Unit Weights PCF Concrete Temperature 73°
A = 146.5
B = 146.8
C = 147.1
D - 146.8

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/23/96	7	82000	2900			TR
B	02/23/96	7	80000	2830			TR
C	03/15/96	28					
D	03/15/96	28					

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American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-4
Date of Report 12/26/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: American Asphalt & Grading, on site, batch plant
Material Supplier: American Asphalt & Grading
Measured Slump, in.: NA
Ticket Number: Mixed on site
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 51
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1
Sampled By: J. Waddell/WT Date: 12/21/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: T. Robbins/WT Date: 12/22/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 12/21/95
Test Procedure: ASTM C39

Remarks: Field Unit Weights PCF
Concrete Temperature 62°

A = 145.2
B = 146.1
C = 143.7
D = 148.2

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load: Pounds Force	Compressive Strength Maximum Load: psi	Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
A	12/28/95	7	64000	2260			JW
B	12/28/95	7	78000	2760			JW
C	01/18/96	28	92000	3250			JW
D	01/18/96	28	109000	3860			JW

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-12
Date of Report 01/16/96
Reviewed By No Review?

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step 8, Sta. 15+00, Elev. 1006'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 67
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/11/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Llewellyn/WT Date: 01/12/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/11/96
Test Procedure: ASTM C39
Remarks: Concrete Temperature 64°
Field Unit Weights PCF unable to obtain due to high winds.

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/18/96	7	71000	2510			JW
B	01/18/96	7	69000	2440			JW
C	02/08/96	28					
D	02/08/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-1
Date of Report 01/17/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #9, Sta. 15+50, Elev. 1008'
Material Supplier American Asphalt & Grading
Measured Slump, in. NA
Ticket Number Mixed on site
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 64
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi " / " days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/15/96
Time in Mixer 0 hrs. 0 min.
Submitted By W. Selseth/WT Date 01/16/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/15/96
Test Procedure ASTM C39

Remarks: Field Unit Weight PCF Concrete Temperature 65°

A = 143.8

B = 143.7

C = 143.1

D = 143.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/22/96	7	51500	1820			RN
B	01/22/96	7	55000	1950			RN
C	02/12/96	28					
D	02/12/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-2
Date of Report 01/18/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step 9, Sta. 12+00, Elev. 1008'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 58
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/16/96
Time in Mixer 0 hrs. 0 min.
Submitted By W. Selseth/WT Date 01/17/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/16/96
Test Procedure ASTM C39

Remarks: Field Unit Weights PCF Concrete Temperature 63°

A = 143.2
B = 143.7
C = 143.1
D = 143.8

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/23/96	7	62000	2190			JW
B	01/23/96	7	59500	2100			JW
C	02/13/96	28					
D	02/13/96	28					

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LABORATORY REPORT
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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632- 21
Date of Report 12/20/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: Spillway Apron, Sta. 12+50 to 16+75, Elev. 986'
Material Supplier: American Asphalt & Grading — Measured Slump, in: NA
Ticket Number: Mixed on site — Measure Air Content, %: NA
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 70
Mix Identification: " " — No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1 — Sampled By: J. Waddell/WT — Date: 12/14/95
Time in Mixer: 0 hrs. 0 min. — Submitted By: C. Anderegg/WT — Date: 12/15/95
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 12/14/95
Test Procedure:
Remarks: Concrete Temperature 69°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/21/95	7	57000	2020			WS
B	12/21/95	7	60500	2140			WS
C	01/11/96	28	94500	3340			WS
D	01/11/96	28	93000	3290			WS

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-22
Date of Report 12/20/95
Reviewed By C Anderegg

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading   Architect/Engineer: Black & Veatch
Source of Sample: Scour hole elev. 975, Sta. 12+50 to 16+00
Material Supplier: Mixed on site   Measured Slump, in.: NA
Ticket Number: " "   Measure Air Content, %: NA
Batch Size, cu. yds.: " "   Ambient Air Temperature, °F: 55
Mix Identification: " "   No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days   Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1   Sampled By: J. Waddell/WT   Date: 12/15/95
Time in Mixer: 0 hrs. 0 min.   Submitted By: C. Anderegg/WT   Date: 12/16/95
Water Added on Job, gal.: 0   Authorized By: K. Smith   Date: 12/15/95
Test Procedure:
Remarks:

Concrete Temperature 65°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/22/95	7	58000	2050			JW
B	12/22/95	7	63000	2230			JW
C	01/12/96	28	92000	3250			WS
D	01/12/96	28	91000	3220			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-8
Date of Report 02/28/96
Reviewed By [signature] SET

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada

Contractor American Asphalt & Grading Architect/Engineer Black & Veatch

Source of Sample Spillway East abutment, Sta. 11+00, Elev. 1082'

Material Supplier Mixed on site Measured Slump, in. NA

Ticket Number " " Measure Air Content, % NA

Batch Size, cu. yds. " " Ambient Air Temperature, °F 58

Mix Identification " " No. of Specimens Molded 4

Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"

Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/22/96

Time in Mixer 0 hrs. 0 min. Submitted By P. Llewellyn/WT Date 02/23/96

Water Added on Job, gal. 0 Authorized By K. Smith Date 02/22/96

Test Procedure ASTM C39

Remarks: Concrete Temperature 68°

Field Unit Weights PCF

A = 146.9 D = 146.8

B = 147.1

C = 146.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/29/96	7	83000	2940			CS
B	02/29/96	7	78500	2780			CS
C	03/21/96	28					
D	03/21/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3630 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-7
Date of Report 02/26/96
Reviewed By NO SIG?

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway Crest, Sta. 12+50, Elev. 1077.5'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 60
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 02/21/96
Time in Mixer 0 hrs. 0 min.
Submitted By W. Selseth/WT Date 02/22/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 02/21/96
Test Procedure ASTM C39

Remarks:
Field Unit Weights PCF Concrete Temperature 72°
A = 146.5
B = 146.7
C = 147.0
D = 146.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/28/96	7	84000	2970			RN
B	02/28/96	7	80000	2830			RN
C	03/20/96	28					
D	03/20/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-6
Date of Report 03/22/96
Reviewed By [signature], S.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: West abutment, Top of spillway, Sta. 17+30, Elev. 1081'
Material Supplier: Mixed on site — Measured Slump, in.: N/A
Ticket Number: " " — Measure Air Content, %: N/A
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 67
Mix Identification: " " — No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 02/20/96
Time in Mixer: 0 hrs. 0 min. — Submitted By: W. Selseth/WT — Date: 02/21/96
Water Added on Job, gal.:) — Authorized By: K. Smith — Date: 02/20/96
Test Procedure: ASTM C31

Remarks: Field Unit Weight PCF — Concrete Temperature 72°
A = 146.9
B = 147.1
C = 146.5
D = 146.8

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load: Pounds Force	psi	Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
A	02/27/96	7	73000	2580			WS
B	02/27/96	7	75000	2650			WS
C	03/19/96	28					
D	03/19/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-4
Date of Report 02/19/96
Reviewed By ND SKG

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #42, Sta. 15+50, Elev. 1074'
Material Supplier Mixed on site
Measured Slump, in. N/A
Ticket Number " "
Measure Air Content, % N/A
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 79
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 02/15/96
Time in Mixer 0 hrs. 0 min.
Submitted By P. Bowen/WT Date 02/16/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 02/15/96
Test Procedure ASTM C39

Remarks: Field Unit Weights PCF   Concrete Temperature 78°

A = 146.5
B = 147.0
C = 147.0
D = 146.8

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/22/96	7	73000	2580			WS
B	02/22/96	7	77000	2720			WS
C	03/14/96	28	107000	3780			WS
D	03/14/96	28	110000	3890			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-3
Date of Report 02/16/96
Reviewed By [signature] S.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #40, Sta. 12+00, Elev. 1070'
Material Supplier: Mixed on site
Measured Slump, in.: N/A
Ticket Number: " "
Measure Air Content, %: N/A
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 73
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 02/14/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Bowen/WT Date: 02/15/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 02/14/96
Test Procedure: ASTM C39

Remarks: Concrete Temperature 72°

Field Unit Weights PCF
A = 147.2
B = 146.8
C = 147.0
D = 146.9

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/21/96	7	71500	2530			WS
B	02/21/96	7	72000	2550			WS
C	03/13/96	28	94000	3330			WS
D	03/13/96	28	95000	3360			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-2
Date of Report 02/15/96
Reviewed By S.E.T.

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #38, Sta. 13+00, Elev. 1066'
Material Supplier Mixed on site
Measured Slump, in. N/A
Ticket Number " "
Measure Air Content, % N/A
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 64
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 02/13/96
Time in Mixer 0 hrs. 0 min.
Submitted By P. Llewellyn/WT Date 02/14/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 02/13/96
Test Procedure ASTM C39

Remarks:
MIX TEMP = 64°

* DOES NOT MEET SPECIFICATIONS

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/20/96	7	60500	2140			WS
B	02/20/96	7	61000	2160			WS
C	03/12/96	28	80000	2830*			PL
D	03/12/96	28	82500	2920*			PL

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-1
Date of Report 02/14/96
Reviewed By S.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #37, Sta. 16+00, Elev. 1064'
Material Supplier: Mixed on site
Measured Slump, in.: N/A
Ticket Number: " "
Measure Air Content, %: N/A
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 77
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 02/12/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Llewellyn/WT Date 02/13/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 02/12/96
Test Procedure: ASTM C39
Remarks: Concrete Temperature 69°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/19/96	7	68000	2410			WS
B	02/19/96	7	69500	2460			WS
C	03/11/96	28	107500	3800			RN
D	03/11/96	28	115500	4090			RN

2

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-16
Date of Report 02/12/96
Reviewed By [signature] S.E.T.

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway face, Step #34, Sta. 15+50, Elev. 1058'
Material Supplier Mixed on site Measured Slump, in. N/A
Ticket Number " " Measure Air Content, % N/A
Batch Size, cu. yds. " " Ambient Air Temperature, °F 70
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/08/96
Time in Mixer 0 hrs. 0 min. Submitted By P. Llewellyn/WT Date 02/09/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 02/08/96
Test Procedure ASTM C39
Remarks:

Concrete Temperature 69°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/15/96	7	89500	3170			TR
B	02/15/96	7	88500	3130			TR
C	03/07/96	28	127000	4490			RN
D	03/07/96	28	128500	4550			RN

2

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-15
Date of Report 02/15/96
Reviewed By Paul Bowen SET

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading   Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #32, Sta. 13+50, Elev. 1054'
Material Supplier Mixed on site   Measured Slump, in. N/A
Ticket Number " "   Measure Air Content, % N/A
Batch Size, cu. yds. " "   Ambient Air Temperature, °F 67
Mix Identification " "   No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days   Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2   Sampled By P. Llewellyn/WT   Date 02/07/96
Time in Mixer 0 hrs. 0 min.   Submitted By P. Llewellyh/WT   Date 02/08/96
Water Added on Job, gal. 0   Authorized By K. Smith   Date 02/07/96
Test Procedure ASTM C39

Remarks:

Concrete Temperature 68°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/14/96	7	88500	3130			CS
B	02/14/96	7	80500	2850			CS
C	03/06/96	28	110000	3890			RN
D	03/06/96	28	114000	4030			RN

Copies to: Client (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-14
Date of Report 02/08/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #30, Sta. 12+00, Elev. 1050'
Material Supplier: Mixed on site — Measured Slump, in.: N/A
Ticket Number: " " — Measure Air Content, %: N/A
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 60
Mix Identification: " " — No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 02/06/96
Time in Mixer: 0 hrs. 0 min. — Submitted By: J. Waddell/WT — Date: 02/07/96
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 02/06/96
Test Procedure: ASTM C39

Remarks:
Concrete Temperature 67°

*** DOES NOT MEET SPECIFICATIONS**

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/13/96	7	57000	2020			CS
B	02/13/96	7	58000	2050			CS
C	03/05/96	28	87500	3100 *			PL
D	03/05/96	28	92000	3250			PL

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-13
Date of Report 02/07/96
Reviewed By [signature]/S.E.T.

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #29, Sta. 14+50, Elev. 1048'
Material Supplier Mixed on site Measured Slump, in. N/A
Ticket Number " " Measure Air Content, % N/A
Batch Size, cu. yds. " " Ambient Air Temperature, °F 71
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/05/96
Time in Mixer 0 hrs. 0 min. Submitted By W. Selseth/WT Date 02/06/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 02/05/96
Test Procedure ASTM C39
Remarks: Concrete Temperature 71°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/12/96	7	78000	2760			WS
B	02/12/96	7	74000	2620			WS
C	03/04/96	28	121000	4280			WS
D	03/04/96	28	117000	4140			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No 27460021-12
Date of Report 02/06/96
Reviewed By S.E.T.

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada

Contractor American Asphalt & Grading Architect/Engineer Black & Veatch

Source of Sample Spillway, Step #27, Sta. 13+00, Elev. 1044'

Material Supplier Mixed on site Measured Slump, in. NA

Ticket Number " " Measure Air Content, % NA

Batch Size, cu. yds. " " Ambient Air Temperature, °F 63

Mix Identification " " No. of Specimens Molded 4

Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"

Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/02/96

Time in Mixer 0 hrs. 0 min. Submitted By W. Selseth/WT Date 02/05/96

Water Added on Job, gal. 0 Authorized By K. Smith Date 02/02/96

Test Procedure ASTM C39

Remarks:

Concrete Temperature 65°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/09/96	7	81000	2860			JW
B	02/09/96	7	79000	2790			JW
C	03/01/96	28	119500	4230			RN
D	03/01/96	28	119000	4210			RN

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-11
Date of Report 03/05/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #25, Sta. 16+00, Elev. 1040'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 65
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/01/96
Time in Mixer 0 hrs. 0 min. Submitted By T. Robbins/WT Date 02/02/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 02/01/96
Test Procedure ASTM C39
Remarks: * Concrete Temperature 67°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/08/96	7	71000	2510			RN
B	02/08/96	7	66000	2340			RN
C	02/29/96	28	103500	3660			CS
D	02/29/96	28	102000	3610			CS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-10
Date of Report 02/02/96
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Apillway, Step #23, Sta. 15+50, Elev. 1036'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 64
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/31/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: T. Robbins/WT Date: 02/01/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/31/96
Test Procedure: ASTM C39
Remarks: Concrete Temperature 64°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/07/96	7	68000	2400			JW
B	02/07/96	7	71000	2510			JW
C	02/28/96	28	108000	3820			RN
D	02/28/96	28	113000	4000			RN

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-9
Date of Report 02/02/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #21, Sta. 15+00, Elev. 1032'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 70
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/30/96
Time in Mixer 0 hrs. 0 min.
Submitted By J. Waddell/WT Date 01/31/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/30/96
Test Procedure ASTM C39
Remarks: Concrete Temperature 68°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/06/96	7	76000	2690			WS
B	02/06/96	7	78000	2760			WS
C	02/27/96	28	112000	3960			WS
D	02/27/96	28	110000	3890			WS

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-8
Date of Report 01/31/96
Reviewed By

Project: Hiko Springs Detention Basin Wash (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #19, Sta. 12+50, Elev. 1028'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 58
Mix Identification: " "
No. of Specimens Molded: 7
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 01/29/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: T. Robbins/WT Date 01/30/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 01/29/96
Test Procedure: ASTM C39

Remarks: Concrete Temperature 64°
Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/05/96	7	78500	2780			WS
B	02/05/96	7	79000	2790			WS
C	02/26/96	28	127000	4490			WS
D	02/26/96	28	124000	4390			WS
E	02/05/96	7	65500	2320			WS
F	02/05/96	7	69500	2460			WS
G	02/26/96	28	105000	3710			WS

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc. Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-7
Date of Report 01/30/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #17, Sta. 13+00, Elev. 1024'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 59
Mix Identification " "
No. of Specimens Molded 7
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/27/96
Time in Mixer 0 hrs. 0 min.
Submitted By P. Llewellyn/WT Date 01/28/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/27/96
Test Procedure ASTM C39

Remarks:

Concrete Temperature 63°

Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/03/96	7	74000	2620			CA
B	02/03/96	7	71500	2530			CA
C	02/24/96	28	127500	4510			PL
D	02/24/96	28	124500	4400			PL
E	02/03/96	7	58000	2050			CA
F	02/03/96	7	55500	1960			CA
G	02/24/96	28	100000	3540			PL

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-6
Date of Report 01/30/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD BId #3476-94)
Location: Laughlin, Nevada
Contractor: American Aspahlt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #16, Sta. 15+00, Elev. 1022'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 59
Mix Identification: " "
No. of Specimens Molded: 6" x 12"
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 7
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/26/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Llewellyn/WT Date: 01/27/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/26/96
Test Procedure: ASTM C39

Remarks:

Concrete Temperature 57°
Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/02/96	7	84000	2970			RN
B	02/02/96	7	75000	2650			RN
C	02/23/96	28	128000	4530			TR
D	02/23/96	28	125000	4420			TR
E	02/02/96	7	49000	1730			RN
F	02/02/96	7	64500	2280			RN
G	02/23/96	28	102000	3610			TR

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-5
Date of Report 01/30/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #13, Sta. 11+00, Elev. 1016'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % AN
Batch Size, cu. yds. " " Ambient Air Temperature, °F 67
Mix Identification " " No. of Specimens Molded 7
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 01/25/96
Time in Mixer 0 hrs. 0 min. Submitted By P. Llewellyn/WT Date 01/26/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 01/25/96
Test Procedure ASTM C39

Remarks:

Concrete Temperature 67°
Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/01/96	7	69000	2440			TR
B	02/01/96	7	69000	2440			TR
C	02/22/96	28	113500	4010			WS
D	02/22/96	28	12000	4240			WS
E	02/01/96	7	50000	1770			TR
F	02/01/96	7	55000	1945			TR
G	02/22/96	28	85000	3010			WS

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-5
Date of Report 01/30/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading   Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #13, Sta. 11+00, Elev. 1016'
Material Supplier Mixed on site   Measured Slump, in. NA
Ticket Number " "   Measure Air Content, % AN
Batch Size, cu. yds. " "   Ambient Air Temperature, °F 67
Mix Identification " "   No. of Specimens Molded 7
Design Strength, psi 1750/3200 / 7/28 days   Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2   Sampled By P. Llewellyn/WT   Date 01/25/96
Time in Mixer 0 hrs. 0 min.   Submitted By P. Llewellyn/WT   Date 01/26/96
Water Added on Job, gal. 0   Authorized By K. Smith   Date 01/25/96
Test Procedure ASTM C39

Remarks:

Concrete Temperature 67°
Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/01/96	7	69000	2440			TR
B	02/01/96	7	69000	2440			TR
C	02/22/96	28					
D	02/22/96	28					
E	02/01/96	7	50000	1770			TR
F	02/01/96	7	55000	1945			TR
G	02/22/96	28					

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-4
Date of Report 01/30/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid#3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step 11, Sta. 13+00, Elev. 1012'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 52
Mix Identification: " "
No. of Specimens Molded: 7
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 01/18/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Anderegg/WT Date 01/19/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 01/18/96
Test Procedure: ASTM C39

Remarks: Concrete Temperature 61°

Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/25/96	7	94000	1910			PL
B	01/25/96	7	93000	1870			PL
C	02/15/96	28	81000 *	2865			TR
D	02/15/96	28	84500 *	2990			TR
E	01/25/96	7	34000*	1200			PL
F	01/25/96	7	43500*	1540			PL
G	02/15/96	28	73000*	2580		RECEIVED 2/9/96	TR

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* Does not meet specification requirements

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-3
Date of Report 01/18/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step 10 Sta. 12+00, Elev. 1012'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 58
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/17/96
Time in Mixer 0 hrs. 0 min.
Submitted By J. Waddell/WT Date 01/18/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/17/96
Test Procedure ASTM C39
Remarks: Concrete Temperature 65°

Note: Cylinder E, Field Cure
Cylingers F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/24/96	7	61500	2180			JW
B	01/24/96	7	64500	2280			JW
C	02/14/96	28	92000	3250			CS
D	02/14/96	28	95500	3380			CS
E	01/24/96	7	42000	1490			JW
F	01/24/96	7	55000	1950			JW
G	02/15/96	29	89500*	3170		RECEIVED 2/9/96	TR

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-2
Date of Report 01/18/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step 9, Sta. 12+00, Elev. 1008'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 58
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 01/16/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: W. Selseth/WT Date 01/17/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 01/16/96
Test Procedure: ASTM C39

Remarks: Field Unit Weights PCF   Concrete Temperature 63°
A = 143.2
B = 143.7
C = 143.1
D = 143.8

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/23/96	7	62000	2190			JW
B	01/23/96	7	59500	2100			JW
C	02/13/96	28	84000	2970			CS
D	02/13/96	28	85500	3020			CS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-1
Date of Report 01/17/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #9, Sta. 15+50, Elev. 1008'
Material Supplier: American Asphalt & Grading — Measured Slump, in.: NA
Ticket Number: Mixed on site — Measure Air Content, %: NA
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 64
Mix Identification: " " — No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 01/15/96
Time in Mixer: 0 hrs. 0 min. — Submitted By: W. Selseth/WT — Date: 01/16/96
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 01/15/96
Test Procedure: ASTM C39

Remarks: Field Unit Weight PCF — Concrete Temperature 65°
A = 143.8
B = 143.7
C = 143.1
D = 143.5

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Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/22/96	7	51500	1820			RN
B	01/22/96	7	55000	1950			RN
C	02/12/96	28	89500	3170			WS
D	02/12/96	28	90000	3180			WS

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-16
Date of Report 02/12/96
Reviewed By [signature] 6.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway face, Step #34, Sta. 15+50, Elev. 1058'
Material Supplier: Mixed on site
Measured Slump, in.: N/A
Ticket Number: " "
Measure Air Content, %: N/A
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 70
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 02/08/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Llewellyn/WT Date: 02/09/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 02/08/96
Test Procedure: ASTM C39

Remarks:

Concrete Temperature 69°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/15/96	7	89500	3170			TR
B	02/15/96	7	88500	3130			TR
C	03/07/96	28					
D	03/07/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-15
Date of Report 02/15/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada

Contractor American Asphalt & Grading Architect/Engineer Black & Veatch

Source of Sample Spillway, Step #32, Sta. 13+50, Elev. 1054'

Material Supplier Mixed on site Measured Slump, in. N/A

Ticket Number " " Measure Air Content, % N/A

Batch Size, cu. yds. " " Ambient Air Temperature, °F 67

Mix Identification " " No. of Specimens Molded 4

Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"

Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/07/96

Time in Mixer 0 hrs. 0 min. Submitted By P. Llewellyh/WT Date 02/08/96

Water Added on Job, gal. 0 Authorized By K. Smith Date 02/07/96

Test Procedure ASTM C39

Remarks:

Concrete Temperature 68°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/14/96	7	88500	3130			CS
B	02/14/96	7	80500	2850			CS
C	03/06/96	28					
D	03/06/96	28					

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-14
Date of Report 02/08/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada

Contractor American Asphalt & Grading Architect/Engineer Black & Veatch

Source of Sample Spillway, Step #30, Sta. 12+00, Elev. 1050'

Material Supplier Mixed on site Measured Slump, in. N/A

Ticket Number " " Measure Air Content, % N/A

Batch Size, cu. yds. " " Ambient Air Temperature, °F 60

Mix Identification " " No. of Specimens Molded 4

Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"

Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 02/06/96

Time in Mixer 0 hrs. 0 min. Submitted By J. Waddell/WT Date 02/07/96

Water Added on Job, gal. 0 Authorized By K. Smith Date 02/06/96

Test Procedure ASTM C39

Remarks:

Concrete Temperature 67°

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Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/13/96	7	57000	2020			CS
B	02/13/96	7	58000	2050			CS
C	03/05/96	28					
D	03/05/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-13
Date of Report 02/07/96
Reviewed By S.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #29, Sta. 14+50, Elev. 1048'
Material Supplier: Mixed on site
Measured Slump, in.: N/A
Ticket Number: " "
Measure Air Content, %: N/A
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 71
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 02/05/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: W. Selseth/WT Date: 02/06/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 02/05/96
Test Procedure: ASTM C39

Remarks: Concrete Temperature 71°

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Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/12/96	7	78000	2760			WS
B	02/12/96	7	74000	2620			WS
C	03/04/96	28					
D	03/04/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No 27460021-12
Date of Report 02/06/96
Reviewed By S.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #27, Sta. 13+00, Elev. 1044'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 63
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 02/02/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: W. Selseth/WT Date 02/05/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 02/02/96
Test Procedure: ASTM C39
Remarks:

Concrete Temperature 65°

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Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/09/96	7	81000	2860			JW
B	02/09/96	7	79000	2790			JW
C	03/01/96	28					
D	03/01/96	28					

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-11
Date of Report 02/05/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #25, Sta. 16+00, Elev. 1040'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 65
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 02/01/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: T. Robbins/WT Date 02/02/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 02/01/96
Test Procedure: ASTM C39
Remarks: * Concrete Temperature 67°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/08/96	7	71000	2510			RN
B	02/08/96	7	66000	2340			RN
C	02/29/96	28					
D	02/29/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-10
Date of Report 02/02/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada

Contractor American Asphalt & Grading Architect/Engineer Black & Veatch

Source of Sample Apillway, Step #23, Sta. 15+50, Elev. 1036'

Material Supplier Mixed on site Measured Slump, in. NA

Ticket Number " " Measure Air Content, % NA

Batch Size, cu. yds. " " Ambient Air Temperature, °F 64

Mix Identification " " No. of Specimens Molded 4

Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"

Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 01/31/96

Time in Mixer 0 hrs. 0 min. Submitted By T. Robbins/WT Date 02/01/96

Water Added on Job, gal. 0 Authorized By K. Smith Date 01/31/96

Test Procedure ASTM C39

Remarks: Concrete Temperature 64°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/07/96		68000	2400			JW
B	02/07/96		71000	2510			JW
C	02/28/96						
D	02/28/96						

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-9
Date of Report 02/02/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #21, Sta. 15+00, Elev. 1032'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 70
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/30/96
Time in Mixer 0 hrs. 0 min.
Submitted By J. Waddell/WT Date 01/31/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/30/96
Test Procedure ASTM C39
Remarks: Concrete Temperature 68°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/06/96	7	76000	2690			WS
B	02/06/96	7	78000	2760			WS
C	02/27/96	28					
D	02/27/96	28					

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LABORATORY REPORT
REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-8
Date of Report 01/31/96
Reviewed By

Project Hiko Springs Detention Basin Wash (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #19, Sta. 12+50, Elev. 1028'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 58
Mix Identification " " No. of Specimens Molded 7
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 01/29/96
Time in Mixer 0 hrs. 0 min. Submitted By T. Robbins/WT Date 01/30/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 01/29/96
Test Procedure ASTM C39
Remarks: Concrete Temperature 64°
Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/05/96	7	78500	2780			WS
B	02/05/96	7	79000	2790			WS
C	02/26/96	28					
D	02/26/96	28					
E	02/05/96	7	65500	2320			WS
F	02/05/96	7	69500	2460			WS
G	02/26/96	28					

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REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc. Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-7
Date of Report 01/30/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, Step #17, Sta. 13+00, Elev. 1024'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 59
Mix Identification " " No. of Specimens Molded 7
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 01/27/96
Time in Mixer 0 hrs. 0 min. Submitted By P. Llewellyn/WT Date 01/28/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 01/27/96
Test Procedure ASTM C39

Remarks:

Concrete Temperature 63°

Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/03/96	7	74000	2620			CA
B	02/03/96	7	71500	2530			CA
C	02/24/96	28					
D	02/24/96	28					
E	02/03/96	7	58000	2050			CA
F	02/03/96	7	55500	1960			CA
G	02/24/96	28				RECEIVED 2/9/96	

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-6
Date of Report 01/30/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD BId #3476-94)
Location: Laughlin, Nevada
Contractor: American Aspahlt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step #16, Sta. 15+00, Elev. 1022'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 59
Mix Identification: " "
No. of Specimens Molded: 6" x 12"
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 7
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/26/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Llewellyn/WT Date: 01/27/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/26/96
Test Procedure: ASTM C39

Remarks:

Concrete Temperature 57°
Note: Cylinder E, Field Cure
Cylinders F & G, Field Bench Cure

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	02/02/96	7	84000	2970			RN
B	02/02/96	7	75000	2650			RN
C	02/23/96	28					
D	02/23/96	28					
E	02/02/96	7	49000	1730			RN
F	02/02/96	7	64500	2280			RN
G	02/23/96	28				RECEIVED 2/9/96	

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-11
Date of Report 01/16/96
Reviewed By 1/16/96

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step 6, Sta. 12+00, Elev. 1002'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 64
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/10/96
Time in Mixer 0 hrs. 0 min.
Submitted By C. Anderegg/WT Date 01/11/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/10/96
Test Procedure ASTM C39

Remarks:

Concrete Temperature 64°
Field Unit Weights PCF

A = 143.7 C = 143.9

B = 143.9 D = 143.6

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/17/96	7	86000	3040			JW
B	01/17/96	7	87500	3100			JW
C	02/07/96	28	124000	4390			JW
D	02/07/96	28	120000	4240			JW

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REVISED REPORT: 02/22/96

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-10
Date of Report 01/17/96
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, Step 5, Sta. 15+50, Elev. 1000'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 54
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 01/09/96
Time in Mixer 0 hrs. 0 min. Submitted By P. Bowen/WT Date 01/10/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 01/09/96
Test Procedure ASTM C39
Remarks: Field Unit Weights PCF Concrete Temperature 63°
A = 143.9
B = 143.6
C = 144.2
D = 143.9

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/16/96	7	63500	2250			WS
B	01/16/96	7	59000	2090			WS
C	02/06/96	28	78000	2760*			WS
D	02/06/96	28	79000	2790*			WS

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* Does not meet specification requirements

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-9
Date of Report 01/10/96
Reviewed By [signature] BT

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway, ~~4th~~ 5 step, Sta. 14+50, Elev. 999'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 58
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimen 6 x 12
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 01/08/96
Time in Mixer 0 hrs. 0 min. Submitted By P. Bowen/WT Date 01/09/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 01/08/96
Test Procedure ASTMC39

Remarks: Field Unit Weights PCF Concrete Temperature 64°
A = 144.0
B - 144.0
C = 144.9
D = 144.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/15/96	7	79000	2790			SG
B	01/15/96	7	77000	2720			SG
C	02/05/96	28	101500	3590			WS
D	02/05/96	28	99500	3520			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-8
Date of Report 01/09/96
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway Apron, 3rd step, Sta. 15+50, Elev. 995'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 62
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/05/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Anderegg/WT Date: 01/05/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/05/96
Test Procedure: ASTMC39

Remarks: Concrete Temperature 50°
Field Unit Weights PCF
A = 143.4
B = 143.3
C = 143.5
D = 144.0

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/12/96	7	65000	2300			WS
B	01/12/96	7	60500	2140			WS
C	02/02/96	28	95000	3360			RN
D	02/02/96	28	86000	3040			RN

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Cir le, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-7
Date of Report 01/09/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Spillway Apron, 2nd step, Sta. 14+50, Elev. 993'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 64
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6 x 12
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 01/04/96
Time in Mixer 0 hrs. 0 min. Submitted By C. Anderegg/WT Date 01/05/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 01/04/96
Test Procedure ASTMC39

Remarks: Concrete Temperature 65°
Field Unit Weights PCF
A = 143.4 D = 143.2
B = 143.3
C = 143.1

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/11/96	7	74000	2620			WS
B	01/11/96	7	74500	2640			WS
C	02/01/96	28	107500	3800			TR
D	02/01/96	28	109000	3855			TR

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-6
Date of Report 01/04/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway Apron step @ elev. 992', Sta. 15+50
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 63
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/03/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: J. Waddell/WT Date: 01/04/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/03/96
Test Procedure: ASTMC39

Remarks: Field Unit Weights PCF CONCRETE TEMP = 63°
A = 142.7
B = 142.6
C = 143.1
D = 143.4

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load: Pounds Force	Compressive Strength Maximum Load: psi	Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
A	01/10/96	7	57000	2020			JW
B	01/10/96	7	58000	2050			JW
C	01/31/96	28	94500	3340			TR
D	01/31/96	28	95000	3360			TR

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-12
Date of Report 01/16/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step 8, Sta. 15+00, Elev. 1006'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 67
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/11/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Llewellyn/WT Date: 01/12/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/11/96
Test Procedure: ASTM C39
Remarks: Concrete Temperature 64°
Field Unit Weights PCF unable to obtain due to high winds.

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/18/96	7	71000	2510			JW
B	01/18/96	7	69000	2440			JW
C	02/08/96	28	96000	3400			RN
D	02/08/96	28	100000	3540			RN

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-9
Date of Report 01/10/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada

Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: Spillway, 4th step, Sta. 14+50, Elev. 999'
Material Supplier: Mixed on site — Measured Slump, in.: NA
Ticket Number: " " — Measure Air Content, %: NA
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 58
Mix Identification: " " — No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 01/08/96
Time in Mixer: 0 hrs. 0 min. — Submitted By: P. Bowen/WT — Date: 01/09/96
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 01/08/96
Test Procedure: ASTMC39

Remarks: Field Unit Weights PCF — Concrete Temperature 64°

A = 144.0
B - 144.0
C = 144.9
D = 144.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/15/96	7	79000	2790			SG
B	01/15/96	7	77000	2720			SG
C	02/05/96	28					
D	02/05/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450685-5
Date of Report 01/04/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada

Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch

Source of Sample: Spillway Apron, Sta. 12+81 to 14+50, elev. 990'

Material Supplier: Mixed on site — Measured Slump, in.: NA

Ticket Number: " " — Measure Air Content, %: NA

Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 58

Mix Identification: " " — No. of Specimens Molded: 4

Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6" x 12"

Max. Size Aggregate, in.: 0 — Sampled By: P. Llewellyn/WT — Date: 01/02/96

Time in Mixer: 0 hrs. 0 min. — Submitted By: T. Robbins/WT — Date: 01/03/96

Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 01/02/96

Test Procedure: ASTMC39

Remarks: Unit Weights PCF — Concrete Temperature 64°

A = 142.6
B = 142.3
C = 142.8
D = 142.0

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/09/96	7	71000	2510			JW
B	01/09/96	7	76000	2690			JW
C	01/30/96	28	106000	3750			JW
D	01/30/96	28	104500	3700			JW

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-11
Date of Report 01/16/96
Reviewed By 1/16/96

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading   Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step 6, Sta. 12+00, Elev. 1002'
Material Supplier: Mixed on site   Measured Slump, in.: NA
Ticket Number: " "   Measure Air Content, %: NA
Batch Size, cu. yds.: " "   Ambient Air Temperature, °F: 64
Mix Identification: " "   No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days   Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2   Sampled By: P. Llewellyn/WT   Date: 01/10/96
Time in Mixer: 0 hrs. 0 min.   Submitted By: C. Anderegg/WT   Date: 01/11/96
Water Added on Job, gal.: 0   Authorized By: K. Smith   Date: 01/10/96
Test Procedure: ASTM C39

Remarks:
Concrete Temperature 64°
Field Unit Weights PCF
A = 143.7   C = 143.9
B = 143.9   D = 143.6

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/17/96	7	86000	3040			JW
B	01/17/96	7	87500	3100			JW
C	02/07/96	28					
D	02/07/96	28					

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-10
Date of Report 01/17/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step 5, Sta. 15+50, Elev. 1000'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 54
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/09/96
Time in Mixer 0 hrs. 0 min.
Submitted By P. Bowen/WT Date 01/10/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/09/96
Test Procedure ASTM C39

Remarks: Field Unit Weights PCF Concrete Temp = 63°F
A = 143.9
B = 143.6
C = 144.2
D = 143.9

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/16/96	7	63500	2250			WS
B	01/16/96	7	59000	2090			WS
C	02/06/96	28					
D	02/06/96	28					

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-3
Date of Report 12/26/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Top of spillway, Sta. 11+36.5 to 17+13.5
Material Supplier American Asphalt & Grading
Measured Slump, in. NA
Ticket Number Mixed on site
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 48
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6 x 12
Max. Size Aggregate, in. 1
Sampled By J. Waddell/WT Date 12/20/95
Time in Mixer 0 hrs. 0 min.
Submitted By T. Robbins/WT Date 12/21/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 12/20/95
Test Procedure
Remarks:

Concrete Temperature 62°
A = 135.1
B = 141.3 (Field Unit Weights PCF)
C = 137.5
D = 139.5

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/27/95	7	31000	1100*		Voids in sample	JH
B	12/27/95	7	56000	1980*			JH
C	01/17/96	28	64500	2280*			JW
D	01/17/96	28	66000	2340*			JW

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Ci--le, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-2
Date of Report 12/26/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading — Architect/Engineer Black & Veatch
Source of Sample Top of spillway, Sta. 11+36.5 to 17+13.5
Material Supplier American Asphalt & Grading — Measured Slump, in. NA
Ticket Number Mixed on site — Measure Air Content, % NA
Batch Size, cu. yds. " " — Ambient Air Temperature, °F 48
Mix Identification " " — No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days — Size of Specimens 6 x 12
Max. Size Aggregate, in. 1 — Sampled By J. Waddell/WT Date 12/19/95
Time in Mixer 0 hrs. 0 min. — Submitted By T. Robbins/WT Date 12/20/95
Water Added on Job, gal. 0 — Authorized By K. Smith Date 12/19/95
Test Procedure ASTM C39

Remarks:

Concrete Temperature 56°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/26/95	7	77500	2740			TR
B	12/26/95	7	78000	2760			TR
C	01/16/96	28	99000	3500			WS
D	01/16/96	28	103500	3660			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-1
Date of Report 12/20/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Scour Hole, Elev. 979, Sta. 12+50 to 16+00
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 55
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1
Sampled By: J. Waddell/WT Date: 12/18/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Aneregg/WT Date: 12/19/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 12/18/95
Test Procedure: ASTM C39

Remarks:

Concrete Temperature 65°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/26/95	8	83000	2940			TR
B	12/26/95	8	76000	2690			TR
C	01/15/96	28	102000	3610			SG
D	01/15/96	28	99000	3500			SG

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-4
Date of Report 01/30/96
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid#3476-94)
Location: Laughlin, Nevada
Contractor: American Aspahlt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway, Step 11, Sta. 13+00, Elev. 1012'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 52
Mix Identification: " "
No. of Specimens Molded: 7
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 01/18/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Anderegg/WT Date 01/19/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 01/18/96
Test Procedure: ASTM C39
Remarks:

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/25/96	7	94000	1910			PL
B	01/25/96	7	93000	1870			PL
C	02/15/96	28					
D	02/15/96	28					
E	01/25/96	7	34000*	1200			PL
F	01/25/96	7	43500*	1540			PL
G	02/15/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460021-3
Date of Report 01/18/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway, Step 10 Sta. 12+00, Elev. 1012'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 58
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6" x 12"
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/17/96
Time in Mixer 0 hrs. 0 min.
Submitted By J. Waddell/WT Date 01/18/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/17/96
Test Procedure ASTM C39
Remarks: Concrete Temperature 65°
Note: Cylinders E, F, & G are field cured specimens

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/24/96	7	61500	2180			JW
B	01/24/96	7	64500	2280			JW
C	02/14/96	28					
D	02/14/96	28					
E	01/24/96	7	42000	1490			JW
F	01/24/96	7	55000	1950			JW
G	02/14/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-8
Date of Report 01/09/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway Apron, 3rd step, Sta. 15+50, Elev. 995'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 62
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/05/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Anderegg/WT Date: 01/05/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/05/96
Test Procedure: ASTMC39

Remarks:
Concrete Temperature 50°
Field Unit Weights PCF
A = 143.4
B = 143.3
C = 143.5
D = 144.0

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/12/96	7	65000	2300			WS
B	01/12/96	7	60500	2140			WS
C	02/02/96	28					
D	02/02/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-7
Date of Report 01/09/96
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Spillway Apron, 2nd step, Sta. 14+50, Elev. 993'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 64
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6 x 12
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 01/04/96
Time in Mixer 0 hrs. 0 min.
Submitted By C. Anderegg/WT Date 01/05/96
Water Added on Job, gal. 0
Authorized By K. Smith Date 01/04/96
Test Procedure ASTMC39

Remarks:
Concrete Temperature 65°
Field Unit Weights PCF
A = 143.4
B = 143.3
C = 143.1
D = 143.2

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/11/96	7	74000	2620			WS
B	01/11/96	7	74500	2640			WS
C	02/01/96	28					
D	02/01/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-6
Date of Report 01/04/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway Apron step @ elev. 992', Sta. 15+50
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 63
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 01/03/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: J. Waddell/WT Date: 01/04/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 01/03/96
Test Procedure: ASTMC39

Remarks: Field Unit Weights PCF
A = 142.7
B = 142.6
C = 143.1
D = 143.4

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/10/96	7	57000	2020			JW
B	01/10/96	7	58000	2050			JW
C	01/31/96	28					
D	01/31/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450685-5
Date of Report 01/04/96
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Spillway Apron, Sta. 12+81 to 14+50, elev. 990'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 58
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6" x 12"
Max. Size Aggregate, in.: 0
Sampled By: P. Llewellyn/WT Date 01/02/96
Time in Mixer: 0 hrs. 0 min.
Submitted By: T. Robbins/WT Date 01/03/96
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 01/02/96
Test Procedure: ASTMC39

Remarks: Unit Weights PCF   Concrete Temperature 64°
A = 142.6
B = 142.3
C = 142.8
D = 142.0

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	01/09/96	7	71000	2510			JW
B	01/09/96	7	76000	2690			JW
C	01/30/96	28					
D	01/30/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Cir-le, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-20
Date of Report 12/26/95
Reviewed By C Anderegg

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Scour Hole, Sta. 12+50, elev. 973' Bid #21
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 66
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1
Sampled By: J. Waddell/WT Date 12/13/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Myers/WT Date 12/14/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 12/13/95
Test Procedure:
Remarks:

Concrete Temperature 69°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/20/95	7	59000	2090			TR
B	12/20/95	7	60500	2140			TR
C	01/10/96	28	107000	3780			JW
D	01/10/96	28	111000	3930			JW

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Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

ient 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-19
Date of Report 12/26/95
Reviewed By C Andueza

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Scour Hole, Elev. 966, Bench #3 ?
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 68
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 12/12/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Myers/WT Date 12/13/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 12/12/95
est Procedure:
Remarks:

Concrete Temperature 70°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load: Pounds Force	Compressive Strength Maximum Load: psi	Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
A	12/19/95	7	62000	2190			TR
B	12/19/95	7	65000	2300			TR
C	01/09/96	28	96000	3400			JW
D	01/09/96	28	99000	3500			JW

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-4
Date of Report 12/26/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: American Asphalt & Grading, on site, batch plant
Material Supplier: American Asphalt & Grading
Measured Slump, in.: NA
Ticket Number: Mixed on site
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 51
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1
Sampled By: J. Waddell/WT Date 12/21/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: T. Robbins/WT Date 12/22/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 12/21/95
Test Procedure: ASTM C39

Remarks: Field Unit Weights PCF
Concrete Temperature 62°

A = 145.2 D = 148.2
B = 146.1
C = 143.7

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/28/95	7	64000	2260			JW
B	12/28/95	7	78000	2760			JW
C	01/18/96	28					
D	01/18/96	28					

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-3
Date of Report 12/26/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Top of spillway, Sta. 11+36.5 to 17+13.5
Material Supplier American Asphalt & Grading
Measured Slump, in. NA
Ticket Number Mixed on site
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 48
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6 x 12
Max. Size Aggregate, in. 1
Sampled By J. Waddell/WT Date 12/20/95
Time in Mixer 0 hrs. 0 min.
Submitted By T. Robbins/WT Date 12/21/95
ater Added on Job, gal. 0
Authorized By K. Smith Date 12/20/95
Test Procedure
Remarks:

Concrete Temperature 62°
A = 135.1
B = 141.3
C = 137.5
D = 139.5
(Field Unit Weights PCF)

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/27/95	7	31000	1100*		Voids in sample	JH
B	12/27/95	7	56000	1980			JH
C	01/17/96	28					
D	01/17/96	28					

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* Does not meet specification

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-2
Date of Report 12/26/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Top of spillway, Sta. 11+36.5 to 17+13.5
Material Supplier American Asphalt & Grading
Measured Slump, in. NA
Ticket Number Mixed on site
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 48
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6 x 12
Max. Size Aggregate, in. 1
Sampled By J. Waddell/WT Date 12/19/95
Time in Mixer 0 hrs. 0 min.
Submitted By T. Robbins/WT Date 12/20/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 12/19/95
Test Procedure ASTM C39

Remarks:

Concrete Temperature 56°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens, Caps If Any	Tested By
			Pounds Force	psi			
A	12/26/95	7	77500	2740			TR
B	12/26/95	7	78000	2760			TR
C	01/16/96	28					
D	01/16/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450684-1
Date of Report 12/20/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Scour Hole, Elev. 979, Sta. 12+50 to 16+00
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 55
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6 x 12
Max. Size Aggregate, in. 1
Sampled By J. Waddell/WT Date 12/18/95
Time in Mixer 0 hrs. 0 min.
Submitted By C. Aneregg/WT Date 12/19/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 12/18/95
Test Procedure ASTM C39

Remarks:

Concrete Temperature 65°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/26/95	8	83000	2940			TR
B	12/26/95	8	76000	2690			TR
C	01/15/96	28					
D	01/15/96	28					

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-22
Date of Report 12/20/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Scour hole elev. 975, Sta. 12+50 to 16+00
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 55
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6 x 12
Max. Size Aggregate, in. 1 Sampled By J. Waddell/WT Date 12/15/95
Time in Mixer 0 hrs. 0 min. Submitted By C. Anderegg/WT Date 12/16/95
Water Added on Job, gal. 0 Authorized By K. Smith Date 12/15/95
Test Procedure

Remarks:

Concrete Temperature 65°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/22/95	7	58000	2050			JW
B	12/22/95	7	63000	2230			JW
C	01/12/96	28					
D	01/12/96	28					

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

ent
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632- 21
Date of Report 12/20/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Soour Hole, Sta. 12+50 to 16+75, elev. 986'
Material Supplier American Asphalt & Grading Measured Slump, in. NA
Ticket Number Mixed on site Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 70
Mix Identification " " No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days Size of Specimens 6 x 12
Max. Size Aggregate, in. 1 Sampled By J. Waddell/WT Date 12/14/95
Time in Mixer 0 hrs. 0 min. Submitted By C. Anderegg/WT Date 12/15/95
Water Added on Job, gal. 0 Authorized By K. Smith Date 12/14/95
st Procedure
Remarks: Concrete Temperature 69°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/21/95	7	57000	2020			WS
B	12/21/95	7	60500	2140			WS
C	01/11/96	28					
D	01/11/96	28					

opies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-20
Date of Report 12/26/95
Reviewed By C Anderegg

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Scour Hole, Sta. 12+50, elev. 973' Bid #21
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 66
Mix Identification: " "
No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days
Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1
Sampled By: J. Waddell/WT Date 12/13/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Myers/WT Date 12/14/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 12/13/95
Test Procedure:

Remarks:

Concrete Temperature 69°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/20/95	7	59000	2090			TR
B	12/20/95	7	60500	2140			TR
C	01/10/96	28					
D	01/10/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-19
Date of Report 12/26/95
Reviewed By C. Andue

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: Scour Hole, Elev. 966, Bench #3
Material Supplier: Mixed on site — Measured Slump, in.: NA
Ticket Number: " " — Measure Air Content, %: NA
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 68
Mix Identification: " " — No. of Specimens Molded: 4
Design Strength, psi: 1750/3200 / 7/28 days — Size of Specimens: 6 x 12
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 12/12/95
Time in Mixer: 0 hrs. 0 min. — Submitted By: C. Myers/WT — Date: 12/13/95
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 12/12/95
Test Procedure:
Remarks:

Concrete Temperature 70°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load: Pounds Force	Compressive Strength Maximum Load: psi	Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
A	12/19/95	7	62000	2190			TR
B	12/19/95	7	65000	2300			TR
C	01/09/96	28					
D	01/09/96	28					

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Rollar Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-3
Date of Report 11/20/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt
Architect/Engineer Black & Veatch
Source of Sample Sta. 13+25, scour hole, Test Strip
Material Supplier American Asphalt
Measured Slump, in. NA
Ticket Number Mixed on site
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 80
Mix Identification " "
No. of Specimens Molded 4
Design Strength, psi 1750/3200 / 7/28 days
Size of Specimens 6 x 12
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 11/15/95
Time in Mixer 0 hrs. 0 min.
Submitted By P. Llewellyn/WT Date 11/16/95
Water Added on Job, gal. NA
Authorized By K. Smith Date 11/15/95
Test Procedure
Remarks:

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	11/22/95	7	84000	2970			CA
B	11/22/95	7	84000	2970			CA
C	12/13/95	28	105000	3710			WS
D	12/13/95	28	102500	3625			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Roller Compacted Concrete

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-1
Date of Report 11/20/95
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada

Contractor: American Asphalt | Architect/Engineer: Black & Veatch

Source of Sample: Sta. 13+00, scour hole

Material Supplier: American Asphalt | Measured Slump, in.: NA

Ticket Number: Mixed on site | Measure Air Content, %: NA

Batch Size, cu. yds.: " " | Ambient Air Temperature, °F: 85

Mix Identification: RCC #2 | No. of Specimens Molded: 4

Design Strength, psi ____ / ____ days | Size of Specimens: 6 x 12

Max. Size Aggregate, in.: 1-1/2 | Sampled By: P. Llewellyn/WT | Date: 11/13/95

Time in Mixer: 0 hrs. 30 min. | Submitted By: P. Llewellyn/WT | Date: 11/14/95

Water Added on Job, gal.: NA | Authorized By: K. Smith | Date: 11/13/95

Test Procedure

Remarks:

1750 psi @ 7 days
3200 psi @ 28 days

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	11/20/95	7	74000	2620			SG
B	11/20/95	7	73000	2580			SG
C	12/11/95	28	112500	3980			PL
D	12/11/95	28	113500	4010			PL

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RCC Cores

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LABORATORY REPORT

Date of Report MARCH 12, 1996
Job No. 2745JC249
Event/Invoice No. 27460061 Lab No. 189
Authorized By KEN SMITH Date 02/29/96
Sampled By P. LLEWELLYN/WT Date 02/29/96
Submitted By P. LLEWELLYN/WT Date 02/29/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94)
Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING
Arch./Engr. BLACK & VEATCH
Type/Use of Material SPILLWAY FACE/RCC
Supplier/Source AMERICAN ASPHALT & GRADING
Sample Source/Location SEE BELOW
Source/Location Desig. By KEN SMITH Date 02/29/96
Reference: N/A
Special Instructions: DESIGN STRENGTH 2200 PSI, DATE PLACED 02/01/96

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A STA. 12+50 ELEV. 1040'	CORE B STA. 13+00 ELEV. 1038"		
DATE TESTED	02/29/96	02/29/96		
CONCRETE AGE, DAYS	28	28		
LENGTH OF CORE, AS RECEIVED	15	12		
LENGTH BEFORE CAPPING, IN.	6.30	8.87		
LENGTH AFTER CAPPING, IN.	6.85	9.35		
DIAMETER, IN.	5.785	5.790		
LENGTH/DIAMETER RATIO	1.18	1.61		
CROSS-SECTIONAL AREA, SQ. IN.	26.28	26.33		
MAXIMUM LOAD, LBF	107000	83000		
COMPRESSIVE STRENGTH, PSI	4070	3150		
STRENGTH CORRELATION FACTOR	.91	.97		
CORRECTED COMPRESSIVE STRENGTH, PSI	3700	3060		
TYPE OF FRACTURE	CONE	CONE		
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR	PERPENDICULAR		
MOISTURE CONDITION AT TIME OF TEST	MOIST	MOIST		
UNIT WEIGHT, LBF PER CU. FT	147.4	145.3		

Comments:

REC'D
3/18/96

Copies To: CLIENT (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY

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Bullhead City, Arizona 86442
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LABORATORY REPORT

Date of Report FEBRUARY 12,1996
Job No. 2745JC249
Event / Invoice No. 27460021 Lab No. 173
Authorized By KEN SMITH Date 02/08/96
Sampled By J. WADDELL/WT Date 02/08/96
Submitted By J. WADDELL/WT Date 02/08/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NEVADA

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94) Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW Source / Location Desig. By KEN SMITH Date 02/08/96
Reference: MIX DESIGN ED/RCC-2, DESIGN STRENGTH 2200 PSI, DATE PLACED 01/11/96
Special Instructions: TEST PROCEDURE/ASTM C42

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A ELEV. 1002 STA. 16+00 STEP 6			
DATE TESTED	02/08/96			
CONCRETE AGE, DAYS	28			
LENGTH OF CORE, AS RECEIVED	12.00			
LENGTH BEFORE CAPPING, IN.	10.785			
LENGTH AFTER CAPPING, IN.	11.375			
DIAMETER, IN.	5.782			
LENGTH/DIAMETER RATIO	1.97			
CROSS-SECTIONAL AREA, SQ. IN.	26.26			
MAXIMUM LOAD, LBF	40000		RECEIVED	
COMPRESSIVE STRENGTH, PSI	1523*			
STRENGTH CORRELATION FACTOR	N/A		FEB 14 1996	
CORRECTED COMPRESSIVE STRENGTH, PSI	1520			
TYPE OF FRACTURE	COLUMNAR		GREINER, INC.	
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR			
MOISTURE CONDITION AT TIME OF TEST	MOIST			
UNIT WEIGHT, LBF PER CU. FT	144.9			

Comments:
* DOES NOT MEET SPECIFICATION REQUIREMENTS

Copies To: CLIENT (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY C. Andurys

4500-95WTI
102795

OBTAINING / TESTING DRILLED CORES OF CONCRETE

USE REPORT FORM NO. 451

Job No. ______ Date Required ______

Procedure: ☐ ASTM C42 ☐ AASHTO ☐ ______ Event/Invoice No. ______ Lab. No. ______

Data: Concrete Mix Design ID. ______ Design Strength, psi ______ Respon. Tech. ______ Proj. Mgr. ______

Nominal Aggregate Size, in. ______ Date Placed ______ Reviewed By ______ Date ______

TEST RESULTS

CORE IDENTIFICATION						
LOCATION OF CORE	16+75 ELEV 1076 TOP					
DATE TESTED	1/17					
CONCRETE AGE, DAYS	28					
LENGTH OF CORE, AS RECEIVED						
LENGTH BEFORE CAPPING, IN.	6 3/8"					
LENGTH AFTER CAPPING, IN. (1)	6.875					
DIAMETER, IN. (2)	3.995					
LENGTH / DIAMETER RATIO (1) ÷ (2)	~~1.596~~	1.7209				
CROSS-SECTIONAL AREA, SQ. IN. (3)	12.535					
MAXIMUM LOAD, LBF (4)	36,400					
COMPRESSIVE STRENGTH, PSI (4) ÷ (3)	2904					
STRENGTH CORRELATION FACTOR	1.098					
CORRECTED COMPRESSIVE STRENGTH, PSI	2850					
TYPE OF FRACTURE						
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR					
MOISTURE CONDITION AT TIME OF TEST	DRY					
UNIT WEIGHT, LBF PER CU. FT.	149.5					
DEFECTS NOTED IN SPECIMENS OR CAPS, IF ANY	~~149.5~~					

Comments: DRAFT — UNOFFICIAL CORE

FILE IN CORE FILE

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LABORATORY REPORT

Date of Report FEBRUARY 16, 1996
Job No. 2745JC249
Event / Invoice No. 27460061 Lab No. 178
Authorized By KEN SMITH Date 02/13/96
Sampled By C. STOWE/WT Date 02/13/96
Submitted By C. STOWE/WT Date 02/13/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94) Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW Source / Location Desig. By P. LLEWELLYN/WT Date 02/13/96
Reference: MIX DESIGN ID/RCC-2, DESIGN STRENGTH 2200 PSI, DATE PLACED 01/16/96
Special Instructions: TEST PROCEDURE C42

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A ELEV. 1008' STA. 11+75 STEP 9	CORE B ELEV. 1010' STA. 15+00 STEP 10		
DATE TESTED	02/13/96	02/13/96		
CONCRETE AGE, DAYS	28	28		
LENGTH OF CORE, AS RECEIVED	14"	14"		
LENGTH BEFORE CAPPING, IN.	9.52	11.51		
LENGTH AFTER CAPPING, IN.	9.92	12.30		
DIAMETER, IN.	5.890	5.908		
LENGTH/DIAMETER RATIO	1.68	2.1		
CROSS-SECTIONAL AREA, SQ. IN.	27.23	27.40		
MAXIMUM LOAD, LBF	60500	80000		
COMPRESSIVE STRENGTH, PSI	2220	2920		
STRENGTH CORRELATION FACTOR	2160	2920		
CORRECTED COMPRESSIVE STRENGTH, PSI	0.97	1.0		
TYPE OF FRACTURE	SHEAR	CONE		
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR	PERPENDICULAR		
MOISTURE CONDITION AT TIME OF TEST	MOIST	MOIST	RECEIVED	
UNIT WEIGHT, LBF PER CU. FT	N/A	N/A		0 1996

Comments:

GREINER, INC.

Copies To: CLIENT (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY SET

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LABORATORY REPORT

Date of Report FEBRUARY 7, 1996
Job No. 2745JC249
Event / Invoice No. 27460021 Lab No. 170
Authorized By KEN SMITH Date 02/06/96
Sampled By J. WADDELL/WT Date 02/06/96
Submitted By J. WADDELL/WT Date 02/06/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRING-DETENTION BASIN (CCBD #3476-94) Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW Source / Location Desig. By KEN SMITH Date 02/06/96
Reference: MIX DESIGN ID/RCC-2, DESIGH STRENGTH 2200 PSI, DATE PLACED 01/09/96
Special Instructions: TEST PROCEDURES/ASTM C42

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A STEP 5 ELV. 1000 STA. 13+50	CORE B STEP 5 ELV. 1000 STA. 11+80		
DATE TESTED	02/06/96	02/06/96		
CONCRETE AGE, DAYS	28	28		
LENGTH OF CORE, AS RECEIVED	15.00	15.00		
LENGTH BEFORE CAPPING, IN.	11.500	11.531		
LENGTH AFTER CAPPING, IN.	12.000	11.941		
DIAMETER, IN.	5.750	5.782		
LENGTH/DIAMETER RATIO	2.1	2.1		
CROSS-SECTIONAL AREA, SQ. IN.	25.97	26.26		
MAXIMUM LOAD, LBF	66000	35000		
COMPRESSIVE STRENGTH, PSI	2541	1333		
STRENGTH CORRELATION FACTOR	N/A	N/A		
CORRECTED COMPRESSIVE STRENGTH, PSI	2540	1330		
TYPE OF FRACTURE	CONC/SPLIT	SHEAR		
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR	PERPENDICULAR		
MOISTURE CONDITION AT TIME OF TEST	MOIST	MOIST		
UNIT WEIGHT, LBF PER CU. FT	146.8	143.3		

RECEIVED
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GREINER, INC.

Comments:

Copies To: CLIENT/KEN SMITH (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY C. Anderson

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LABORATORY REPORT

Date of Report JANUARY 24, 1996
Job No. 2745JC249
Event / Invoice No. 27460021 Lab No. 147
Authorized By KEN SMITH Date 01/16/96
Sampled By J. WADDELL/WT Date 01/16/96
Submitted By P. BOWEN/WT Date 01/16/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94) Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW Source / Location Desig. By KEN SMITH Date 01/16/96
Reference: MIX DESIGN ID/RCC-2, DESIGN STRENGTH 2200 PSI
Special Instructions: TEST PROCEDURE/ASTM C42

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A SCOUR HOLE ELV. 982-984 STA. 16+75/TOP	CORE B SCOUR HOLE ELV. 982-984 STA. 16+75/BM	CORE C TOP OF DAM ELV. 1076 STA. 16+15/TOP	CORE D TOP OF DAM ELV. 1075 STA.11+75/TOP
DATE TESTED	01/17/96	01/17/96	01/17/96	01/17/96
CONCRETE AGE, DAYS	28	28	28	28
LENGTH OF CORE, AS RECEIVED	N/A	N/A	N/A	N/A
LENGTH BEFORE CAPPING, IN.	7-1/8	6-1/4	7-3/4	7.300
LENGTH AFTER CAPPING, IN.	7.250	6-3/8	8.250	7.800
DIAMETER, IN.	3.995	4.004	4.001	3.999
LENGTH/DIAMETER RATIO	1.815	1.592	2.06	1.95
CROSS-SECTIONAL AREA, SQ. IN.	12.54	12.59	12.57	12.56
MAXIMUM LOAD, LBF	18000	42500	26400	25800
COMPRESSIVE STRENGTH, PSI	1435	3376	2100	2054
STRENGTH CORRELATION FACTOR	.99	0.96	2.0	2.0
CORRECTED COMPRESSIVE STRENGTH, PSI	1420	3240	2100	2050
TYPE OF FRACTURE	CONE/SHEAR	CONE	CONE	CONE
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR	PERPENDICULAR	PERPENDICULAR	PERPENDICULAR
MOISTURE CONDITION AT TIME OF TEST	MOIST	MOIST	MOIST	MOIST
UNIT WEIGHT, LBF PER CU. FT	N/A	N/A	148.8	149.3

Comments:

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FEB 02 1996

GREINER, INC.

Copies To: CLIENT/KEN SMITH (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY C. Andueza

795WTI
.795

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

Date of Report JANUARY 24, 1996
Job No. 2745JC249
Event / Invoice No. 27460021 Lab No. 147
Authorized By KEN SMITH Date 01/16/96
Sampled By J. WADDELL/WT Date 01/16/96
Submitted By J. WADDELL/WT Date 01/16/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94) Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW Source / Location Desig. By KEN SMITH Date 01/16/96
Reference: MIX DESIGN ID/RCC-2, DESIGN STRENGTH 2200 PSI
Special Instructions: TEST PROCEDURE/ASTM C42

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE E TOP OF DAM ELV. 1076 STA. 11+75/TOP			
DATE TESTED	01/17/96			
CONCRETE AGE, DAYS	28			
LENGTH OF CORE, AS RECEIVED	N/A			
LENGTH BEFORE CAPPING, IN.	7-3/8			
LENGTH AFTER CAPPING, IN.	7.875			
DIAMETER, IN.	3.998			
LENGTH/DIAMETER RATIO	1.97			
CROSS-SECTIONAL AREA, SQ. IN.	12.55			
MAXIMUM LOAD, LBF	23000			
COMPRESSIVE STRENGTH, PSI	1833			
STRENGTH CORRELATION FACTOR	2.0			
CORRECTED COMPRESSIVE STRENGTH, PSI	1830			
TYPE OF FRACTURE	CONE			
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR			
MOISTURE CONDITION AT TIME OF TEST	MOIST			
UNIT WEIGHT, LBF PER CU. FT	147.7			

Comments:

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Copies To: CLIENT/KEN SMITH (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY C Andueza

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LABORATORY REPORT

Date of Report JANUARY 25, 1996
Job No. 2745JC249
Event / Invoice No. 27460021 Lab No. 152
Authorized By KEN SMITH Date 01/18/96
Sampled By J. WADDELL/WT Date 01/18/96
Submitted By J. WADDELL/WT Date 01/18/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94
Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING
Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE
Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW
Source / Location Desig. By KEN SMITH Date 01/18/96
Reference: MIX DESIGN ID/RCC-2, DESIGN STRENGTH 2200 PSI
Special Instructions: TEST PROCEDURE/ASTM C42, DATE PLACED 12/21/95

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A SPILLWAY APR. ELV. 990 STA. 14+75	CORE B SPILLWAY APR. ELV. 990 STA. 16+00		
DATE TESTED	01/18/96	01/18/96		
CONCRETE AGE, DAYS	28	28		
LENGTH OF CORE, AS RECEIVED	15.00	15.00		
LENGTH BEFORE CAPPING, IN.	7.750	7.500		
LENGTH AFTER CAPPING, IN.	8.000	8.125		
DIAMETER, IN.	4.014	4.003		
LENGTH/DIAMETER RATIO	1.99	2.00		
CROSS-SECTIONAL AREA, SQ. IN.	12.65	12.59		
MAXIMUM LOAD, LBF	21900	29900		
COMPRESSIVE STRENGTH, PSI	1731	2375		
STRENGTH CORRELATION FACTOR	N/A	N/A	27 1996	
CORRECTED COMPRESSIVE STRENGTH, PSI	1730*	2380		
TYPE OF FRACTURE	CONICAL	SPLIT SHEAR	GREINER, INC.	
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR	PERPENDICULAR		
MOISTURE CONDITION AT TIME OF TEST	MOIST	MOIST		
UNIT WEIGHT, LBF PER CU. FT	148.2	149.8		

Comments:
* DOES NOT MEET SPECIFICATION REQUIREMENTS

Copies To: CLIENT/KEN SMITH (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY

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102795

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Bullhead City, Arizona 86442
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LABORATORY REPORT

DRILLED CORES OF ROLLER COMPACTED CONCRETE

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job. No. 2745JC249
Lab./Invoice No. 27450684
Date of Report 01/15/96
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Concrete Scour Hole, elev. 972-974 Sampled By J. Waddell/WT Date 01/11/96
Max. Size Aggregate, in. Unit Wt., pcf Submitted By J. Waddell/WT Date 01/11/96
Design Strength, psi 2200 @ 28 days Authorized By K. Smith Date 01/11/96
Test Procedure ASTM C42

Identification	A	B				
Date Concrete Placed	12/14/95	12/14/95				
Date of Test	01/12/96	01/12/96				
Age of Specimen, Days	29	29				
Diameter, in.	3.900	4.000				
Length Before Capping, in.	7.313	7.437				
Length After Capping, in.	7.500	7.750				
Cross-sectional Area, sq. in.	11.95	12.57				
Maximum Load, lbs.	20000	17000				
Compressive Strength, psi	1670	1350				
Corrected Compressive Strength, psi	1650 **	1350 **				
Type of Fracture	*	*				
Dir. of Load with Respect to Plane of Placement	Perpendicul	ar----------				
Moist. Cond. at Time of Test	Moist	Moist				
Unit Wt., pcf	140.1	141.8				

Specific Source of Cores and Nature of Defects in Specimens or Caps, if any:

* A - Conical/Shear ** Does not meet specification requirements

B - Columnar

A - Sta. 14+20, Elev. 972-974, Top

B - Sta. 14+19.50, Elev. 972-974, Top

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JAN 1 8 1996
GREINER, INC.

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Bullhead City, Arizona 86442
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LABORATORY REPORT

DRILLED CORES OF ROLLER COMPACTED CONCRETE

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job. No. 2745JC249
Lab./Invoice No. 27450684
Date of Report 01/15/96
Reviewed By C Andruzzi

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Concrete Scour Hole, elev. 972-974 Sampled By J. Waddell/WT Date 01/11/96
Max. Size Aggregate, in. Unit Wt., pcf Submitted By J. Waddell/WT Date 01/11/96
Design Strength, psi 2200 @ 28 days Authorized By K. Smith Date 01/11/96
Test Procedure ASTM C42

Identification	A	B				
Date Concrete Placed	12/14/95	12/14/95				
Date of Test	01/12/96	01/12/96				
Age of Specimen, Days	29	29				
Diameter, in.	3.900	4.000				
Length Before Capping, in.	7.313	7.437				
Length After Capping, in.	7.500	7.750				
Cross-sectional Area, sq. in.	11.95	12.57				
Maximum Load, lbs.	20000	17000				
Compressive Strength, psi	1670	1350				
Corrected Compressive Strength, psi	1650*	1350*				
Type of Fracture	*	*				
Dir. of Load with Respect to Plane of Placement	Perpendicular----------					
Moist. Cond. at Time of Test	Moist	Moist				
Unit Wt., pcf	140.1	141.8				

Specific Source of Cores and Nature of Defects in Specimens or Caps, if any:

* A - Conical/Shear
B - Columnar
A - Sta. 14+20, Elev. 972-974, Top
B - Sta. 14+90.50, Elev. 972-974, Top

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Western Technologies Inc.
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Bullhead City, Arizona 86442
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LABORATORY REPORT

DRILLED CORES OF ROLLER COMPACTED CONCRETE

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job. No. 2745JC249
Lab./Invoice No. 27450684
Date of Report 01/15/96
Reviewed By C. Andruzzi

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Concrete Scour Hole, Elev. 972-974 Sampled By J. Waddell/WT Date 01/13/96
Max. Size Aggregate, in. ______ Unit Wt., pcf ______ Submitted By J. Waddell/WT Date 01/13/96
Design Strength, psi 2200 @ 28 days Authorized By K. Smith Date 01/13/96
Test Procedure ASTM C42

Identification	A	B	C	D		
Date Concrete Placed	12/14/95	12/14/95	12/14/95	12/14/95		
Date of Test	01/13/96	01/13/96	01/13/96	01/13/96		
Age of Specimen, Days	30	30	30	30		
Diameter, in.	4.005	4.002	4.002	4.006		
Length Before Capping, in.	7.500	7.000	3.875	6.000		
Length After Capping, in.	7.939	7.313	4.250	6.375		
Cross-sectional Area, sq. in.	12.60	12.59	12.59	12.60		
Maximum Load, lbs.	21100	32300	30300	25300		
Compressive Strength, psi	1675	2540	2407	2008		
Corrected Compressive Strength, psi	1680 *	2540	2120 *	1950 *		
Type of Fracture	Conical	Columnar	Columnar	Cone/Shear		
Dir. of Load with Respect to Plane of Placement	Perpedicular----------	----------	----------	----------		
Moist. Cond. at Time of Test	Moist	Moist	Moist	Moist		
Unit Wt., pcf	146.0	147.8	147.2	145.1		

Specific Source of Cores and Nature of Defects in Specimens or Caps, if any:

A - Sta. 14+60, Elev. 972-974, Top

B - Sta. 14+60, Elev. 972-974, Middle

C - Sta. 14+60, Elev. 972-974, Bottom

D - Sta. 14+19.50, Elev. 972-974, Bottom

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

Western Technologies Inc.
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Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

Date of Report JANUARY 11, 1996
Job No. 2745JC249
Event / Invoice No. 27450684 Lab No. 134
Authorized By KEN SMITH Date 01/10/96
Sampled By J. WADDELL/WT Date 01/10/96
Submitted By J. WADDELL/WT Date 01/10/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUTIE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94) Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW Source / Location Desig. By KEN SMITH Date 01/10/96
Reference: MIX DESIGN ID/RCC-2, DESIGN STRENGTH 2200 PSI, DATE PLACED 12/14/95
Special Instructions: TEST PROCEDURE/ASTM C42

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A ELV. 968-970 STA. 13+50 TOP	CORE B ELV. 968-970 STA. 13+50 BOTTOM	CORE C ELV. 970-972 STA. 14+20 TOP	CORE D ELV. 970-972 STA. 14+20 BOTTOM
DATE TESTED	01/10/96	01/10/96	01/10/96	01/10/96
CONCRETE AGE, DAYS	28	28	28	28
LENGTH OF CORE, AS RECEIVED	13.00	11.00	14.00	10.00
LENGTH BEFORE CAPPING, IN.	7.000	7.125	7.000	7.250
LENGTH AFTER CAPPING, IN.	7.250	7.500	7.250	7.250
DIAMETER, IN.	3.810	3.824	3.823	3.833
LENGTH\DIAMETER RATIO	1.90	1.96	1.90	1.89
CROSS-SECTIONAL AREA, SQ. IN.	11.40	11.48	11.48	11.54
MAXIMUM LOAD, LBF	32500	26500	23100	21200
COMPRESSIVE STRENGTH, PSI	2850	2310	2010*	1840*
STRENGTH CORRELATION FACTOR	0.99	1.0	0.99	0.99
CORRECTED COMPRESSIVE STRENGTH, PSI	2820	NA	1990	1820
TYPE OF FRACTURE	CONE/SHEAR	SHEAR	CONE/SHEAR	CONICAL
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR	PERPENDICULAR	PERPENDICULAR	PERPENDICULAR
MOISTURE CONDITION AT TIME OF TEST	MOIST	MOIST	MOIST	MOIST
UNIT WEIGHT, LBF PER CU. FT.	146.4	146.0	143.6	142.6

Comments:
* DOES NOT MEET SPECIFICATION REQUIREMENTS

RECEIVED
JAN 17 1996
GREINER, INC.

Copies To: CLIENT (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY Lance Andrews

450@95WT1
102795

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

Date of Report JANUARY 11, 1996
Job No. 2745JC249
Event / Invoice No. 27450684 Lab No. 133
Authorized By KEN SMITH Date 01/09/96
Sampled By J. WADDELL/WT Date 01/09/96
Submitted By J. WADDELL/WT Date 01/09/96

Client GREINER, INC., SOUTHWEST
KEN SMITH
3650 SOUTH POINTE CIRCLE, SUTIE 203
LAUGHLIN, NEVADA 89028

Project HIKO SPRINGS-DETENTION BASIN (CCBD #3476-94) Location LAUGHLIN, NEVADA
Contractor AMERICAN ASPHALT & GRADING Arch. / Engr. BLACK & VEATCH
Type / Use of Material ROLLER COMPACTED CONCRETE Supplier / Source AMERICAN ASPHALT & GRADING
Sample Source / Location SEE BELOW Source / Location Desig. By KEN SMITH Date 01/09/96
Reference: MIX DESIGN ID/RCC-2, DESIGN STRENGTH 2200 PSI, DATE PLACED 12/12/95
Special Instructions: TEST PROCEDURE/ASTM C42

TEST RESULTS

IDENTIFICATION/LOCATION OF CORE	CORE A ELV. 964-966 STA. 13+25 TOP	CORE B ELV. 964-966 STA. 13+25 BOTTOM	CORE C ELV. 966-968 STA. 14+00 TOP	CORE D ELV. 966-968 STA. 14+00 BOTTOM
DATE TESTED	01/09/96	01/09/96	01/09/96	01/09/96
CONCRETE AGE, DAYS	28	28	28	28
LENGTH OF CORE, AS RECEIVED	5.000	4.500	11.000	13.000
LENGTH BEFORE CAPPING, IN.	3.438	3.375	7.186	6.938
LENGTH AFTER CAPPING, IN.	3.750	3.750	7.750	7.585
DIAMETER, IN.	3.802	3.791	3.823	3.824
LENGTH\DIAMETER RATIO	.98	.99	2.02	1.98
CROSS-SECTIONAL AREA, SQ. IN.	11.353	11.287	11.479	11.485
MAXIMUM LOAD, LBF	26000	34000	24000	42000
COMPRESSIVE STRENGTH, PSI	2290	3010	2090	3660
STRENGTH CORRELATION FACTOR	0.87	0.87	1.0	1.0
CORRECTED COMPRESSIVE STRENGTH, PSI	1990	2620	2090*	3660
TYPE OF FRACTURE				
DIRECTION OF LOAD TO PLACEMENT PLANE	PERPENDICULAR	PERPENDICULAR	PERPENDICULAR	PERPENDICULAR
MOISTURE CONDITION AT TIME OF TEST	DRY	DRY	DRY	DRY
UNIT WEIGHT, LBF PER CU. FT.	147.9	148.6	146.2	148.2

Comments:
CORES A & B LENGTH/DIAMETER RATIO NOT WITHIN ASTM C42 REQUIREMENTS
* DOES NOT MEET SPECIFICATION REQUIREMENTS

RECEIVED
JAN 15 1996
GREINER, INC.

Copies To: CLIENT (3)
AMERICAN ASPHALT & GRADING/WAYNE PHELPS (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED IS INCLUDED OR INTENDED.

REVIEWED BY C. Anderson

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Bullhead City, Arizona 86442
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LABORATORY REPORT
REVISED REPORT: 12/28/95

DRILLED CORES OF ROLLER COMPACTED CONCRETE

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job. No. 2745JC249
Lab./Invoice No. 27450632
Date of Report 12/12/95
Reviewed By C. Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Concrete Scour Hole Sampled By J. Waddell/WT Date 12/11/95
Max. Size Aggregate, in. 1-1/2 Unit Wt., pcf NA Submitted By J. Waddell/WT Date 12/11/95
Design Strength, psi 2200 @ 28 days Authorized By K. Smith Date 12/11/95
Test Procedure ASTM C42

Identification	2	3	4	5		
Date Concrete Placed	11/13/95	11/13/95	11/13/95	11/13/95		
Date of Test	12/11/95	12/11/95	12/11/95	12/11/95		
Age of Specimen, Days	28	28	28	28		
Diameter, in.	3.8125	3.8125	3.8125	3.8125		
Length Before Capping, in.	7.479	6.969	7.333	4.052		
Length After Capping, in.	7.729	7.167	7.573	4.406		
Cross-sectional Area, sq. in.	11.42	11.42	11.42	11.42	RECEIVED	
Maximum Load, lbs.	26500	38000	34500	33600		
Compressive Strength, psi	2320	3327	3021	2942	JAN 0 2	1996
Corrected Compressive Strength, psi	2320	3290	2990	2590		
Type of Fracture					GREINER	, INC.
Dir. of Load with Respect to Plane of Placement	perpendicular--------	------------	------------	------------		
Moist. Cond. at Time of Test	moist	moist	moist	moist		
Unit Wt., pcf						

Specific Source of Cores and Nature of Defects in Specimens or Caps, if any:

Locations:

2 - Sta. 13+00, "Bottom" elev. 962'
3 - Sta. 13+00, "Top" elev. 962'
4 - Sta. 15+00, "Top" elev. 962'
5 - Sta. 15+00, "Bottom" elev. 962'

Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

DRILLED CORES OF CONCRETE

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job. No. 2745JC249
Lab./Invoice No. 27450632
Date of Report 12/21/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Concrete: Scour Pad — Sampled By: J. Waddell/WT — Date: 11/30/95
Max. Size Aggregate, in.: 1-1/2 — Unit Wt., pcf: NA — Submitted By: J. Waddell/WT — Date: 11/30/95
Design Strength, psi: 2200 @ 28 days — Authorized By: K. Smith — Date: 11/30/95
Test Procedure: ASTM D42

Identification	1	2	3	4		
Date Concrete Placed	11/15/95	11/15/95	11/15/95	11/15/95		
Date of Test	12/13/95	11/30/95	11/13/95	12/13/95		
Age of Specimen, Days	28	15	15	28		
Diameter, in.	3.725	3.738	3.721	3.725		
Length Before Capping, in.	7.816	8"	8"	7.625		
Length After Capping, in.	8.063	8.250	8.250	7.875	RECEIVED	
Cross-sectional Area, sq. in.	10.898	10.974	10.874	10,898		
Maximum Load, lbs.	27000	24000	17000	30000	JAN 08 1996	
Compressive Strength, psi	2480	2190	1560	2750		
Corrected Compressive Strength, psi	2480	2190	2190	2750	GREINER, INC.	
Type of Fracture	cone/shear	cone/shear	cone/shear	cone/shear		
Dir. of Load with Respect to Plane of Placement	Perpendicular	----------	----------	----------		
Moist. Cond. at Time of Test	dry	moist	moist	dry		
Unit Wt., pcf	NA	NA	NA	NA		

Specific Source of Cores and Nature of Defects in Specimens or Caps, if any:

Locations:

1 - Sta. 15+00, "Top" elev. 1064'
2 - Sta. 15+00, "Bottom" elev. 1064'
3 - Sta. 14+00, "Top" elev. 1064'
4 - Sta. 14+00, "Bottom" elev. 1064'

"Top" and "bottom" refers to 1st and 2nd section of approx. 12" length of core taken from each location specified.

Copies to:

Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

DRILLED CORES OF ROLLER COMPACTED CONCRETE

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job. No. 2745JC249
Lab./Invoice No. 27450632
Date of Report 12/14/95
Reviewed By C Andruzzi

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading   Architect/Engineer Black & Veatch
Source of Concrete Scour Pad   Sampled By J. Waddell/WT   Date 12/13/95
Max. Size Aggregate, in. 1-1/2   Unit Wt., pcf ____   Submitted By J. Waddell/WT   Date 12/13/95
Design Strength, psi 2200   Authorized By K. Smith   Date 12/13/95
Test Procedure ASTM C42

Identification	1	2	3			
Date Concrete Placed	11/15/95	11/15/95	11/15/95			
Date of Test	12/13/95	12/13/95	12/13/95			
Age of Specimen, Days	28	28	28			
Diameter, in.	3.824	3.820	3.841			
Length Before Capping, in.	7.438	7.313	7.125			
Length After Capping, in.	7.625	7.375	7.375			
Cross-sectional Area, sq. in.	11.48	11.46	11.59			
Maximum Load, lbs.	28500	25500	31000			
Compressive Strength, psi	2480	2230	2670			
Corrected Compressive Strength, psi	2480	2220	2650			
Type of Fracture	Shear	Shear	Shear			
Dir. of Load with Respect to Plane of Placement	Perpendicular	----------	----------			
Moist. Cond. at Time of Test	Moist	Moist	Moist			
Unit Wt., pcf	NA	NA	NA			

Specific Source of Cores and Nature of Defects in Specimens or Caps, if any:

Locations:

1 - Sta. 12+75, "Top" elev. 964'

2 - Sta. 12+75, "Bottom" elev. 964'

3 - Sta. 15+50, 2nd tier, "Top" elev. 964'

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GREINER, INC.

Copies to: Client/Ken Smith (3)
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Soil Cement Tests

Soil Cement Belt Cuts

Western Technologies Inc.
The Quality People
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1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460061
Date of Report 03/07/96
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 02/28/96

Type of Aggregate Soil Cement Aggregate — Submitted By P. Llewellyn/WT — Date 02/28/96

Source of Aggregate Belt Cut — Authorized By K. Smith — Date 02/28/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	99	
3/8 in.	97	
1/4 in.	92	
No. 4	86	65–100
No. 8	63	
No. 10	57	
No. 16	39	
No. 30	23	
No. 40	18	
No. 50	14	
No. 100	10	
No. 200	7.3	5–20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %		24		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

Copies To: Client (3)
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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460061
Date of Report 03/07/96
Reviewed By C Andrews

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location	Laughlin, Nevada	Sampled By	P. Llewellyn/WT	Date	02/27/96
Type of Aggregate	Soil Cement Aggregate	Submitted By	P. Llewellyn/WT	Date	02/27/96
Source of Aggregate	Belt Cut	Authorized By	K. Smith	Date	02/27/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.	100	
3/4 in.	99	
1/2 in.	97	
3/8 in.	95	
1/4 in.	88	
No. 4	80	65-100
No. 8	58	
No. 10	53	
No. 16	37	
No. 30	22	
No. 40	17	
No. 50	14	
No. 100	10	
No. 200	7.2	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %		2.3		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

Copies To: Client (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27460061
Date of Report 02/28/96
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada   Sampled By P. Bowen/WT   Date 02/26/96

Type of Aggregate Soil Cement Aggregate   Submitted By P. Bowen/WT   Date 02/26/96

Source of Aggregate Belt Cut   Authorized By K. Smith   Date 02/26/96

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	98	
3/8 in.	96	
1/4 in.	89	
No. 4	82	65-100
No. 8	58	
No. 10	53	
No. 16	38	
No. 30	23	
No. 40	18	
No. 50	15	
No. 100	10	
No.200	7.2	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Content, %		2.8		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

es To: Client (3)
American Asphalt & Grading/Wayne Phelps (2)

REC'D
3/1/96
JWB

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Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 12/11/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 12/08/95
Type of Aggregate Soil Cement — Submitted By C. Anderegg/WT — Date 12/08/95
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 12/08/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
[illegible] in.		
3/4 in.	100	
1/2 in.	98	
3/8 in.	96	
1/4 in.	90	
No. 4	84	65-100
No. 8	63	
No. 10	58	
No. 16	42	
No. 30	25	
No. 40	20	
No. 50	15	
No. 100	10	
No.200	7.1	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture		3.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

[illegible]s To: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

DEC 2 0 1995
GREINER, INC.

19 (10/92)

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 12/11/95
Reviewed By C. Anderegg

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date 12/07/95

Type of Aggregate: Soil Cement — Submitted By: C. Anderegg/WT — Date 12/07/95

Source of Aggregate: Belt Cut — Authorized By: K. Smith — Date 12/07/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.		
1/2 in.	97	
3/8 in.	95	
1/4 in.	88	
No. 4	81	65-100
No. 8	58	
No. 10	52	
No. 16	37	
No. 30	23	
No. 40	19	
No. 50	15	
No. 100	11	
No. 200	8.4	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture		3.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc. Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 12/08/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada | Sampled By P. Llewellyn/WT | Date 12/06/95

Type of Aggregate Soil Cement Aggregate | Submitted By C. Anderegg/WT | Date 12/06/95

Source of Aggregate Belt Cut | Authorized By K. Smith | Date 12/06/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	97	
3/8 in.	96	
1/4 in.	89	
No. 4	82	65-100
No. 8	59	
No. 10	54	
No. 16	38	
No. 30	24	
No. 40	19	
No. 50	15	
No. 100	11	
No.200	8.0	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture		3.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc. Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 12/08/95
Reviewed By C Andrews

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 12/05/95
Type of Aggregate Soil Cement Aggregate — Submitted By J. Waddell/WT — Date 12/05/95
Source of Aggregate Belt Cut — Authorized By K. Smith — Date 12/05/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.	100	
1 in.	100	
3/4 in.	100	
1/2 in.	99	
3/8 in.	96	
1/4 in.	91	
No. 4	83	65-100
No. 8	62	
No. 10	57	
No. 16	41	
No. 30	25	
No. 40	19	
No. 50	16	
No. 100	11	
No. 200	8.2	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight | Count		|	|	C235-
Fractured Faces, % By: Weight | Count		|	|	
Liquid Limit | Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture		2.7		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc. Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 12/08/95
Reviewed By C Andrews

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada — Sampled By: P. Llewellyn/WT — Date: 12/04/95
Type of Aggregate: Soil Cement Aggregate — Submitted By: J. Waddell/WT — Date: 12/04/95
Source of Aggregate: Belt Cut — Authorized By: K. Smith — Date: 12/04/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.	100	
1 in.	100	
3/4 in.	98	
1/2 in.	95	
3/8 in.	94	
1/4 in.	90	
No. 4	84	65-100
No. 8	64	
No. 10	58	
No. 16	42	
No. 30	25	
No. 40	20	
No. 50	17	
No. 100	12	
No.200	9.6	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		|	|	C235-
Fractured Faces, % By: Weight / Count		|	|	
Liquid Limit / Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture		2.3		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 12/07/95
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 12/01/95

Type of Aggregate Soil Cement Aggregate — Submitted By C. Anderegg/WT — Date 12/01/95

Source of Aggregate Belt cut — Authorized By K. Smith — Date 12/01/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	94	
3/8 in.	93	
1/4 in.	87	
No. 4	82	65-100
No. 8	61	
No. 10	56	
No. 16	41	
No. 30	25	
No. 40	20	
No. 50	16	
No. 100	11	
No.200	8.2	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count				C235-
Fractured Faces, % By: Weight I Count				
Liquid Limit I Plasticity Index				D424-
Cleanness Value				Calif. 227-
Batch Moisture		2.9		
Moisture Density Relations	Maximum Dry Density, pcf			☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %			☐ C127- ☐ C128-
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 11/30/95
Reviewed By C Andrus

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 11/29/95

Type of Aggregate Soil Cement Aggregate — Submitted By J. Waddell/WT — Date 11/29/95

Source of Aggregate Belt cut — Authorized By K. Smith — Date 11/29/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.	100	
3/4 in.	97	
1/2 in.	96	
3/8 in.	94	
1/4 in.	89	
No. 4	82	65-100
No. 8	62	
No. 10	56	
No. 16	40	
No. 30	23	
No. 40	17	
No. 50	13	
No. 100	8	
No. 200	5.3	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch moisture		2.5%		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557- ☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF SOILS

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 11/30/95
Reviewed By C Anderson

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada Sampled By P. Llewellyn/WT Date 11/28/95
Type of Material Soil Cement Submitted By R. Nickerson/WT Date 11/28/95
Source of Material Belt cut 11:20 am Authorized By K. Smith Date 11/28/95

Sieve Analysis, ASTM D422-

Sieve Size	% Passing Accumulative	Specification
3"		
2½"		
2"		
1½"	100	100
1"	97	
¾"	97	
½"	96	
⅜"	93	
¼"	87	
No. 4	77	65-100
8	59	
10	54	
16	39	
30	24	
40	19	
50	15	
100	10	
200	6.6	5-20
Finer than 200 ASTM D1140-		

Soil Classification

Liquid Limit and Plasticity of Soils LL =
ASTM D4318- PI =

Moisture - Density Relations Maximum Dry Density, pcf
☐ ASTM D698- ; ☐ ASTM D1557- ; Method Optimum Moisture, %

Specific Gravity of Soils (minus No. 4 material)
ASTM D854- Specific Gravity

Resistance 'R' Value of Compacted Soils
ASTM D2844- 'R' Value

Other:

Batch Moisture = 2.6%

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 11/28/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 11/27/95
Type of Aggregate Soil Cement Aggregate — Submitted By C. Anderegg/WT — Date 11/27/95
Source of Aggregate Belt cut 9:50 am — Authorized By K. Smith — Date 11/27/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	98	
3/8 in.	96	
1/4 in.	90	
No. 4	83	65-100
No. 8	60	
No. 10	55	
No. 16	38	
No. 30	23	
No. 40	18	
No. 50	14	
No. 100	10	
No. 200	6.7	0-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count				C235-
Fractured Faces, % By: Weight / Count				
Liquid Limit / Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture		2.6		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevad 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 11/27/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 11/22/95

Type of Aggregate Soil Cement Aggregate — Submitted By C. Anderegg/WT — Date 11/22/95

Source of Aggregate Belt Cut 12:30 pm — Authorized By K. Smith — Date 11/22/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	97	
3/8 in.	94	
1/4 in.	89	
No. 4	83	65-100
No. 8	62	
No. 10	56	
No. 16	40	
No. 30	25	
No. 40	19	
No. 50	16	
No. 100	11	
No. 200	7.9	0-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count				C235-
Fractured Faces, % By: Weight I Count				
Liquid Limit I Plasticity Index				D424-
Cleanness Value				Calif. 227-
Moisture		6.8		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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SIEVE ANALYSIS

Type of Material: SOIL CEMENT AGGR. Job. No. 2745JC249

Source of Material: BELT CUT 12:30PM Lab/Invoice No.

Sieve No.	Weight Retained	% Retained	% Pass Accum.	Specs.
4				
3				
2				
1 1/2				100
1 1/8				
1				
3/4	—	0	100	
1/2	26.0	3	97	
3/8	49.4	6	94	
1/4, #3	88.2	11	89	
#4	142.2	17	83	100
Ret. #4		Technician Initial		
Pass #4 Wet		Wet Weight Before Wash	850.0	CA
Pass #4 Dry		Dry Weight Before Wash	830.4	
Total Dry		Weight After Wash	769.6	
Initial Total		Elutriation	7.3%	
#8	316.1	38	62	
#10	363.0	44	56	
#16	494.8	60	40	
#30	622.9	75	25	
#40	668.5	81	19	
#50	701.3	84	16	
#100	742.5	89	11	
#200	764.6	92.1	7.9	0-20
Finer Than 200				

Sampled By: PL Date: 11-22

Submitted By: CA Date: 11-22

Test/Calc. By: CA Date: 11-22

Reviewed By: ______ Date: ______

Classification: ______

Test Procedure

☒ Aggregate

Sieve ASTM C136-

-200 ASTM C117-

☐ Soil

Sieve ASTM D422-

-200 ASTM D1140-

☒ M/C SAMPLE 836.8/817.5 / 2.4

☒ BATCH M/C 751.6 / 732.3 2.6

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Special Instructions: SOIL CEMENT MOISTURE 6.8%

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 11/22/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 11/21/95
Type of Aggregate Soil Cement Aggregate — Submitted By C. Anderegg/WT — Date 11/21/95
Source of Aggregate Belt Cut 10:15 — Authorized By K. Smith — Date 11/21/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	100
1 1/8 in.	100	
1 in.	100	
3/4 in.	100	
1/2 in.	99	
3/8 in.	98	
1/4 in.	92	
No. 4	85	65-100
No. 8	63	
No. 10	58	
No. 16	42	
No. 30	26	
No. 40	20	
No. 50	16	
No. 100	11	
No. 200	8.0	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture, %		3.2		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
			☐ AASHTO T99-	
	Method		☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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SIEVE ANALYSIS

Type of Material SOIL CEMENT AGGR Job. No. 2745JC249

Source of Material BELT CUT 10:15 Lab/Invoice No.

Sieve No.	Weight Retained	% Retained	% Pass Accum.	Specs.
4				
3				
2				
1 1/2	0	0	100	100
1 1/8	0	0	100	
1	0	0	100	
3/4	~~15~~	0	100	
1/2	7.4	.9	99.1	
3/8	18.2	2.4	98.6	
1/4, #3	63.6	8.5	91.5	
#4	113.1	15.1	84.9	65-100
Ret. #4		Technician Initial		
Pass #4 Wet		Wet Weight Before Wash	774.9	
Pass #4 Dry		Dry Weight Before Wash	750.2	
Total Dry		Weight After Wash	691.7	
Initial Total		Elutriation	8.5	%
#8	280.1	37.3	63.7	
#10	316.8	42.2	58.8	
#16	438.1	58.4	42.1	
#30	556.8	74.2	26.6	
#40	599.7	79.9	20.1	
#50	630.7	84.2	16.9	
#100	669.6	89.3	11.7	
#200	689.9	92.0	8.0	5-20
Finer Than 200				
Total	750.2			

Sampled By PL Date 11-21

Submitted By CA Date 11-21

Test/Calc. By J WADDELL Date 11/21/95

Reviewed By ______ Date ______

Classification ______

Test Procedure

☒ Aggregate

Sieve ASTM C136-

-200 ASTM C117-

☐ Soil

Sieve ASTM D422-

-200 ASTM D1140-

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☒ M/C BATCH 1091.9/1057.8 = 3.2%

☒ M/C SOIL CEMENT FROM SPECIMENS 1190.0/1102.1 = 8.0%

Special Instructions ______

% MOISTURE ⊗ WT WT 134.8 4.3 130.5

DRY WT 130.5 3.3

774.9 / X = 134.8 / ~~136.5~~

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Bullhead City, Arizona 86442
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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 11/21/95
Reviewed By C Anderegg

Project Hiko Springs Wash Dentention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 11/20/95
Type of Aggregate Soil Cement — Submitted By C. Anderegg/WT — Date 11/20/95
Source of Aggregate Belt cut — Authorized By K. Smith — Date 11/20/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.	100	
3/4 in.	97	
1/2 in.	94	
3/8 in.	90	
1/4 in.	85	
No. 4	79	65-100
No. 8	59	
No. 10	54	
No. 16	49	
No. 30	24	
No. 40	19	
No. 50	16	
No. 100	11	
No. 200	8.3	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count				C235-
Fractured Faces, % By: Weight I Count				
Liquid Limit I Plasticity Index				D424-
Cleanness Value				Calif. 227-
Batch Moisture,		3.7		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

Copies To: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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319 (10/92)

SIEVE ANALYSIS

Type of Material SOIL CEMENT Job. No. 2745JC249

Source of Material BELT CUT Lab/Invoice No.

Sieve No.	Weight Retained	% Retained	% Pass Accum.	Specs.
4				
3				
2				
1 1/2				100
1 1/8				
1	0		100	
3/4	21.9	3	97	
1/2	48.2	6	94	
3/8	75.6	10	90	
1/4, #3	116.1	15	85	
#4	162.8	21	79	65-100
Ret. #4		Technician Initial		
Pass #4 Wet		Wet Weight Before Wash	809.7	CA
Pass #4 Dry		Dry Weight Before Wash	782.5	CA
Total Dry		Weight After Wash	723.3	
Initial Total		Elutriation		
#8	323.0	41	59	
#10	363.1	46	54	
#16	478.0	61	49	
#30	593.1	76	24	
#40	631.2	81	19	
#50	659.8	84	16	
#100	695.9	89	11	
#200	717.3	91.7	8.3	5-20
Finer Than 200				
Total	722.9			

Sampled By PL Date 11/20

Submitted By CA Date 11/20

Test/Calc. By CA Date 11/20

Reviewed By ______ Date ______

Classification ______

Test Procedure

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GREINER, INC.

☒ Aggregate

Sieve ASTM C136-

-200 ASTM C117-

☐ Soil

Sieve ASTM D422-

-200 ASTM D1140-

☒ BATCH M/C 749.8
719.1
3.7%

☒ SAMPLE M/C
1137.1 3.48%
1098.9 → 3.5

Special Instructions

SOIL CEM M/C (ACTUAL)
802.8 -7.78%
744.9

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632
Date of Report 11/20/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 11/17/95
Type of Aggregate Soil Cement Aggregate — Submitted By C. Anderegg/WT — Date 11/17/95
Source of Aggregate Belt cut — Authorized By K. Smith — Date 11/17/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	96	
3/8 in.	95	
1/4 in.	88	
No. 4	80	65–100
No. 8	58	
No. 10	53	
No. 16	38	
No. 30	28	
No. 40	18	
No. 50	15	
No. 100	10	
No. 200	8.0	0–20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
100 rities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture, %		3.1		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

es To: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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19 (10/92)

SIEVE ANALYSIS

Type of Material Soil Cement Aggr Job. No. 2T45JC249

Source of Material Brit Cut Lab/Invoice No.

Soil Cement Aggs.

Sampled By FPL Date 11-17
Submitted By KA Date 11-17
Test/Calc. By CA Date 11-17
Reviewed By CA Date 11-17

Classification

Test Procedure

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☐ Aggregate
Sieve ASTM C136-
-200 ASTM C117-

☐ Soil 775.3
Sieve ASTM D422-
-200 ASTM D1140- BATCH

☑ M/C ~~TOTAL SAMPLE~~ 3.1
1550.5 1504.3

☐ SIEVE M/C 822.1
798.6 2.8

Sieve No.	Weight Retained	% Retained	% Pass Accum.	Specs.
4				
3				
2				
1 1/2				
1 1/8				
1				
3/4	—		100	
1/2	31.6	4	96	
3/8	44.2	5	95	
1/4, #3	107.2	12	88	
#4	170.6	20	80	
Ret. #4		Technician Initial		
Pass #4 Wet		Wet Weight Before Wash	883.3	CA
Pass #4 Dry		Dry Weight Before Wash	858.4	CA
Total Dry		Weight After Wash	796.5	CA
Initial Total		Elutriation		
#8	359.2	42	58	
#10	404.1	47	53	
#16	536.1	62	38	
#30	620.1	72	28	
#40	700.1	82	18	
#50	729.5	85	15	
#100	768.7	90	10	
#200	790.0	92.0	8.0	
Finer Than 200	796.4			
Total				

Special Instructions
8:25 AM

7.4

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LABORATORY REPORT
REVISED REPORT: 12/29/95

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 11/17/95
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location	Laughlin, Nevada	Sampled By P. Llewellyn/WT	Date 11/16/95
Type of Aggregate	Soil Cement Aggreagte	Submitted By P. LLewellyn/WT	Date 11/16/95
Source of Aggregate	Belt Sample 1:00 pm	Authorized By K. Smith	Date 11/16/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	98	
3/8 in.	96	
1/4 in.	90	
No. 4	84	65-100
No. 8	62	
No. 10	57	
No. 16	40	
No. 30	32	
No. 40	25	
No. 50	19	
No. 100	11	
No. 200	8.1	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight / Count		|	|	C235-
Fractured Faces, % By: Weight / Count		|	|	
Liquid Limit / Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture, %		2.0		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab / Invoice No. 27450632
Date of Report 11/17/95
Reviewed By [signature]

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)

Location Laughlin, Nevada — Sampled By P. Llewellyn/WT — Date 11/15/95

Type of Aggregate Soil Cement Aggreagte — Submitted By P. LLewellyn/WT — Date 11/15/95

Source of Aggregate Belt Sample 1:00 pm — Authorized By K. Smith — Date 11/15/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.		100
1 1/8 in.		
1 in.		
3/4 in.	100	
1/2 in.	98	
3/8 in.	96	
1/4 in.	90	
No. 4	84	65-100
No. 8	62	
No. 10	57	
No. 16	40	
No. 30	32	
No. 40	25	
No. 50	19	
No. 100	11	
No. 200	8.1	5-20
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Batch Moisture, %		2.0		
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698	
	Optimum Moisture, %		☐ D1557-	
	Method		☐ AASHTO T99- ☐ AASHTO T180-	
Specific Gravity	Absorption, %			
	Bulk (Dry)		☐ C127-	
	Bulk (SSD)		☐ C128-	
	Apparent			

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9 (10/92)

SOIL CEMENT

SIEVE ANALYSIS

Type of Material ~~FILL~~ AGGREGATE Job. No. 2745JC2~~[illegible]~~49

Source of Material BELT SAMPLE - ~~AFTERNOON~~ 1 PM Lab/Invoice No.

Sieve No.	Weight Retained	% Retained	% Pass Accum.	Specs.
4				
3				
2				
1 1/2				
1 1/8				
1	—			
3/4	—	0	100	
1/2	18.7	1.5	98	
3/8	46.3	3.7	96	
1/4, #3	126.0	10.2	90	
#4	201.8	16.3	84	
Ret. #4		Technician Initial		
Pass #4 ~~Wet~~		Wet Weight Before Wash	1263.7	CA
Pass #4 WASHED Dry	~~[illegible]~~	Dry Weight Before Wash	1238.7	CA
Total Dry		Weight After Wash	1147.1	
~~Initial Total~~		Elutriation		
#8	475.9	38	62	
#10	538.5	43	57	
#16	739.8	60	40	
#30	845.1	68	32	
#40	931.5	75	25	
#50	999.9	81	19	
#100	1105.3	89	11	
#200	1138.7	91.9	8.1	
Finer Than 200				
Total	1146.7			

SPLIT #4 WASHED

Sampled By P LLEWELLYN Date 11-15

Submitted By P. LLEWELLYN Date 11-15

Test/Calc. By C ANDREGG Date 11-15

Reviewed By CA Date 11-16

Classification

Test Procedure

☒ Aggregate

Sieve ASTM C136-

-200 ASTM C117-

☐ Soil

Sieve ASTM D422-

-200 ASTM D1140-

☒ M/CONTENT
1068.3
1047.2 2.0%

☐

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Special Instructions

M/C SIEVE 1161.6
2.0%

7.4

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LABORATORY REPORT

PHYSICAL PROPERTIES OF AGGREGATES

Client
20287
American Asphalt & Grading
3624 Goldfield Street
North Las Vegas, Nevada 89030

Job No. 2745JC232
Lab / Invoice No. 27450520
Date of Report 09/28/95
Reviewed By C Andueza

Project Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Sampled By F. Booth Date 09/22/95
Type of Aggregate Silty sand w/gravel
Submitted By F. Booth Date 09/22/95
Source of Aggregate Stockpile
Authorized By W. Phelps Date 09/22/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
4 in.		
3 in.		
2 in.		
1 1/2 in.	100	
1 1/8 in.	99	
1 in.	98	
3/4 in.	97	
1/2 in.	95	
3/8 in.	93	
1/4 in.	87	
No. 4	81	
No. 8	67	
No. 10	62	
No. 16	48	
No. 30	32	
No. 40	25	
No. 50	21	
No. 100	15	
No.200	10.8	
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

Copies To: Client/Wayne Phelps (2)
Greiner, Inc., Southwest/Ken Smith (3)

Rec'd 10/3/95
MNJ

Soil Cement Densities

Western Technologies Inc.
The Quality People
Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 02-28-96
Job No. 2745JC249 — Page 1 of 1
Event/Invoice No. 27460061
Authorized By KEN SMITH — Date 02-22-96
Tested By P. LLEWELLYN/WT — Date 02-22-96

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3098** H_2O **621**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
165		7.6	128.7	0.0	6	133.6	7.6	96		96	YES
166		7.4	129.9	0.0	6	133.6	7.6	97		96	YES
167		7.9	129.2	0.0	6	133.6	7.6	97		96	YES
168		8.0	128.5	0.0	6	133.6	7.6	96		96	YES
169		7.5	129.1	0.0	6	133.6	7.6	97		96	YES
170		8.0	129.3	0.0	6	133.6	7.6	97		96	YES
171		8.3	129.8	0.0	6	133.6	7.6	97		96	YES
172		7.9	130.4	0.0	6	133.6	7.6	98		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
165	TOP OF DAM, STA. 11+00	.7	1086.7	SOIL CEMENT
166	TOP OF DAM, STA. 10+00	.7	1086.7	SOIL CEMENT
167	TOP OF DAM, STA. 9+25	.7	1086.7	SOIL CEMENT
168	TOP OF DAM, STA. 8+00	.7	1086.7	SOIL CEMENT
169	TOP OF DAM, STA. 6+75	.7	1086.7	SOIL CEMENT
170	TOP OF DAM, STA. 5+00	.7	1086.7	SOIL CEMENT
171	TOP OF DAM, STA. 3+50	.7	1086.7	SOIL CEMENT
172	TOP OF DAM, STA. 2+00	.7	1086.7	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: **MOISTURE SPECIFICATION, BID #14**
*** DATUM TOPOGRAPHIC**

REC'D
3/1/96
TMP

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 02-28-96
Job No. 2745JC249

Event/Invoice No. 27460061-1
Authorized By KEN SMITH Date 02-26-96
Tested By P. LLEWELLYN/WT Date 02-26-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3095 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
173		7.0	128.8	0.0	6	133.6	7.6	96		96	YES
174		6.9	129.2	0.0	6	133.6	7.6	97		96	YES
175		7.3	130.0	0.0	6	133.6	7.6	97		96	YES
176		7.5	129.1	0.0	6	133.6	7.6	97		96	YES
177		7.3	130.1	0.0	6	133.6	7.6	97		96	YES
178		7.4	129.7	0.0	6	133.6	7.6	97		96	YES
179		7.5	128.7	0.0	6	133.6	7.6	96		96	YES
180		7.9	129.9	0.0	6	133.6	7.6	97		96	YES
181		8.0	129.5	0.0	6	133.6	7.6	97		96	YES
182		7.5	127.3	0.0	6	133.6	7.6	95		96	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
173	DOWNSTREAM EAST SLOPE, STA. 11+50	2.5	994.0	SOIL CEMENT
174	DOWNSTREAM EAST SLOPE, STA. 11+00	2.5	996.0	SOIL CEMENT
175	DOWNSTREAM EAST SLOPE, STA. 10+50	2.5	998.0	SOIL CEMENT
176	DOWNSTREAM EAST SLOPE, STA. 10+00	2.5	1000.0	SOIL CEMENT
177	DOWNSTREAM EAST SLOPE, STA. 11+00	2.5	1002.0	SOIL CEMENT
178	DOWNSTREAM EAST SLOPE, STA. 11+50	2.5	1004.0	SOIL CEMENT
179	DOWNSTREAM EAST SLOPE, STA. 10+00	2.5	1006.0	SOIL CEMENT
180	DOWNSTREAM WEST SLOPE, STA. 17+00	2.5	998.0	SOIL CEMENT
181	DOWNSTREAM WEST SLOPE, STA. 16+50	2.5	1000.0	SOIL CEMENT
182	DOWNSTREAM WEST SLOPE, STA. 16+00	2.5	1002.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: MOISTURE SPECIFICATION, BID #14
* DATUM TOPOGRAPHIC

REC'D 3/1/96

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 02-28-96
Job No. 2745JC249

Event/Invoice No. 27460061-1
Authorized By KEN SMITH Date 02-26-96
Tested By P. LLEWELLYN/WT Date 02-26-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS			LAB CHARACTERISTICS				COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
183		7.6	129.2	0.0	6	133.6	7.6	97		96	YES
184		7.9	128.8	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
183	RETEST 182A	2.5	1002.0	SOIL CEMENT
184	DOWNSTREAM WEST SLOPE, STA. 17+00	2.5	1006.0	SOIL CEMENT

Comments: MOISTURE SPECIFICATION, BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 03-11-96
Job No. 2745JC249
Event/Invoice No. 27460061-2
Authorized By KEN SMITH Date 02-27-96
Tested By P. LLEWELLYN/WT Date 02-27-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3098 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
185		7.4	128.7	0.0	6	133.6	7.6	96		96	YES
186		7.9	130.7	0.0	6	133.6	7.6	98		96	YES
187		8.0	128.1	0.0	6	133.6	7.6	96		96	YES
188		8.0	128.3	0.0	6	133.6	7.6	96		96	YES
189		8.5	129.3	0.0	6	133.6	7.6	97		96	YES
190		8.3	128.5	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
185	DOWN STREAM, WEST SLOPE 5:1, STA. 16+50	.9	1008.0	SOIL CEMENT
186	DOWN STREAM, WEST SLOPE 5:1, STA. 17+50	.9	1012.0	SOIL CEMENT
187	DOWN STREAM, WEST SLOPE 5:1, STA. 17+00	.9	1018.0	SOIL CEMENT
188	DOWN STREAM, WEST SLOPE 5:1, STA. 18+00	.9	1020.0	SOIL CEMENT
189	DOWN STREAM, WEST SLOPE 5:1, STA. 17+00	.9	1024.0	SOIL CEMENT
190	DOWN STREAM, WEST SLOPE 5:1, STA. 16+50	.9	1028.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: MOISTURE SPECIFICATION
* DATUM TOPOGRAPHIC
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

REC'D 3/14/96

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 03-11-96
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27460061-3
Authorized By KEN SMITH Date 02-28-96
Tested By P. LLEWELLYN/WT Date 02-28-96

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3098** H_2O **621**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
191		9.0	129.1	0.0	6	133.6	7.6	97		96	YES
192		9.3	130.1	0.0	6	133.6	7.6	97		96	YES
193		8.7	128.7	0.0	6	133.6	7.6	96		96	YES
194		8.9	128.4	0.0	6	133.6	7.6	96		96	YES
195		8.5	128.3	0.0	6	133.6	7.6	96		96	YES
196		9.0	130.5	0.0	6	133.6	7.6	98		96	YES
197		8.7	128.3	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
191	DOWN STREAM, EAST SLOPE 5:1, STA. 10+50	.9	1010.0	SOIL CEMENT
192	DOWN STREAM, EAST SLOPE 5:1, STA. 9+50	.9	1014.0	SOIL CEMENT
193	DOWN STREAM, EAST SLOPE 5:1, STA. 10+00	.9	1018.0	SOIL CEMENT
194	DOWN STREAM, EAST SLOPE 5:1, STA. 9+75	.9	1020.0	SOIL CEMENT
195	DOWN STREAM, EAST SLOPE 5:1, STA. 10+50	.9	1022.0	SOIL CEMENT
196	DOWN STREAM, EAST SLOPE 5:1, STA. 10+00	.9	1026.0	SOIL CEMENT
197	DOWN STREAM, EAST SLOPE 5:1, STA. 11+00	.9	1028.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: * **DATUM TOPOGRAPHIC**
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

REC'D 3/14/96

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **CORWIN ANDEREGG**
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-14-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-19
Authorized By KEN SMITH Date 12-08-95
Tested By P. LLEWELLYN/WT Date 12-08-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3088 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
157		7.6	129.3	0.0	6	133.6	7.6	97		96	YES
158		7.8	129.7	0.0	6	133.6	7.6	97		96	YES
159		7.3	130.0	0.0	6	133.6	7.6	97		96	YES
160		7.9	128.7	0.0	6	133.6	7.6	96		96	YES
161		7.5	128.7	0.0	6	133.6	7.6	96		96	YES
162		7.6	129.5	0.0	6	133.6	7.6	97		96	YES
163		7.8	128.4	0.0	6	133.6	7.6	96		96	YES
164		7.5	128.8	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
157	STA. 12+50, UPSTREAM SLOPE	2.5	1080.0	SOIL CEMENT
158	STA. 12+00, UPSTREAM SLOPE	2.5	1083.0	SOIL CEMENT
159	STA. 12+50, UPSTREAM SLOPE	2.5	1084.0	SOIL CEMENT
160	STA. 11+00, UPSTREAM SLOPE	2.5	1086.0	SOIL CEMENT
161	STA. 13+00, 5' LEFT OF CENTERLINE, SEDIMENT BERM	11.0	1014.0	SOIL CEMENT
162	STA. 16+00, 2' RIGHT OF CENTERLINE, SEDIMENT BERM	11.0	1014.0	SOIL CEMENT
163	STA. 14+00 AT CENTERLINE, SEDIMENT BERM	12.0	1015.0	SOIL CEMENT
164	STA. 15+00, 2' LEFT OF CENTERLINE, SEDDIMENT BERM	12.0	1015.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

DEC 20 1995

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **12-12-95**
Job No. **2745JC249**
Event/Invoice No. **27450632-17**
Authorized By **KEN SMITH** Date **12-06-95**
Tested By **P. LLEWELLYN/WT** Date **12-06-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3088** H_2O **621**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
133		7.2	127.1	0.0	6	133.6	7.6	95		96	NO
134		7.4	129.3	0.0	6	133.6	7.6	97		96	YES
135		7.6	129.9	0.0	6	133.6	7.6	97		96	YES
136		7.2	131.1	0.0	6	133.6	7.6	98		96	YES
137		7.0	129.2	0.0	6	133.6	7.6	97		96	YES
138		7.4	128.7	0.0	6	133.6	7.6	96		96	YES
139		7.4	131.5	0.0	6	133.6	7.6	98		96	YES
140		7.5	129.5	0.0	6	133.6	7.6	97		96	YES
141		7.1	128.1	0.0	6	133.6	7.6	96		96	YES
142		7.5	128.4	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
133	STA. 6+00, UPSTREAM SLOPE	2.5	1073.0	SOIL CEMENT
134	RETEST 133A	2.5	1073.0	SOIL CEMENT
135	STA. 9+50, UPSTREAM SLOPE	2.5	1074.0	SOIL CEMENT
136	STA. 10+00, UPSTREAM SLOPE	2.5	1075.0	SOIL CEMENT
137	STA. 2+00, UPSTREAM SLOPE	2.5	1076.0	SOIL CEMENT
138	STA. 6+50, UPSTREAM SLOPE	2.5	1077.0	SOIL CEMENT
139	STA. 4+50, UPSTREAM SLOPE	2.5	1078.0	SOIL CEMENT
140	STA. 3+50, UPSTREAM SLOPE	2.5	1079.0	SOIL CEMENT
141	STA. 12+00, 5' RIGHT OF CENTERLINE, SEDIMENT BERM	6.0	1009.0	SOIL CEMENT
142	STA. 16+00, 5' LEFT OF CENTERLINE, SEDIMENT BERM	6.0	1009.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

RECEIVED
DEC 2 0 1995
GREINER, INC.

Comments: **BID #14**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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REVIEWED BY **CORWIN ANDEREGG**
(SIGNED COPY ON FILE)

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The Quality People
Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report **12-12-95**
Job No. **2745JC249**
Event/Invoice No. **27450632-17**
Authorized By **KEN SMITH** Date **12-06-95**
Tested By **P. LLEWELLYN/WT** Date **12-06-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
143		7.0	130.0	0.0	6	133.6	7.6	97		96	YES
144		7.3	128.8	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
143	STA. 13+00, AT CENTERLINE, SEDIMENT BERM	7.0	1010.0	SOIL CEMENT
144	STA. 15+00, 7' RIGHT OF CENTERLINE, SEDIMENT BERM	7.0	1010.0	SOIL CEMENT

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Comments: **BID #14**
*** DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report **11-29-95**
Job No. **2745JC249** Page **1** of **1**
Event/Invoice No. **27450632-6**
Authorized By **KEN SMITH** Date **11-27-95**
Tested By **P. LLEWELLYN/WT** Date **11-27-95**

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3073** H_2O **616**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
73		7.9	129.3	0.0	6	133.6	7.6	97		96	YES
74		6.3	127.9	0.0	6	133.6	7.6	96		96	YES
75		7.1	128.4	0.0	6	133.6	7.6	96		96	YES
76		7.2	130.0	0.0	6	133.6	7.6	97		96	YES
77		7.0	129.5	0.0	6	133.6	7.6	97		96	YES
78		7.6	130.7	0.0	6	133.6	7.6	98		96	YES
79		7.4	129.8	0.0	6	133.6	7.6	97		96	YES
80		7.0	131.1	0.0	6	133.6	7.6	98		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation •	
73	STA. 11+00, UPSTREAM SLOPE	2.5	1047.0	SOIL CEMENT
74	STA. 14+50, UPSTREAM SLOPE	2.5	1047.0	SOIL CEMENT
75	STA. 13+50, UPSTREAM SLOPE	2.5	1048.0	SOIL CEMENT
76	STA. 17+00, UPSTREAM SLOPE	2.5	1048.0	SOIL CEMENT
77	STA. 14+75, UPSTREAM SLOPE	2.5	1050.0	SOIL CEMENT
78	STA. 12+00, UPSTREAM SLOPE	2.5	1050.0	SOIL CEMENT
79	STA. 17+25, UPSTREAM SLOPE	2.5	1051.0	SOIL CEMENT
80	STA. 15+00, UPSTREAM SLOPE	2.5	1050.0	SOIL CEMENT

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LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: • **DATUM TOPOGRAPHIC**

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-07-95
Job No. 2745JC249 Page 1 of 2
Event/Invoice No. 27450632-16
Authorized By KEN SMITH Date 12-05-95
Tested By P. LLEWELLYN/WT Date 12-05-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3088 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
121		7.3	129.5	0.0	6	133.6	7.6	97		96	YES
122		7.2	131.3	0.0	6	133.6	7.6	98		96	YES
123		7.6	129.9	0.0	6	133.6	7.6	97		96	YES
124		7.4	129.3	0.0	6	133.6	7.6	97		96	YES
125		7.2	129.7	0.0	6	133.6	7.6	97		96	YES
126		7.8	130.1	0.0	6	133.6	7.6	97		96	YES
127		7.8	128.7	0.0	6	133.6	7.6	96		96	YES
128		7.4	129.5	0.0	6	133.6	7.6	97		96	YES
129		7.4	131.2	0.0	6	133.6	7.6	98		96	YES
130		7.5	130.0	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
121	STA. 16+50, SEDIMENT BERM	4.0	1007.0	SOIL CEMENT
122	STA. 14+00, SEDIMENT BERM	4.0	1007.0	SOIL CEMENT
123	STA. 12+00, SEDIMENT BERM	5.0	1008.0	SOIL CEMENT
124	STA. 15+00, SEDIMENT BERM	5.0	1008.0	SOIL CEMENT
125	STA. 2+00, UPSTREAM SLOPE	2.5	1075.0	SOIL CEMENT
126	STA. 6+00, UPSTREAM SLOPE	2.5	1063.0	SOIL CEMENT
127	STA. 4+00, UPSTREAM SLOPE	2.5	1067.0	SOIL CEMENT
128	STA. 5+00, UPSTREAM SLOPE	2.5	1068.0	SOIL CEMENT
129	STA. 3+00, UPSTREAM SLOPE	2.5	1070.0	SOIL CEMENT
130	STA. 5+00, UPSTREAM SLOPE	2.5	1069.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

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GREINER, INC.

Comments: BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 12-07-95
Job No. 2745JC249
Event/Invoice No. 27450632-16
Authorized By KEN SMITH Date 12-05-95
Tested By P. LLEWELLYN/WT Date 12-05-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
131		7.4	129.9	0.0	6	133.6	7.6	97		96	YES
132		7.6	130.8	0.0	6	133.6	7.6	98		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
131	STA. 6+00, UPSTREAM SLOPE	2.5	1069.0	SOIL CEMENT
132	STA. 7+00, UPSTREAM SLOPE	2.5	1070.0	SOIL CEMENT

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Comments: BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-07-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-14
Authorized By KEN SMITH Date 12-04-95
Tested By P. LLEWELLYN/WT Date 12-04-95

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3088** H_2O **621**

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
113		7.5	129.9	0.0	6	133.6	7.6	97		96	YES
114		8.0	129.1	0.0	6	133.6	7.6	97		96	YES
115		8.4	131.1	0.0	6	133.6	7.6	98		96	YES
116		8.2	129.5	0.0	6	133.6	7.6	97		96	YES
117		8.6	129.7	0.0	6	133.6	7.6	97		96	YES
118		8.2	128.7	0.0	6	133.6	7.6	96		96	YES
119		7.9	130.0	0.0	6	133.6	7.6	97		96	YES
120		7.3	129.4	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
113	STA. 13+50, 15' LEFT OF CL, SEDIMENT BERM	1.0	1004.0	SOIL CEMENT
114	STA. 15+50, 10' RIGHT OF CL, SEDIMENT BERM	1.0	1004.0	SOIL CEMENT
115	STA. 17+00, RIGHT OF CL, WEST TURN AROUND	3.0	1083.0	SOIL CEMENT
116	STA. 17+00, RIGHT OF CL, WEST TURN AROUND	6.0	1086.0	SOIL CEMENT
117	STA. 16+00, 16' RIGHT OF CL, SEDIMENT BERM	2.0	1005.0	SOIL CEMENT
118	STA. 13+00, 15' LEFT OF CL, SEDIMENT BERM	2.0	1005.0	SOIL CEMENT
119	STA. 12+50, 10' RIGHT OF CL, SEDIMENT BERM	3.0	1006.0	SOIL CEMENT
120	STA. 14+50, 5' LEFT OF CL, SEDIMENT BERM	3.0	1006.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

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Comments: **BID #14**
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Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-07-95
Job No. 2745JC249
Event/Invoice No. 27450632-12
Authorized By KEN SMITH Date 12-01-95
Tested By P. LLEWELLYN/WT Date 12-01-95

Client GREINER, INC., SOUTHWEST
ATTN· KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3088 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
105		6.9	130.3	0.0	6	133.6	7.6	98		96	YES
106		7.4	131.3	0.0	6	133.6	7.6	98		96	YES
107		7.3	129.3	0.0	6	133.6	7.6	97		96	YES
108		7.0	131.1	0.0	6	133.6	7.6	98		96	YES
109		7.0	128.2	0.0	6	133.6	7.6	96		96	YES
110		7.3	129.9	0.0	6	133.6	7.6	97		96	YES
111		7.1	130.4	0.0	6	133.6	7.6	98		96	YES
112		7.5	128.8	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
105	STA. 17+25, UPSTREAM SLOPE	2.5	1073.0	SOIL CEMENT
106	STA. 19+00, UPSTREAM SLOPE	2.5	1074.0	SOIL CEMENT
107	STA. 20+00, UPSTREAM SLOPE	2.5	1075.0	SOIL CEMENT
108	STA. 22+00, UPSTREAM SLOPE	2.5	1076.0	SOIL CEMENT
109	STA. 16+50, UPSTREAM SLOPE	2.5	1078.0	SOIL CEMENT
110	STA. 20+00, UPSTREAM SLOPE	2.5	1081.0	SOIL CEMENT
111	STA. 18+00, UPSTREAM SLOPE	2.5	1083.0	SOIL CEMENT
112	STA. 21+50, UPSTREAM SLOPE	2.5	1085.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

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GREINER, INC.

Comments: BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-01-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-8
Authorized By KEN SMITH Date 11-28-95
Tested By P. LLEWELLYN/WT Date 11-28-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
81		7.3	128.9	0.0	6	133.6	7.6	96		96	YES
82		7.6	130.4	0.0	6	133.6	7.6	98		96	YES
83		5.6	131.1	0.0	6	133.6	7.6	98		96	YES
84		7.5	130.2	0.0	6	133.6	7.6	97		96	YES
85		7.2	131.1	0.0	6	133.6	7.6	98		96	YES
86		6.8	130.0	0.0	6	133.6	7.6	97		96	YES
87		7.6	129.8	0.0	6	133.6	7.6	97		96	YES
88		7.5	128.8	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
81	STA. 12+00, UPSTREAM SLOPE	2.5	1057.0	SOIL CEMENT
82	STA. 16+50, UPSTREAM SLOPE	2.5	1050.0	SOIL CEMENT
83	STA. 13+50, UPSTREAM SLOPE	2.5	1052.0	SOIL CEMENT
84	STA. 11+00, UPSTREAM SLOPE	2.5	1052.0	SOIL CEMENT
85	STA. 11+00, UPSTREAM SLOPE	2.5	1053.0	SOIL CEMENT
86	STA. 16+00, UPSTREAM SLOPE	2.5	1054.0	SOIL CEMENT
87	STA. 10+50, UPSTREAM SLOPE	2.5	1055.0	SOIL CEMENT
88	STA. 13+50, UPSTREAM SLOPE	2.5	1056.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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Western Technologies Inc.
The Quality People
Since 1955
1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-01-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-9
Authorized By KEN SMITH Date 11-29-95
Tested By P. LLEWELLYN/WT Date 11-29-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIESI INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 618

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
89		7.2	131.2	0.0	6	133.6	7.6	98		96	YES
90		7.0	130.0	0.0	6	133.6	7.6	97		96	YES
91		7.5	129.5	0.0	6	133.6	7.6	97		96	YES
92		6.9	130.0	0.0	6	133.6	7.6	97		96	YES
93		7.0	131.1	0.0	6	133.6	7.6	98		96	YES
94		6.6	130.5	0.0	6	133.6	7.6	98		96	YES
95		7.4	131.9	0.0	6	133.6	7.6	99		96	YES
96		7.8	130.1	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
89	STA. 12+50, UPSTREAM SLOPE	2.5	1057.0	SOIL CEMENT
90	STA. 15+50, UPSTREAM SLOPE	2.5	1058.0	SOIL CEMENT
91	STA. 11+00, UPSTREAM SLOPE	2.5	1059.0	SOIL CEMENT
92	STA. 16+00, UPSTREAM SLOPE	2.5	1059.0	SOIL CEMENT
93	STA. 11+00, UPSTREAM SLOPE	2.5	1060.0	SOIL CEMENT
94	STA. 14+25, UPSTREAM SLOPE	2.5	1061.0	SOIL CEMENT
95	STA. 17+00, UPSTREAM SLOPE	2.5	1061.0	SOIL CEMENT
96	STA. 10+00, UPSTREAM SLOPE	2.5	1062.0	SOIL CEMENT

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DEC 4 1995
GREINER, INC.

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-28-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632-5
Authorized By KEN SMITH Date 11-22-95
Tested By P. LLEWELLYN/WT Date 11-22-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
65		6.1	130.0	0.0	6	133.6	7.6	97		96	YES
66		6.3	131.2	0.0	6	133.6	7.6	98		96	YES
67		6.0	128.7	0.0	6	133.6	7.6	96		96	YES
68		6.5	130.9	0.0	6	133.6	7.6	98		96	YES
69		6.5	129.8	0.0	6	133.6	7.6	97		96	YES
70		6.6	131.1	0.0	6	133.6	7.6	98		96	YES
71		6.3	130.8	0.0	6	133.6	7.6	98		96	YES
72		6.3	129.7	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
65	STA. 12+00, UPSTREAM SLOPE	2.5	1039.0	SOIL CEMENT
66	STA. 15+00, UPSTREAM SLOPE	2.5	1039.0	SOIL CEMENT
67	STA. 11+25, UPSTREAM SLOPE	2.5	1041.0	SOIL CEMENT
68	STA. 14+00, UPSTREAM SLOPE	2.5	1041.0	SOIL CEMENT
69	STA. 13+00, UPSTREAM SLOPE	2.5	1043.0	SOIL CEMENT
70	STA. 15+50, UPSTREAM SLOPE	2.5	1043.0	SOIL CEMENT
71	STA. 10+75, UPSTREAM SLOPE	2.5	1045.0	SOIL CEMENT
72	STA. 13+25, UPSTREAM SLOPE	2.5	1045.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-28-95
Job No. 2745JC249 Page 1 of 1
Event/Invoice No. 27450632
Authorized By KEN SMITH Date 11-15-95
Tested By P. LLEWELLYN/WT Date 11-15-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
1		6.7	121.8	0.0	6	133.6	7.6	91		96	NO
2		7.2	129.3	0.0	6	133.6	7.6	97		96	YES
3		6.9	131.1	0.0	6	133.6	7.6	98		96	YES
4		7.5	131.5	0.0	6	133.6	7.6	98		96	YES
5		7.8	131.5	0.0	6	133.6	7.6	98		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
1	STA. 14+00, UPSTREAM SLOPE	1.0	1003.0	SOIL CEMENT
2	RETEST 1A	1.0	1003.0	SOIL CEMENT
3	STA. 12+00, UPSTREAM SLOPE	1.0	1005.0	SOIL CEMENT
4	STA. 13+50, UPSTREAM SLOPE	1.0	1007.0	SOIL CEMENT
5	STA. 14+75, UPSTREAM SLOPE	2.0	1012.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (1)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-28-95
Job No. 2745JC249 Page 1 of 2
Event/Invoice No. 27450632-1
Authorized By KEN SMITH Date 11-16-95
Tested By P. LLEWELLYN/WT Date 11-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
6		8.0	129.9	0.0	6	133.6	7.6	97		96	YES
7		7.9	130.9	0.0	6	133.6	7.6	98		96	YES
8		8.3	129.2	0.0	6	133.6	7.6	97		96	YES
9		8.0	129.2	0.0	6	133.6	7.6	97		96	YES
10		7.5	128.9	0.0	6	133.6	7.6	96		96	YES
11		7.8	130.8	0.0	6	133.6	7.6	98		96	YES
12		7.2	130.5	0.0	6	133.6	7.6	98		96	YES
13		8.1	130.5	0.0	6	133.6	7.6	98		96	YES
14		7.8	128.6	0.0	6	133.6	7.6	96		96	YES
15		7.5	128.7	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
6	STA. 11+00, UPSTREAM SLOPE	2.5	1003.0	SOIL CEMENT
7	STA. 13+50, UPSTREAM SLOPE	2.5	1011.0	SOIL CEMENT
8	STA. 15+00, UPSTREAM SLOPE	2.5	1017.0	SOIL CEMENT
9	STA. 14+00, UPSTREAM SLOPE	2.5	1012.0	SOIL CEMENT
10	STA. 14+75, UPSTREAM SLOPE	2.5	1013.0	SOIL CEMENT
11	STA. 12+00, UPSTREAM SLOPE	2.5	1009.0	SOIL CEMENT
12	STA. 15+75, UPSTREAM SLOPE	2.5	1009.0	SOIL CEMENT
13	STA. 16+75, UPSTREAM SLOPE	2.5	1009.0	SOIL CEMENT
14	STA. 12+00, UPSTREAM SLOPE	2.5	1009.0	SOIL CEMENT
15	STA. 13+50, UPSTREAM SLOPE	2.5	1011.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 11-28-95
Job No. 2745JC249

Event/Invoice No. 27450632-1
Authorized By KEN SMITH Date 11-16-95
Tested By P. LLEWELLYN/WT Date 11-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
16		7.6	131.8	0.0	6	133.6	7.6	99		96	YES
17		7.3	132.7	0.0	6	133.6	7.6	99		96	YES
18		8.0	126.9	0.0	6	133.6	7.6	95		96	NO
19		7.8	129.1	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
16	STA. 14+50, UPSTREAM SLOPE	2.5	1014.0	SOIL CEMENT
17	STA. 15+75, UPSTREAM SLOPE	2.5	1014.0	SOIL CEMENT
18	STA. 16+00, UPSTREAM SLOPE	2.5	1007.0	SOIL CEMENT
19	RETEST 18A	2.5	1009.0	SOIL CEMENT

Comments: BID #14
* DATUM TOPOGRAPHIC

RECEIVED
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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report **11-28-95**
Job No. **2745JC249** Page **1** of **2**
Event/Invoice No. **27450632-2**
Authorized By **KEN SMITH** Date **11-17-95**
Tested By **P. LLEWELLYN/WT** Date **11-17-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)**
Location **LAUGHLIN, NEVADA**
Test Locations Designated By **WESTERN TECHNOLOGIES INC.**
Test Procedures In-Place Unit Weight : **ASTM D2922** Moisture Content : **ASTM D3017**
Gauge : Make **TROXLER** Model **3430** Serial No. **24742** Standard Count: Unit Weight **3073** H_2O **616**

TEST NO.	IN-PLACE CHARACTERISTICS: Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	LAB CHARACTERISTICS: ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	COMPACTION: % of Maximum Dry Unit Weight	REQUIREMENTS: Moisture %	Compaction %	CONFORMANCE INDICATED
20		6.9	130.2	0.0	6	133.6	7.6	97		96	YES
21		6.8	127.0	0.0	6	133.6	7.6	95		96	NO
22		6.5	130.1	0.0	6	133.6	7.6	97		96	YES
23		7.6	128.2	0.0	6	133.6	7.6	96		96	YES
24		7.5	131.3	0.0	6	133.6	7.6	98		96	YES
25		7.8	129.0	0.0	6	133.6	7.6	97		96	YES
26		7.2	130.5	0.0	6	133.6	7.6	98		96	YES
27		7.6	128.5	0.0	6	133.6	7.6	96		96	YES
28		7.9	127.9	0.0	6	133.6	7.6	96		96	YES
29		8.1	130.1	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL: Approximate Fill Depth, ft.	Elevation *	MATERIAL TESTED
20	STA. 10+00, UPSTREAM SLOPE	2.5	1009.0	SOIL CEMENT
21	STA. 11+00, UPSTREAM SLOPE	2.5	1012.0	SOIL CEMENT
22	RETEST 21A	2.5	1012.0	SOIL CEMENT
23	STA. 12+00, UPSTREAM SLOPE	2.5	1013.0	SOIL CEMENT
24	STA. 12+50, UPSTREAM SLOPE	2.5	1014.0	SOIL CEMENT
25	STA. 13+50, UPSTREAM SLOPE	2.5	1014.0	SOIL CEMENT
26	STA. 14+00, UPSTREAM SLOPE	2.5	1015.0	SOIL CEMENT
27	STA. 14+25, UPSTREAM SLOPE	2.5	1016.0	SOIL CEMENT
28	STA. 14+75, UPSTREAM SLOPE	2.5	1016.0	SOIL CEMENT
29	STA. 11+00, UPSTREAM SLOPE	2.5	1016.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE,%	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

RECEIVED
NOV 29 1995
GREINER, INC.

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

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REVIEWED BY **CORWIN ANDEREGG**
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Western Technologies Inc.
The Quality People
Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 11-28-95
Job No. 2745JC249
Event/Invoice No. 27450632-2
Authorized By KEN SMITH Date 11-17-95
Tested By P. LLEWELLYN/WT Date 11-17-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
30		8.4	126.4	0.0	6	133.6	7.6	95		96	NO
31		7.9	129.0	0.0	6	133.6	7.6	97		96	YES
32		8.1	127.6	0.0	6	133.6	7.6	96		96	YES
33		8.0	130.9	0.0	6	133.6	7.6	98		96	YES
34		7.6	130.4	0.0	6	133.6	7.6	98		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
30	STA. 12+50, UPSTREAM SLOPE	2.5	1017.0	SOIL CEMENT
31	RETEST 30A	2.5	1017.0	SOIL CEMENT
32	STA. 13+50, UPSTREAM SLOPE	2.5	1018.0	SOIL CEMENT
33	STA. 11+50, UPSTREAM SLOPE	2.5	1017.0	SOIL CEMENT
34	STA. 14+00, UPSTREAM SLOPE	2.5	1021.0	SOIL CEMENT

Comments BID #14
* DATUM TOPOGRAPHIC

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NOV 29 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY CORWIN ANDEREGG
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-28-95
Job No. 2745JC249
Event/Invoice No. 27450632-3
Authorized By KEN SMITH Date 11-20-95
Tested By P. LLEWELLYN/WT Date 11-20-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 613

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
35		7.3	129.2	0.0	6	133.6	7.6	97		96	YES
36		7.6	131.2	0.0	6	133.6	7.6	98		96	YES
37		7.8	128.7	0.0	6	133.6	7.6	96		96	YES
38		8.0	130.7	0.0	6	133.6	7.6	98		96	YES
39		7.5	129.7	0.0	6	133.6	7.6	97		96	YES
40		7.8	129.3	0.0	6	133.6	7.6	97		96	YES
41		7.8	130.0	0.0	6	133.6	7.6	97		96	YES
42		7.6	128.7	0.0	6	133.6	7.6	96		96	YES
43		7.3	126.4	0.0	6	133.6	7.6	95		96	NO
44		7.0	124.7	0.0	6	133.6	7.6	93		96	NO

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
35	STA. 11+20, UPSTREAM SLOPE	2.5	1020.0	SOIL CEMENT
36	STA. 13+00, UPSTREAM SLOPE	2.5	1020.0	SOIL CEMENT
37	STA. 15+00, UPSTREAM SLOPE	2.5	1020.0	SOIL CEMENT
38	STA. 10+00, UPSTREAM SLOPE	2.5	1021.0	SOIL CEMENT
39	STA. 12+00, UPSTREAM SLOPE	2.5	1021.0	SOIL CEMENT
40	STA. 14+75, UPSTREAM SLOPE	2.5	1021.0	SOIL CEMENT
41	STA. 11+00, UPSTREAM SLOPE	2.5	1022.0	SOIL CEMENT
42	STA. 14+00, UPSTREAM SLOPE	2.5	1022.0	SOIL CEMENT
43	STA. 11+50, UPSTREAM SLOPE	2.5	1023.0	SOIL CEMENT
44	STA. 13+70, UPSTREAM SLOPE	2.5	1023.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

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NOV 29 1995
GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 11-28-95
Job No. 2745JC249
Event/Invoice No. 27450632-3
Authorized By KEN SMITH Date 11-20-95
Tested By P. LLEWELLYN/WT Date 11-20-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
45		7.5	124.5	0.0	6	133.6	7.6	93		96	NO
46		7.6	129.2	0.0	6	133.6	7.6	97		96	YES
47		7.3	128.7	0.0	6	133.6	7.6	96		96	YES
48		7.5	129.9	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
45	STA. 15+50, UPSTREAM SLOPE	2.5	1023.0	SOIL CEMENT
46	RETEST 43A	2.5	1023.0	SOIL CEMENT
47	RETEST 44A	2.5	1023.0	SOIL CEMENT
48	RETEST 45A	2.5	1023.0	SOIL CEMENT

Comments: BID #14
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 11-28-95
Job No. 2745JC249

Event/Invoice No. 27450632-4
Authorized By KEN SMITH Date 11-21-95
Tested By P. LLEWELLYN/WT Date 11-21-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3073 H_2O 616

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
49		8.9	119.8	0.0	6	133.6	7.6	90		96	NO
50		7.7	127.7	0.0	6	133.6	7.6	96		96	YES
51		6.3	126.0	0.0	6	133.6	7.6	94		96	NO
52		7.3	123.8	0.0	6	133.6	7.6	93		96	NO
53		8.4	129.3	0.0	6	133.6	7.6	97		96	YES
54		7.0	124.5	0.0	6	133.6	7.6	93		96	NO
55		7.0	128.7	0.0	6	133.6	7.6	96		96	YES
56		7.0	125.4	0.0	6	133.6	7.6	94		96	NO
57		7.4	122.5	0.0	6	133.6	7.6	92		96	NO
58		6.8	128.8	0.0	6	133.6	7.6	96		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
49	STA. 17+00, UPSTREAM SLOPE	2.5	1024.0	SOIL CEMENT
50	RETEST 49A	2.5	1024.0	SOIL CEMENT
51	STA. 17+00, UPSTREAM SLOPE	2.5	1026.0	SOIL CEMENT
52	RETEST 51A	2.5	1026.0	SOIL CEMENT
53	RETEST 51B	2.5	1026.0	SOIL CEMENT
54	STA. 14+50, UPSTREAM SLOPE	2.5	1028.0	SOIL CEMENT
55	RETEST 54A	2.5	1028.0	SOIL CEMENT
56	STA. 17+50, UPSTREAM SLOPE	2.5	1033.0	SOIL CEMENT
57	RETEST 56A	2.5	1033.0	SOIL CEMENT
58	RETEST 56B	2.5	1033.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

Comments: BID #14
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 11-28-95
Job No. 2745JC249
Event/Invoice No. 27450632-4
Authorized By KEN SMITH Date 11-21-95
Tested By P. LLEWELLYN/WT Date 11-21-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
59		6.4	124.5	0.0	6	133.6	7.6	93		96	NO
60		7.0	130.0	0.0	6	133.6	7.6	97		96	YES
61		7.0	128.7	0.0	6	133.6	7.6	96		96	YES
62		6.9	129.8	0.0	6	133.6	7.6	97		96	YES
63		6.5	130.0	0.0	6	133.6	7.6	97		96	YES
64		7.5	131.3	0.0	6	133.6	7.6	98		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
59	STA. 12+00, UPSTREAM SLOPE	2.5	1035.0	SOIL CEMENT
60	RETEST 59A	2.5	1035.0	SOIL CEMENT
61	STA. 13+25, UPSTREAM SLOPE	2.5	1036.0	SOIL CEMENT
62	STA. 15+00, UPSTREAM SLOPE	2.5	1036.0	SOIL CEMENT
63	STA. 12+50, UPSTREAM SLOPE	2.5	1037.0	SOIL CEMENT
64	STA. 14+75, UPSTREAM SLOPE	2.5	1037.1	SOIL CEMENT

Comments: BID #14
* DATUM TOPOGRAPHIC

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GREINER, INC.

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS (FIELD DENSITY)

Date of Report 12-28-95
Job No 2745JC249 Page 1 of 2
Event/Invoice No. 27450632-18
Authorized By KEN SMITH Date 12-07-95
Tested By P. LLEWELLYN/WT Date 12-07-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA REVISED REPORT: 12/28/95
Test Locations Designated By WESTERN TECHNOLOGIES INC.
Test Procedures In-Place Unit Weight : ASTM D2922 Moisture Content : ASTM D3017
Gauge : Make TROXLER Model 3430 Serial No. 24742 Standard Count: Unit Weight 3088 H_2O 621

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
145		7.4	128.7	0.0	6	133.6	7.6	96		96	YES
146		7.2	130.8	0.0	6	133.6	7.6	98		96	YES
147		7.0	131.3	0.0	6	133.6	7.6	98		96	YES
148		7.4	129.5	0.0	6	133.6	7.6	97		96	YES
149		7.0	129.5	0.0	6	133.6	7.6	97		96	YES
150		7.3	131.5	0.0	6	133.6	7.6	98		96	YES
151		7.0	130.2	0.0	6	133.6	7.6	97		96	YES
152		7.8	128.9	0.0	6	133.6	7.6	96		96	YES
153		7.7	128.7	0.0	6	133.6	7.6	96		96	YES
154		7.9	129.2	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
145	STA. 16+00, 4' LEFT OF CENTERLINE	8.0	1011.0	SEDIMENT BERM
146	STA. 12+00, AT CENTERLINE	9.0	1012.0	SEDIMENT BERM
147	STA. 13+50, 2' LEFT OF CENTERLINE	10.0	1013.0	SEDIMENT BERM
148	STA. 15+00, 8' RIGHT OF CENTERLINE	10.0	1013.0	SEDIMENT BERM
149	STA. 5+50, UPSTREAM SLOPE	2.5	1080.0	SOIL CEMENT
150	STA. 9+00, UPSTREAM SLOPE	2.5	1080.0	SOIL CEMENT
151	STA. 6+50, UPSTREAM SLOPE	2.5	1081.0	SOIL CEMENT
152	STA. 7+50, UPSTREAM SLOPE	2.5	1082.0	SOIL CEMENT
153	STA. 4+00, UPSTREAM SLOPE	2.5	1084.0	SOIL CEMENT
154	STA. 11+00, UPSTREAM SLOPE	2.5	1083.0	SOIL CEMENT

LABORATORY DATA & COMPACTION CHARACTERISTICS

LAB ID.	EVENT/ INVOICE NO.	DESCRIPTION OF MATERIAL	SOURCE OF MATERIAL	OPTIMUM MOISTURE, %	MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft.	TEST METHOD
6	27450632	SOIL CEMENT	ON SITE	7.6	133.6	D558-B

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GREINER, INC.

Comments: BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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REVIEWED BY C. Anderson

(FILE)

Western Technologies Inc.
The Quality People
Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
CONTINUATION SHEET

Date of Report 12-28-95
Job No. 2745JC249
Event/Invoice No. 27450632-18
Authorized By KEN SMITH Date 12-07-95
Tested By P. LLEWELLYN/WT Date 12-07-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS DETENTION BASIN, (CCBD BID #3476-94)
Location LAUGHLIN, NEVADA REVISED REPORT: 12/28/95

TEST NO.	IN-PLACE CHARACTERISTICS				LAB CHARACTERISTICS			COMPACTION	REQUIREMENTS		
	Hole Volume cu. ft.	Moisture % of Dry Unit Weight	Dry Unit Weight lbf / cu. ft.	Oversize %	ID	Maximum Dry Unit Weight lbf / cu. ft.	Optimum Moisture %	% of Maximum Dry Unit Weight	Moisture %	Compaction %	CONFORMANCE INDICATED
155		7.5	129.1	0.0	6	133.6	7.6	97		96	YES
156		7.2	129.5	0.0	6	133.6	7.6	97		96	YES

TEST NO.	TEST LOCATION, HORIZONTAL	TEST LOCATION, VERTICAL		MATERIAL TESTED
		Approximate Fill Depth, ft.	Elevation *	
155	STA. 6+00, UPSTREAM SLOPE	2.5	1086.0	SOIL CEMENT
156	STA. 3+50, UPSTREAM SLOPE	2.5	1086.0	SOIL CEMENT

RECEIVED
JAN 02 1996
GREINER, INC.

Comments: BID #14
* DATUM TOPOGRAPHIC

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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REVIEWED BY

Soil Cement Cores

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

LABORATORY REPORT

1.

DRILLED CORES OF SOIL CEMENT

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Su9te 203
Laughlin, Nevada 89028

Job. No. 2745JC249
Lab./Invoice No. 27450612
Date of Report 12/11/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Concrete Upstream Dam Face Sampled By J. Waddell/WT Date 11/30/95
Max. Size Aggregate, in. 1-1/2 Unit Wt., pcf NA Submitted By J. Waddell/WT Date 11/30/95
Design Strength, psi 500 @ 7 days Authorized By K. Smith Date 11/30/95
Test Procedure ASTM D42

Identification	1	2	3			
Date Concrete Placed	11/22/95	11/22/95	11/22/95			
Date of Test	11/30/95	11/30/95	11/30/95			
Age of Specimen, Days	8	8	8			
Diameter, in.	3.744	3.725	3.711			
Length Before Capping, in.	8"	8"	8"			
Length After Capping, in.	8.375	8.1875	6.500			
Cross-sectional Area, sq. in.	11.009	10.897	10.816			
Maximum Load, lbs.	9000	10500	11600			
Compressive Strength, psi	820	960	1070			
Corrected Compressive Strength, psi	820	960	1050			
Type of Fracture	shear	shear	shear			
Dir. of Load with Respect to Plane of Placement	parallel	parallel	parallel			
Moist. Cond. at Time of Test	moist	moist	moist			
Unit Wt., pcf	142.2	142.6	141.6			

Specific Source of Cores and Nature of Defects in Specimens or Caps, if any:

Location:

1 - Sta. 10+25, top elev. 1040'

2 - Sta. 10+25, middle elev. 1040'

3 - Sta. 10+25, bottom elev. 1040'

Unit weights are in-situ moisture after fan drying.

Copies to: Client/Ken Smith (3)
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Soil Cement Cylinders

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-10
Date of Report 03/07/96
Reviewed By S.E.T.

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veacth
Source of Sample: South Slope, East 5:1, Sta. #10+00, Elev. 1000'
Material Supplier: Mixed on site — Measured Slump, in.: NA
Ticket Number: " " — Measure Air Content, %: NA
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 52
Mix Identification: " " — No. of Specimens Molded: 3
Design Strength, psi: 500 / 7 days — Size of Specimens: 4" x 8"
Max. Size Aggregate, in.: 3/4 — Sampled By: P. Llewellyn/WT — Date: 02/28/96
Time in Mixer: 0 hrs. 0 min. — Submitted By: P. Llewellyn/WT — Date: 02/29/96
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 02/28/96
Test Procedure: ASTM 1633
Remarks: Concrete Temperature 67°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	03/06/96	7	15000	1190			RN
B	03/06/96	7	15100	1200			RN
C	03/06/96	7	14500	1150			RN
D							

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27460061-9
Date of Report 02/28/96
Reviewed By NO SKG ?

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Downstream West Slope, Sta. 17+00, Elev. 998'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 53
Mix Identification " " No. of Specimens Molded 3
Design Strength, psi 500 / 7 days Size of Specimens 4" x 8"
Max. Size Aggregate, in. 3/4 Sampled By P. Llewellyn/WT Date 02/26/96
Time in Mixer 0 hrs. 0 min. Submitted By P. Bowen/WT Date 02/27/96
Water Added on Job, gal. 0 Authorized By K. Smith Date 02/26/96
Test Procedure
Remarks: Concrete Temperature 65°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	03/04/96	7	13500	1070			WS
B	03/04/96	7	12500	1000			WS
C	03/04/96	7	13000	1040			WS

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COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-10
Date of Report 12/13/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading   Architect/Engineer Black & Veatch
Source of Sample Sta. 15+50, Sediment Berm, elev. 1014'
Material Supplier Mixed on site   Measured Slump, in. NA
Ticket Number " "   Measure Air Content, % NA
Batch Size, cu. yds. " "   Ambient Air Temperature, °F 68
Mix Identification " "   No. of Specimens Molded 3
Design Strength, psi 500 / 7 days   Size of Specimens 4 x 4
Max. Size Aggregate, in. 1-1/2   Sampled By P. Llewellyn/WT   Date 12/08/95
Time in Mixer 0 hrs. 0 min.   Submitted By C. Anderegg/WT   Date 12/09/95
Water Added on Job, gal. 0   Authorized By K. Smith   Date 12/08/95
Test Procedure
Remarks:

A = 146.5 pcf

B = 145.0 pcf

C = 145.0 pcf

Soil Cement Temperature 73°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/15/95	7	18100	1440			WS
B	12/15/95	7	18500	1470			WS
C	12/15/95	7	17900	1420			WS

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client: 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-17
Date of Report 12/11/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Lauhglin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: Upstream slope, sta. 7+00, 1084'
Material Supplier: Mixed on site — Measured Slump, in.: NA
Ticket Number: " " — Measure Air Content, %: NA
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 72
Mix Identification: " " — No. of Specimens Molded: 3
Design Strength, psi: 500 / 7 days — Size of Specimens: 4 x 4
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 12/07/95
Time in Mixer: 0 hrs. 0 min. — Submitted By: C. Anderegg/WT — Date: 12/08/95
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 12/07/95
Test Procedure:

Remarks:

A = 144.7 pcf

B = 144.7 pcf

C = 145.0 pcf

Soil Cement Temperature 72°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/14/95	7	17500	1390			WS
B	12/14/95	7	17000	1350			WS
C	12/14/95	7	15200	1210			WS

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COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client
20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-15
Date of Report 12/08/95
Reviewed By [signature]

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Upstream face of dam, sta. 5+00, elev. 1074'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 68
Mix Identification: " "
No. of Specimens Molded: 3
Design Strength, psi: 500 / 7 days
Size of Specimens: 4 x 4.584
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date: 12/06/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: P. Llewellyn/WT Date: 12/07/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date: 12/06/95
Test Procedure:
Remarks:

A = 144.1 pcf
B = 144.4 pcf
C = 145.5 pcf
Soil Cement Temperature 75°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/13/95	7	16900	1340			WS
B	12/13/95	7	17700	1410			WS
C	12/13/95	7	17900	1420			WS

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COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-16
Date of Report 12/08/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading — Architect/Engineer: Black & Veatch
Source of Sample: Sediment berm, sta. 15+00, elev. 1007'
Material Supplier: Mixed on site — Measured Slump, in.: NA
Ticket Number: " " — Measure Air Content, %: NA
Batch Size, cu. yds.: " " — Ambient Air Temperature, °F: 67
Mix Identification: " " — No. of Specimens Molded: 3
Design Strength, psi: 500 / 7 days — Size of Specimens: 4 x 4
Max. Size Aggregate, in.: 1-1/2 — Sampled By: P. Llewellyn/WT — Date: 12/05/95
Time in Mixer: 0 hrs. 0 min. — Submitted By: J. Waddell/WT — Date: 12/06/95
Water Added on Job, gal.: 0 — Authorized By: K. Smith — Date: 12/05/95
Test Procedure:
Remarks:

A = 144.4 pcf
B = 144.7 pcf
C = 144.1 pcf
Soil Cement Temperature 74°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/12/95	7	13100	1040			JW
B	12/12/95	7	14500	1150			JW
C	12/12/95	7	13300	1060			JW

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COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-14
Date of Report 12/06/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Sediment berm, sta. 13+00, elev. 1004'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 65
Mix Identification " "
No. of Specimens Molded 3
Design Strength, psi 500 / 7 days
Size of Specimens 4 x 4
Max. Size Aggregate, in. 1-1/2
Sampled By P. Llewellyn/WT Date 12/04/95
Time in Mixer 0 hrs. 0 min.
Submitted By J. Waddell/WT Date 12/05/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 12/04/95
Test Procedure
Remarks:

A = 145.3 pcf

B = 144.7 pcf

C = 144.7 pcf

Soil Cement Temperature 70°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/11/95	7	13500	1070			PL
B	12/11/95	7	12900	1030			PL
C	12/11/95	7	13300	1060			PL

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COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-13
Date of Report 12/06/95
Reviewed By

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt & Grading
Architect/Engineer: Black & Veatch
Source of Sample: Upstream slope, sta. 15+80, elev. 1071'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 56
Mix Identification: " "
No. of Specimens Molded: 3
Design Strength, psi: 500 / 7 days
Size of Specimens: 4 x 4
Max. Size Aggregate, in.: 1-1/2
Sampled By: P. Llewellyn/WT Date 12/01/95
Time in Mixer: 0 hrs. 0 min.
Submitted By: C. Anderegg/WT Date 11/30/95
Water Added on Job, gal.: 0
Authorized By: K. Smith Date 12/01/95
Test Procedure:
Remarks:

A = 139.9 pcf
B = 137.8 pcf
C = 139.3 pcf
Soil Cement Temperature 68°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/08/95	7	15100	1200			JW
B	12/08/95	7	16500	1310			JW
C	12/08/95	7	15900	1260			JW

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-12
Date of Report 12/01/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid#3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading Architect/Engineer Black & Veatch
Source of Sample Sta. 10+00, upstream slope, elev. 1065'
Material Supplier Mixed on site Measured Slump, in. NA
Ticket Number " " Measure Air Content, % NA
Batch Size, cu. yds. " " Ambient Air Temperature, °F 68
Mix Identification " " No. of Specimens Molded 3
Design Strength, psi 500 / 7 days Size of Specimens 4 x 4
Max. Size Aggregate, in. 1-1/2 Sampled By P. Llewellyn/WT Date 11/30/95
Time in Mixer 0 hrs. 0 min. Submitted By C. Anderegg/WT Date 12/10/95
Water Added on Job, gal. 0 Authorized By K. Smith Date 11/30/95
Test Procedure
Remarks:

A = 144.7 pcf
B = 142.9 pcf
C = 143.7 pcf

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/07/95	7	15100	1200			JW
B	12/07/95	7	16200	1290			JW
C	12/07/95	7	15700	1250			JW

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COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-11
Date of Report 12/01/95
Reviewed By No SIG.

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughline, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Sta. 17+50, upstream slope, elev. 1060'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 69
Mix Identification " "
No. of Specimens Molded 3
Design Strength, psi 500 / 7 days
Size of Specimens 4 x 4
Max. Size Aggregate, in. ~~0~~ ¾"
Sampled By P. Llewellyn/WT Date 11/29/95
Time in Mixer 0 hrs. 0 min.
Submitted By C. Anderegg/WT Date 11/30/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 11/29/95
Test Procedure

Remarks:

A = 140.8 pcf
B = 143.2 pcf
C = 141.7 pcf
Soil Cement Temperature 73°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/06/95	7	18100	1440			JW
B	12/06/95	7	17500	1380			JW
C	12/06/95	7	16500	1300			JW

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20049
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-10
Date of Report 11/30/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Upstream slope, Sta. 13+50, elev. 1051'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 63
Mix Identification " "
No. of Specimens Molded 3
Design Strength, psi 500 / 7 days
Size of Specimens 4 x 4
Max. Size Aggregate, in. ~~0~~ 1½"
Sampled By P. Llewellyn/WT Date 11/28/95
Time in Mixer 0 hrs. 0 min.
Submitted By J. Waddell/WT Date 11/29/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 11/28/95
Test Procedure
Remarks:

A = 142.9 pcf

B = 141.4 pcf

C = 141.7 pcf

Soil Cement Temperature 70°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/05/95	7	17300	1380			JW
B	12/05/95	7	18200	1450			JW
C	12/05/95	7	16000	1280			JW

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LABORATORY REPORT

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-9
Date of Report 12/06/95
Reviewed By NO SIG.

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading   Architect/Engineer Black & Veatch
Source of Sample Upstream slope, sta. 16+50, elev. 1043'
Material Supplier Mixed on site   Measured Slump, in. NA
Ticket Number " "   Measure Air Content, % NA
Batch Size, cu. yds. " "   Ambient Air Temperature, °F 62
Mix Identification " "   No. of Specimens Molded 3
Design Strength, psi 500 / 7 days   Size of Specimens 4 x 4
Max. Size Aggregate, in. ~~3/4~~ 1½"   Sampled By P. Llewellyn/WT   Date 11/27/95
Time in Mixer 0 hrs. 0 min.   Submitted By P. Llewellyn/WT   Date 11/28/95
Water Added on Job, gal. 0   Authorized By K. Smith   Date 11/27/95
Test Procedure
Remarks:

A = 145.0 pcf
B = 140.5 pcf
C = 143.8 pcf
Soil Cement Temperature 72°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	12/04/95	7	19100	1520			JW
B	12/04/95	7	17800	1420			JW
C	12/04/95	7	18600	1480			JW

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LABORATORY REPORT
REVISED REPORT: 12/06/95

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client
20049
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-8
Date of Report 11/27/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid#3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Mixed on site STATION, ELEV ?
Material Supplier " "
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 73
Mix Identification Mix #3
No. of Specimens Molded 3
Design Strength, psi 500 / 7 days
Size of Specimens 4 x 4
Max. Size Aggregate, in. ~~3/4~~ 1½"
Sampled By P. Llewellyn/WT Date 11/22/95
Time in Mixer 0 hrs. 0 min.
Submitted By C. Anderegg/WT Date 11/23/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 11/22/95
Test Procedure

Remarks:
A = 141.7 pcf
B = 141.7 pcf
C = 141.1 pcf
Soil Cement Temperature 79°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	11/29/95	7	21000	1630			JW
B	11/29/95	7	20000	1550			JW
C	11/29/95	7	18000	1400			JW

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LABORATORY REPORT
REVISED REPORT: 12/06/95

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-7
Date of Report 11/27/95
Reviewed By

Project Hiko Springs Wash Detention Basin (CCBD BId #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Balck & Veatch
Source of Sample Sta. 10+00, elev. 1027', upstream slope
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 72
Mix Identification " "
No. of Specimens Molded 3
Design Strength, psi 500 / 7 days
Size of Specimens 4 x 4
Max. Size Aggregate, in. ~~3/4~~ 1½"
Sampled By P. Llewellyn/WT Date 11/21/95
Time in Mixer 0 hrs. 0 min.
Submitted By C. Anderegg/WT Date 11/22/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 11/21/95
Test Procedure
Remarks:

A = 147.4 pcf

B = 146.5 pcf

C = 144.7 pcf

Soil Cement Temperature 77°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	11/28/95	7	17000	1340			JW
B	11/28/95	7	19500	1530			JW
C	11/28/95	7	19000	1490			JW

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Copies to: Client/Ken Smith (3)
American Asphalt & Grading/Wayne Phelps (2)

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LABORATORY REPORT
REVISED REPORT: 12/06/95

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20049
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-6
Date of Report 11/22/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Sta. 10+75, upstream slope-elev 1027
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 75
Mix Identification " "
No. of Specimens Molded 3
Design Strength, psi 500 / 7 days
Size of Specimens 4 x 4
Max. Size Aggregate, in. ~~3/4~~ 1½"
Sampled By P. Llewellyn/WT Date 11/20/95
Time in Mixer 0 hrs. 0 min.
Submitted By C. Anderegg/WT Date 11/21/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 11/20/95
Test Procedure
Remarks:

A = 148.0 pcf

B = 145.6 pcf

c = 146.8 pcf

Soil Cement Temperature 72°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	11/27/95	7	18000	1430			JW
B	11/27/95	7	18000	1430			JW
C	11/27/95	7	18500	1470			JW

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LABORATORY REPORT
REVISED REPORT: 12/06/95

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-5
Date of Report 11/21/95
Reviewed By C Anderegg

Project Hiko Springs Wash Detention Basin (CCBC Bid #3476-94)
Location Laughlin, Nevada
Contractor American Asphalt & Grading
Architect/Engineer Black & Veatch
Source of Sample Upstream slope, Sta. 11+25, elev. 1020'
Material Supplier Mixed on site
Measured Slump, in. NA
Ticket Number " "
Measure Air Content, % NA
Batch Size, cu. yds. " "
Ambient Air Temperature, °F 75
Mix Identification " "
No. of Specimens Molded 3
Design Strength, psi 500 / 7 days
Size of Specimens 4 x 4
Max. Size Aggregate, in. ~~3/4~~ 1½"
Sampled By P. Llewellyn/WT Date 11/17/95
Time in Mixer 0 hrs. 0 min.
Submitted By C. Anderegg/WT Date 11/20/95
Water Added on Job, gal. 0
Authorized By K. Smith Date 11/17/95
Test Procedure ASTMD558/C39

Remarks:

A (1) = 148.9 pcf   Area A = 12.57
B (2) = 147.7 pcf   Area B = 12.63
C (3) = 148.0 pcf   Area C = 12.57

Soil Cement Temperature 80°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load		Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
			Pounds Force	psi			
A	11/24/95	7	16500	1310			JW
B	11/24/95	7	18000	1430			JW
C	11/24/95	7	17500	1390			JW

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LABORATORY REPORT
REVISED REPORT: 12/06/95

COMPRESSIVE STRENGTH TESTS ON Soil Cement

Client 20449
Greiner, Inc., Southwest
3650 South Pointe Circle, Suite 203
Laughlin, Nevada 89028

Job No. 2745JC249
Lab/Invoice No. 27450632-4
Date of Report 11/20/95
Reviewed By C. Anderegg

Project: Hiko Springs Wash Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada
Contractor: American Asphalt
Architect/Engineer: Black & Veatch
Source of Sample: Sta. 11+00, Upstream slope, Elev. 1003'
Material Supplier: Mixed on site
Measured Slump, in.: NA
Ticket Number: " "
Measure Air Content, %: NA
Batch Size, cu. yds.: " "
Ambient Air Temperature, °F: 94
Mix Identification: " "
No. of Specimens Molded: 3
Design Strength, psi 500 / 7 days
Size of Specimens: 4 x 4
Max. Size Aggregate, in. ~~3/4~~ 1½"
Sampled By: P. Llewellyn/WT Date 11/16/95
Time in Mixer 0 hrs. 0 min.
Submitted By: C. Anderegg/WT Date 11/17/95
Water Added on Job, gal.: NA
Authorized By: K. Smith Date 11/16/95
Test Procedure: ASTM D558/C39

Remarks:

Area A = 12.72
Area B = 12.57
Area C = 12.63

Soil Cement Temperature 77°

Specimen Marking If Any	Date Tested	Specimen Age in Days	Compressive Strength Maximum Load: Pounds Force	Compressive Strength Maximum Load: psi	Type Fracture If Other Than Cone	Defects in Specimens/Caps If Any	Tested By
A	11/24/95	8	24000	1890			JW
B	11/24/95	8	23000	1830			JW
C	11/24/95	8	23000	1830			JW

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Concrete Tests

Concrete Tests

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **APRIL 3, 1996**
Job No. **2745JC249**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Event/Invoice No. **190** — Lab No. **27460006-11**
Authorized By **K. SMITH** — Date **03-01-96**
Sampled By **P. LLEWELLYN** — Date **03-01-96**
Submitted By **P. LLEWELLYN** — Date **03-02-96**

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location **LAUGHLIN, NEVADA**
Source of Sample **STA. 4+90, INVERT CHANNEL SLAB-ON-GRADE, OUTLET WORKS**
Architect/Engineer **BLACK & VEATCH**
Contractor **AMERICAN ASPHALT**
Supplier **WMK MATERIALS**
Truck/Ticket No. **773/475315** — Mix Identification **WA261FA** — Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards — Required Strength **4000** psi @ **28** days — Water Added Before Sampling **7** gallons
Time In Mixer hours **38** minutes — Ambient Air Temperature **65** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; lbf/cu.ft. — Temperature: **ASTM C1064** **70** °F
Air Content; % — Slump; **ASTM C143** **5-3/4** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **4** — Diameter/Length **6** in.x **12** in. — Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	03-08-96	7	149000	5270				RN
B	03-08-96	7	148000	5240				RN
C	03-29-96	28	183000	6470				RN
D	03-29-96	28	181000	6400				RN
	AVERAGE	7		5260				
	AVERAGE	28		6440	YES			

Comments: * **3000 PSI @ 7 DAYS REQUIRED**

REC'D 4/4/96

Distribution : **CLIENT - (3)**
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **J. PAUL BOWEN, S.E.T.**
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report APRIL 3, 1996
Job No. 2745JC249
Event/Invoice No. 194
Lab No. 27460061-12
Authorized By K. SMITH Date 03-04-96
Sampled By P. LLEWELLYN Date 03-04-96
Submitted By P. LLEWELLYN Date 03-05-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET CHANNEL IMPACT SLAB
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT
Supplier WMK MATERIALS
Truck/Ticket No. 776/476107 Mix Identification WA261FA Maximum Size Aggregate -1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 0 gallons
Time In Mixer hours 34 minutes Ambient Air Temperature 77 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; lbf/cu.ft. Temperature: ASTM C1064 75 °F
Air Content; % Slump; ASTM C143 7-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	03-11-96	7	137000	4850				RN
B	03-11-96	7	137000	4850				RN
C	04-01-96	28	164000	5800				RN
D	04-01-96	28	162000	5730				RN
	AVERAGE	7		4850				
	AVERAGE	28		5770	YES			

Comments: REQUIRED STRENGTH 3000 PSI AT 7 DAYS

REC'D 4/4/96

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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LABORATORY REPORT

PHYSICA ATES

Client 20287
American Asphalt & Gradi
3624 Goldfield Street
North Las Vegas, Nevada

PCC QC

Job No. 2745JC232
Lab/Invoice No. 27450520
Date of Report 10/06/95
Reviewed By C Anderegg

Project: Hiko Springs Detention Basin (CCBD Bid #3476-94)
Location: Laughlin, Nevada — Sampled By: C. Anderegg/WT — Date: 09/05/95
Type of Aggregate: Coarse Aggregate — Submitted By: C. Anderegg/WT — Date: 09/05/95
Source of Aggregate: WMK Materials — Authorized By: W. Phelps — Date: 09/05/95

SIEVE ANALYSIS – ASTM C136-

Sieve Size	% Passing Accumulative	Specification
		ASTM C-33
4 in.		NO. 67
3 in.		
2 in.		
1 1/2 in.		
1 1/8 in.		
1 in.	100	100
3/4 in.	90	90-100
1/2 in.	43	
3/8 in.	21	20-55
1/4 in.	3	
No. 4	2	0-10
No. 8	1	0-5
No. 10	1	
No. 16	1	
No. 30	1	
No. 40	1	
No. 50	1	
No. 100	1	
No. 200	0.2	0-1
Finer Than 200 ASTM C117-		

TEST STANDARDS ARE ASTM UNLESS OTHERWISE NOTED.

Test		Result	Specification	Test Standard
Fineness Modulus				C125-
Dry Rodded Unit Weight, pcf				C29-
Lightweight Pieces, %				C123-
Clay Lumps and Friable Particles				C142-
Organic Impurities				C40-
Sand Equivalent Value				C2419-
Resistance To Abrasion	% Wear, Revolutions			C131-
	% Wear, 500 Revolutions			Grading
	% Wear, Revolutions			C535-
	% Wear, 1000 Revolutions			Grading
Scratch Hardness, % By: Weight I Count		|	|	C235-
Fractured Faces, % By: Weight I Count		|	|	
Liquid Limit I Plasticity Index		|	|	D424-
Cleanness Value				Calif. 227-
Moisture Density Relations	Maximum Dry Density, pcf		☐ D698 ☐ D1557- ☐ AASHTO T99- ☐ AASHTO T180-	
	Optimum Moisture, %			
	Method			
Specific Gravity	Absorption, %		☐ C127- ☐ C128-	
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

Copies To: Client/Wayne Phelps (2)
Greiner, Inc., Southwest/Ken Smith (3)

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report MARCH 15, 1996
Job No. 2745JC249
Event/Invoice No. 194 Lab No. 27460061-12
Authorized By K. SMITH Date 03-04-96
Sampled By P. LLEWELLYN Date 03-04-96
Submitted By P. LLEWELLYN Date 03-05-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET CHANNEL IMPACT SLAB
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT
Supplier WMK MATERIALS
Truck/Ticket No. 776/476107 Mix Identification WA261FA Maximum Size Aggregate -1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 0 gallons
Time In Mixer hours 34 minutes Ambient Air Temperature 77 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; lbf/cu.ft. Temperature: ASTM C1064 75 °F
Air Content; % Slump; ASTM C143 7-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	COMPRESSIVE STRENGTH Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	03-11-96	7	137000	4850				RN
B	03-11-96	7	137000	4850				RN
C	04-01-96	28						
D	04-01-96	28						
	AVERAGE	7		4850				

Comments: REQUIRED STRENGTH 3000 PSI AT 7 DAYS

REC'D 3/18/96

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY J. PAUL BOWEN, S.E.T.
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report MARCH 12, 1996
Job No. 2745JC249
Event/Invoice No. 190 Lab No. 27460006-11
Authorized By K. SMITH Date 03-01-96
Sampled By P. LLEWELLYN Date 03-01-96
Submitted By P. LLEWELLYN Date 03-02-96

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample STA. 4+90, INVERT CHANNEL SLAB-ON-GRADE, OUTLET WORKS
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT
Supplier WMK MATERIALS
Truck/Ticket No. 773/475315 Mix Identification WA261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 7 gallons
Time In Mixer hours 38 minutes Ambient Air Temperature 65 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; lbf/cu.ft. Temperature: ASTM C1064 70 °F
Air Content; % Slump: ASTM C143 5-3/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	03-08-96	7	149000	5270				RN
B	03-08-96	7	148000	5240				RN
C	03-29-96	28						
D	03-29-96	28						
	AVERAGE	7		5260				

Comments: * 3000 PSI @ 7 DAYS REQUIRED

REC'D 3/14/96

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY J. PAUL BOWEN, S.E.T.
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report NOVEMBER 9, 1995
Job No. 2745JC249
Event/Invoice No. 58 Lab No. 27450527-2
Authorized By K. SMITH Date 10-09-95
Sampled By J. WADDELL Date 10-09-95
Submitted By J. WADDELL Date 10-10-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample WING WALL OUTLET STRUCTURE, STA. 4+35 TO 4+49*
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT
Supplier WMK MATERIALS
Truck/Ticket No. 408/42537 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 0 gallons
Time in Mixer hours 47 minutes Ambient Air Temperature 78 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 141.2 lbf/cu.ft. Temperature: ASTM C1064 81 °F
Air Content; % Slump; ASTM C143 4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	10-16-95	7	138000	4880				SG
B	10-16-95	7	136000	4810				SG
C	11-06-95	28	175000	6190				WS
D	11-06-95	28	176000	6230				WS
	AVERAGE	7		4850				
	AVERAGE	28		6210	YES			

Comments: BID ~~#79~~13
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI 28 DAYS
* TRASH RACK STRUCTURE, STA. 0+03.00 TO 0+37.50

Distribution : CLIENT - (3)
AMERICAN ASPHALT & GRADING (2)

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GREINER, INC.

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY J. WADDELL, E.T.
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **OCTOBER 31, 1995**
Job No. **2745JC249**
Event/Invoice No. **51** Lab No. **27450527-1**
Authorized By **K. SMITH** Date **09-27-95**
Sampled By **P. LLEWELLYN** Date **09-28-95**
Submitted By **P. LLEWELLYN** Date **09-29-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location **LAUGHLIN, NEVADA**
Source of Sample **SLAB-ON-GRADE FOOTING AT OUTLET WORKS, STA. 4+45 TO 4+59**
Architect/Engineer **BLACK & VEATCH**
Contractor **AMERICAN ASPHALT & GRADING**
Supplier **WMK MATERIALS**
Truck/Ticket No. **776/421863** Mix Identification **W261FA** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **0** gallons
Time In Mixer hours **50** minutes Ambient Air Temperature **80** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; lbf/cu.ft. Temperature: **ASTM C1064** 81 °F
Air Content; % Slump; ? inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **4** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	10-05-95	7	147000	5200				SG
B	10-05-95	7	148000	5240				SG
C	10-26-95	28	178000	6300				SG
D	10-26-95	28	180000	6370				SG
	AVERAGE	7		5220				
	AVERAGE	28		6340	YES			

Comments: * **DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS**

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

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NOV 1 1995
GREINER, INC.

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **VICKI A. WOODARD**
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **OCTOBER 10, 1995**
Job No. **2745JC249**
Event/Invoice No. **38** Lab No. **27450485-15**
Authorized By **W. THOMAS** Date **09-11-95**
Sampled By **P. LLEWELLYN** Date **09-11-95**
Submitted By **P. LLEWELLYN** Date **09-12-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location **LAUGHLIN, NEVADA**
Source of Sample **OUTLET WORKS TOPS & WALLS, STA. 2+77 TO 2+97**
Architect/Engineer **BLACK & VEATCH**
Contractor **AMERICAN ASPHALT & GRADING**
Supplier **WMK MATERIALS**
Truck/Ticket No. **408/415460** Mix Identification **W261FA** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **0** gallons
Time In Mixer hours **48** minutes Ambient Air Temperature **85** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **144.1** lbf/cu.ft. Temperature: **ASTM C1064** **83** °F
Air Content; % Slump; **ASTM C143** **7-1/2** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **6** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Compressive Strength: Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-14-95	3	105500	3730				SG
B	09-14-95	3	105000	3710				SG
C	09-18-95	7	119500	4230				SG
D	09-18-95	7	116500	4120				SG
E	10-09-95	28	160000	5660				SG
F	10-09-95	28	158000	5590				SG
	AVERAGE	3		3720				
	AVERAGE	7		4180				
	AVERAGE	28		5630	YES			

Comments: **BID #13 OUTLET WORKS**
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

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OCT 1 1 1995
GREINER, INC.

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **VICKI A. WOODARD**
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **OCTOBER 10, 1995**
Job No. **2745JC249**
Event/Invoice No. **38** Lab No. **27450485-16**
Authorized By **K. SMITH** Date **09-11-95**
Sampled By **P. LLEWELLYN** Date **09-11-95**
Submitted By **P. LLEWELLYN** Date **09-12-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location **LAUGHLIN, NEVADA**
Source of Sample **OUTLET WORKS TOPS & WALLS, STA. 3+17 TO 3+37**
Architect/Engineer **BLACK & VEATCH**
Contractor **AMERICAN ASPHALT & GRADING**
Supplier **WMK MATERIALS**
Truck/Ticket No. **746/415514** Mix Identification **W261FA** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **10** gallons
Time In Mixer hours **44** minutes Ambient Air Temperature **95** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **143.5** lbf/cu.ft. Temperature: **ASTM C1064** **87** °F
Air Content; % Slump; **ASTM C143** **7-3/4** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **6** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength – Maximum Load lbf	Compressive Strength – Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-14-95	3	123000	4350				SG
B	09-14-95	3	121000	4280				SG
C	09-18-95	7	133000	4700				SG
D	09-18-95	7	135500	4790				SG
E	10-09-95	28	183000	6470				SG
F	10-09-95	28	185000	6540				SG
	AVERAGE	3		4320				
	AVERAGE	7		4750				
	AVERAGE	28		6510	YES			

Comments: **BID #13 OUTLET WORKS**
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

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GREINER, INC.

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REVIEWED BY **VICKI A. WOODARD**
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report OCTOBER 10, 1995
Job No. 2745JC249
Event/Invoice No. 38 Lab No. 27450485-17
Authorized By K. SMITH Date 09-11-95
Sampled By P. LLEWELLYN Date 09-11-95
Submitted By P. LLEWELLYN Date 09-12-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS TOPS & WALLS, STA. 3+57 TO 3+77
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS

Truck/Ticket No. 776/415548 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 10 gallons
Time In Mixer hours 47 minutes Ambient Air Temperature 101 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 144.2 lbf/cu.ft. Temperature: ASTM C1064 91 °F
Air Content; % Slump; ASTM C143 7-3/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 6 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-14-95	3	99000	3500				SG
B	09-14-95	3	102000	3610				SG
C	09-18-95	7	122000	4320				SG
D	09-18-95	7	120000	4240				SG
E	10-09-95	28	170000	6010				SG
F	10-09-95	28	167500	5930				SG
	AVERAGE	3		3560				
	AVERAGE	7		4280				
	AVERAGE	28		5970	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

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GREINER, INC.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report OCTOBER 10, 1995
Job No. 2745JC249
Event/Invoice No. 38 — Lab No. 27450485-18
Authorized By K. SMITH — Date 09-11-95
Sampled By P. LLEWELLYN — Date 09-11-95
Submitted By P. LLEWELLYN — Date 09-12-95

Client: GREINER, INC., SOUTHWEST
Project: HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location: LAUGHLIN, NEVADA
Source of Sample: OUTLET WORKS TOPS & WALLS, STA. 3+97 TO 4+17
Architect/Engineer: BLACK & VEATCH
Contractor: AMERICAN ASPHALT & GRADING
Supplier: WMK MATERIALS

Truck/Ticket No. 776/415588 — Mix Identification W261FA — Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards — Required Strength 4000 psi @ 28 days — Water Added Before Sampling 10 gallons
Time In Mixer hours 46 minutes — Ambient Air Temperature 106 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.8 lbf/cu.ft. — Temperature: ASTM C1064 93 °F
Air Content; % — Slump; ASTM C143 8-1/2* inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 6 — Diameter/Length 6 in.x 12 in. — Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength – Maximum Load lbf	Compressive Strength – Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-14-95	3	103000	3640				SG
B	09-14-95	3	104000	3680				SG
C	09-18-95	7	114000	4030				SG
D	09-18-95	7	117000	4140				SG
E	10-09-95	28	157000	5550				SG
F	10-09-95	28	155500	5500				SG
	AVERAGE	3		3660				
	AVERAGE	7		4090				
	AVERAGE	28		5530	YES			

Comments: BID #13 OUTLET WORKS
* INFORMED KEN SMITH OF SLLUMP
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

RECEIVED
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GREINER, INC.

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report OCTOBER 5, 1995
Job No. 2745JC249
Event/Invoice No. 36 Lab No. 27450485-12
Authorized By W. THOMAS Date 09-07-95
Sampled By P. LLEWELLYN Date 09-07-95
Submitted By P. LLEWELLYN Date 09-08-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS WALLS & TOPS, STA. 2+57 TO 2+77, 2+97 TO 3+17
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 409/414435 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 0 gallons
Time In Mixer hours 45 minutes Ambient Air Temperature 91 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.6 lbf/cu.ft. Temperature: ASTM C1064 87 °F
Air Content; % Slump; ASTM C143 5-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	COMPRESSIVE STRENGTH Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-14-95	7	136000	4810				SG
B	09-14-95	7	137500	4860				SG
C	10-05-95	28	172000	6080				SG
D	10-05-95	28	175000	6190				SG
	AVERAGE	7		4840				
	AVERAGE	28		6140	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

RECEIVED
OCT 6 1995
GREINER, INC.

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report OCTOBER 5, 1995
Job No. 2745JC249
Event/Invoice No. 36 — Lab No. 27450485-13
Authorized By W. THOMAS — Date 09-07-95
Sampled By P. LLEWELLYN — Date 09-07-95
Submitted By P. LLEWELLYN — Date 09-08-95

Client	GREINER, INC., SOUTHWEST
Project	HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location	LAUGHLIN, NEVADA
Source of Sample	OUTLET WORKS WALLS & TOPS, STA. 2+97 TO 3+17 & 3+37 TO 3+57
Architect/Engineer	BLACK & VEATCH
Contractor	AMERICAN ASPHALT & GRADING
Supplier	WMK MATERIALS

Truck/Ticket No. 748/414514 — Mix Identification W261FA — Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards — Required Strength 4000 psi @ 28 days — Water Added Before Sampling 5 gallons
Time In Mixer hours 42 minutes — Ambient Air Temperature 96 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.9 lbf/cu.ft. — Temperature: ASTM C1064 90 °F
Air Content; % — Slump; ASTM C143 7-1/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded 4 — Diameter/Length 6 in.x 12 in. — Cross Sectional Area 28.27 sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-14-95	7	134000	4740				SG
B	09-14-95	7	136000	4810				SG
C	10-05-95	28	177500	6280				SG
D	10-05-95	28	179000	6330				SG
	AVERAGE	7		4780				
	AVERAGE	28		6310	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

RECEIVED
OCT 6 1995
GREINER, INC.

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
(SIGNED COPY ON FILE)

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The Quality People
Since 1955

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Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report OCTOBER 5, 1995
Job No. 2745JC249
Event/Invoice No. 36 Lab No. 27450485-14
Authorized By W. THOMAS Date 09-07-95
Sampled By P. LLEWELLYN Date 09-07-95
Submitted By P. LLEWELLYN Date 09-08-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS WALLS & TOPS, STA. 3+37 TO 3+57 & 3+77 TO 3+97
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 776/414568 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 0 gallons
Time In Mixer 1 hours 10 minutes Ambient Air Temperature 93 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.2 lbf/cu.ft. Temperature: ASTM C1064 96 °F
Air Content; % Slump; ASTM C143 6-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	COMPRESSIVE STRENGTH Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-14-95	7	135000	4780				SG
B	09-14-95	7	133500	4720				SG
C	10-05-95	28	168000	5940				SG
D	10-05-95	28	168500	5960				SG
	AVERAGE	7		4750				
	AVERAGE	28		5950	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

RECEIVED
OCT 6 1995
GREINER, INC.

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report OCTOBER 3, 1995
Job No. 2745JC249
Event/Invoice No. 32 — Lab No. 27450485-10
Authorized By W. THOMAS — Date 09-02-95
Sampled By P. LLEWELLYN — Date 09-02-95
Submitted By P. LLEWELLYN — Date 09-03-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client	GREINER, INC., SOUTHWEST
Project	HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location	LAUGHLIN, NEVADA
Source of Sample	OUTLET WORKS WALLS AND TOPS, STA. 1+17 TO 1+37
Architect/Engineer	BLACK & VEATCH
Contractor	AMERICAN ASPHALT & GRADING
Supplier	WMK MATERIALS

Truck/Ticket No. 776/413311 — Mix Identification W261FA — Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards — Required Strength 4000 psi @ 28 days — Water Added Before Sampling 0 gallons
Time In Mixer hours 58 minutes — Ambient Air Temperature 100 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.7 lbf/cu.ft. — Temperature: ASTM C1064 92 °F
Air Content; % — Slump; ASTM C143 7-3/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded 6 — Diameter/Length 6 in.x 12 in. — Cross Sectional Area 28.27 sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-05-95	3	102000	3610				PL
B	09-05-95	3	105000	3710				PL
C	09-11-95	9	129000	4560				JW
D	09-11-95	9	131500	4650				JW
E	09-30-95	28	140000	4950				CA
F	09-30-95	28	141000	4990				CA
	AVERAGE	3		3660				
	AVERAGE	9		4610				
	AVERAGE	28		4970	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/4/95
MAT

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report OCTOBER 3, 1995
Job No. 2745JC249
Event/Invoice No. 32 Lab No. 27450485-11
Authorized By W. THOMAS Date 09-02-95
Sampled By P. LLEWELLYN Date 09-02-95
Submitted By P. LLEWELLYN Date 09-03-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS WALLS & TOP, STA. 1+57 TO 1+77
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 413330 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 20 gallons
Time In Mixer hours 50 minutes Ambient Air Temperature 106 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.7 lbf/cu.ft. Temperature: ASTM C1064 91 °F
Air Content; % Slump; ASTM C143 7-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded 6 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-05-95	3	100000	3540				PL
B	09-05-95	3	92000	3250				PL
C	09-11-95	9	134000	4740				JW
D	09-11-95	9	133000	4700				JW
E	09-30-95	28	144000	5090				CA
F	09-30-95	28	142000	5020				CA
	AVERAGE	3		3400				
	AVERAGE	9		4720				
	AVERAGE	28		5060	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/4/95
MAP

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **OCTOBER 3, 1995**
Job No. **2745JC249**
Event/Invoice No. **32** Lab No. **27450485-8**
Authorized By **W. THOMAS** Date **09-02-95**
Sampled By **P. LLEWELLYN** Date **09-02-95**
Submitted By **P. LLEWELLYN** Date **09-03-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client	**GREINER, INC., SOUTHWEST**
Project	**HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location	**LAUGHLIN, NEVADA**
Source of Sample	**OUTLET WORKS WALLS AND TOP, STA. 0+57 TO 0+77**
Architect/Engineer	**BLACK & VEATCH**
Contractor	**AMERICAN ASPHALT AND GRADING**
Supplier	**WMK MATERIALS**

Truck/Ticket No. **776/413241** Mix Identification **W261FA** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **0** gallons
Time In Mixer hours **56** minutes Ambient Air Temperature **85** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **143.6** lbf/cu.ft. Temperature: **ASTM C1064** **91** °F
Air Content; % Slump; **ASTM C143** **7-1/2** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **6** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-05-95	3	101000	3570				PL
B	09-05-95	3	104500	3700				PL
C	09-11-95	9	134000	4740				JW
D	09-11-95	9	132500	4690				JW
E	09-30-95	28	152000	5380				CA
F	09-30-95	28	155000	5480				CA
	AVERAGE	3		3640				
	AVERAGE	9		4720				
	AVERAGE	28		5430	YES			

Comments: **BID #13 OUTLET WORKS**
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/4/95
MAR

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **VICKI A. WOODARD**
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report OCTOBER 3, 1995
Job No. 2745JC249
Event/Invoice No. 32 Lab No. 27450485-9
Authorized By W. THOMAS Date 09-02-95
Sampled By P. LLEWELLYN Date 09-02-95
Submitted By P. LLEWELLYN Date 09-03-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS WALLS AND TOP, STA. 0+37 TO 0+57
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 408/413263 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 0 gallons
Time In Mixer hours 45 minutes Ambient Air Temperature 88 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.2 lbf/cu.ft. Temperature: ASTM C1064 88 °F
Air Content; % Slump; ASTM C143 7-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 6 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Compressive Strength: Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-05-95	3	103500	3660				PL
B	09-05-95	3	104000	3680				PL
C	09-11-95	9	129000	4560				JW
D	09-11-95	9	131500	4650				JW
E	09-30-95	28	142000	5020				CA
F	09-30-95	28	145000	5130				CA
	AVERAGE	3		3670				
	AVERAGE	9		4610				
	AVERAGE	28		5080	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

Rec'd 10/4/95
MMP

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report SEPTEMBER 29, 1995
Job No. 2745JC249
Event/Invoice No. 29 Lab No. 27450485-6
Authorized By W. THOMAS Date 08-30-95
Sampled By P. LLEWELLYN Date 08-30-95
Submitted By P. LLEWELLYN Date 08-31-95

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample TOP AND WALLS OUTLET WORKS, STA 2+17 TO 2+37
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 411868 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 5 gallons
Time In Mixer 1 hours 2 minutes Ambient Air Temperature 84 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 142.8 lbf/cu.ft. Temperature: ASTM C1064 91 °F
Air Content; % Slump; ASTM C143 7-1/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 6 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-05-95	6	130000	4600				PL
B	09-05-95	6	128500	4550				PL
C	09-06-95	7	131000	4630				JW
D	09-06-95	7	130500	4620				JW
E	09-27-95	28	163500	5780				SG
F	09-27-95	28	161000	5700				SG
	AVERAGE	6		4580				
	AVERAGE	7		4630				
	AVERAGE	28		5740	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

Rec'd 10/2/95
MAT

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report **SEPTEMBER 29, 1995**
Job No. **2745JC249**
Event/Invoice No. **29** — Lab No. **27450485-7**
Authorized By **W. THOMAS** — Date **08-30-95**
Sampled By **P. LLEWELLYN** — Date **08-30-95**
Submitted By **P. LLEWELLYN** — Date **08-31-95**

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location **LAUGHLIN, NEVADA**
Source of Sample **TOP AND WALLS OUTLET WORKS, STA. 1+37 TO 1+57**
Architect/Engineer **BLACK & VEATCH**
Contractor **AMERICAN ASPHALT & GRADING**
Supplier **WMK MATERIALS**
Truck/Ticket No. **411998** — Mix Identification **W261FA** — Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards — Required Strength **4000** psi @ **28** days — Water Added Before Sampling **0** gallons
Time In Mixer hours **42** minutes — Ambient Air Temperature **102** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **143.2** lbf/cu.ft. — Temperature: **ASTM C1064** **90** °F
Air Content; % — Slump; **ASTM C143** **9-1/4*** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **6** — Diameter/Length **6** in.x **12** in. — Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength Maximum Load lbf	Compressive Strength Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	09-05-95	6	100000	3540				PL
B	09-05-95	6	104000	3680				PL
C	09-06-95	7	114000	4030				JW
D	09-06-95	7	111500	3940				JW
E	09-27-95	28	151000	5340				SG
F	09-27-95	28	148500	5250				SG
	AVERAGE	6		3610				
	AVERAGE	7		3990				
	AVERAGE	28		5300	YES			

Comments: **BID #13 OUTLET WOKRS**
*** INFORMED WOODY THOMAS OF HIGH SLUMP.**
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

Rec'd 10/2/95
MM

REVIEWED BY **VICKI A. WOODARD**
(SIGNED COPY ON FILE)

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Bullhead City, Arizona 86442
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report SEPTEMBER 26, 1995
Job No. 2745JC249
Event/Invoice No. 27 Lab No. 27450485-5
Authorized By W. THOMAS Date 08-28-95
Sampled By P. LLEWELLYN Date 08-28-95
Submitted By P. LLEWELLYN Date 08-29-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample WALL AND TOP OF OUTLET WORKS, STA. 0+97 TO 1+17
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 746/411167 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 10 gallons
Time In Mixer hours 55 minutes Ambient Air Temperature 102 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.4 lbf/cu.ft. Temperature: ASTM C1064 96 °F
Air Content; % Slump; ASTM C143 7-1/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 6 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	COMPRESSIVE STRENGTH Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	08-31-95	3	120000	4240				JW
B	08-31-95	3	118000	4170				JW
C	09-04-95	7	134000	4740				PL
D	09-04-95	7	140000	4950				PL
E	09-25-95	28	179000	6330				SG
F	09-25-95	28	177000	6260				SG
	AVERAGE	3		4210				
	AVERAGE	7		4850				
	AVERAGE	28		6300	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/27/95 MP

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **SEPTEMBER 22, 1995**
Job No. **2745JC249**
Event/Invoice No. **23** Lab No. **27450485-4**
Authorized By **W. THOMAS** Date **08-23-95**
Sampled By **P. LLEWELLYN** Date **08-23-95**
Submitted By **P. LLEWELLYN** Date **08-24-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client	GREINER, INC., SOUTHWEST
Project	HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location	LAUGHLIN, NEVADA
Source of Sample	OUTLET WORKS FOOTINGS STA. 3+20
Architect/Engineer	BLACK & VEATCH
Contractor	AMERICAN ASPHALT & GRADING
Supplier	WMK MATERIALS

Truck/Ticket No. **747/409427** Mix Identification **W261FA** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **0** gallons
Time In Mixer hours **57** minutes Ambient Air Temperature **89** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **142.5** lbf/cu.ft. Temperature: **ASTM C1064** **85** °F
Air Content; % Slump; **ASTM C143** **7-3/4** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **4** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength Maximum Load lbf	Compressive Strength Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
A	08-30-95	7	124500	4400				JW
B	08-30-95	7	127000	4490				JW
C	09-20-95	28	165000	5840				SG
D	09-20-95	28	168000	5940				SG
E								
	AVERAGE	7		4450				
	AVERAGE	28		5890	YES			

Comments: **BID #13 OUTLET WORKS**
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

Rec'd 9/25/95 MOP

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report SEPTEMBER 19, 1995
Job No. 2745JC249
Event/Invoice No. 21 — Lab No. 27450485-2
Authorized By W. THOMAS — Date 08-21-95
Sampled By P. LLEWELLYN — Date 08-21-95
Submitted By J. WADDELL — Date 08-22-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client: GREINER, INC., SOUTHWEST
Project: HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location: LAUGHLIN, NEVADA
Source of Sample: OUTLET WORKS, STATION 2+40
Architect/Engineer: BLACK & VEATCH
Contractor: AMERICAN ASPHALT
Supplier: WMK MATERIALS
Truck/Ticket No. 748/408490 — Mix Identification W261FA — Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards — Required Strength 4000 psi @ 28 days — Water Added Before Sampling 5 gallons
Time In Mixer hours 59 minutes — Ambient Air Temperature 93 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.3 lbf/cu.ft. — Temperature: ASTM C1064 85 °F
Air Content; % — Slump; ASTM C143 7-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 — Diameter/Length 6 in.x 12 in. — Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Compressive Strength: Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
485-2A	08-28-95	7	141000	4990				JW
485-2B	08-28-95	7	142500	5040				JW
485-2C	09-18-95	28	170000	6010				SG
485-2D	09-18-95	28	172000	6080				SG
	AVERAGE	7		5020				
	AVERAGE	28		6050	YES			

Comments: DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS
BID #13, OUTLET WORKS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
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9/20

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report SEPTEMBER 19, 1995
Job No. 2745JC249
Event/Invoice No. 21 Lab No. 27450485-3
Authorized By W. THOMAS Date 08-21-95
Sampled By P. LLEWELLYN Date 08-21-95
Submitted By J. WADDELL Date 08-22-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS, STATION 3+50
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT
Supplier WMK MATERIALS

Truck/Ticket No. 729/408563 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @28 days Water Added Before Sampling 10 gallons
Time In Mixer hours 50 minutes Ambient Air Temperature 100 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.5 lbf/cu.ft. Temperature: ASTM C1064 86 °F
Air Content; % Slump; ASTM C143 7-1/2 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength – Maximum Load lbf	Compressive Strength – Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
485-3A	08-28-95	7	137500	4860				JW
485-3B	08-28-95	7	142000	5020				JW
485-3C	09-18-95	28	170000	6010				SG
485-3D	09-18-95	28	172500	6100				SG
	AVERAGE	7		4940				
	AVERAGE	28		6060	YES			

Comments: **DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS**
BID #13, OUTLET WORKS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95 MAH

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report SEPTEMBER 19, 1995
Job No. 2745JC249
Event/Invoice No. 21 Lab No. 27450485-1
Authorized By W. THOMAS Date 08-21-95
Sampled By P. LLEWELLYN Date 08-21-95
Submitted By J. WADDELL Date 08-22-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS, STATION 2+00
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT
Supplier WMK MATERIALS

Truck/Ticket No. 747/408440 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 35* gallons
Time In Mixer hours 58 minutes Ambient Air Temperature 91 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 143.1 lbf/cu.ft. Temperature: ASTM C1064 85 °F
Air Content; % Slump; ASTM C143 6-1/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 5 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Compressive Strength: Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
485-1A	08-24-95	3	117000	4140				JW
485-1B	08-28-95	7	129000	4560				JW
485-1C	08-28-95	7	129000	4560				JW
485-1D	09-18-95	28	157000	5550				SG
485-1E	09-18-95	28	159000	5620				SG
	AVERAGE	7		4560				
	AVERAGE	28		5590	YES			

Comments: BID #13, OUTLET WORKS
*NOTIFIED WOODY THOMAS, GREINER
DESIGN STRENGTH IS 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Date of Report **SEPTEMBER 13, 1995**
Job No. **2745JC249**
Event/Invoice No. **17** Lab No. **27450450-4**
Authorized By **W. THOMAS** Date **08-14-95**
Sampled By **P. LLEWELLYN** Date **08-15-95**
Submitted By **P. LLEWELLYN** Date **08-16-95**

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location **LAUGHLIN, NEVADA**
Source of Sample **OUTLET WORKS, STA. 0+37-0+57.50 FOOTINGS**
Architect/Engineer **BLACK & VEATCH**
Contractor **AMERICAN ASPHALT & GRADING**
Supplier **WMK MATERIALS**
Truck/Ticket No. **M47/406599** Mix Identification **W261FA** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **10** gallons
Time In Mixer hours **57** minutes Ambient Air Temperature **94** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **142.6** lbf/cu.ft. Temperature: **ASTM C1064** **88** °F
Air Content; % Slump; **ASTM C143** **6-3/4** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **5** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	COMPRESSIVE STRENGTH Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
1A	08-18-95	3	122500	4330				JH
1B	08-23-95	8	150000	5310				JW
1C	08-23-95	8	149000	5270				JW
1D	09-12-95	28	179500	6350				SG
1E	09-12-95	28	181000	6400				SG
	AVERAGE	8		5290				
	AVERAGE	28		6380	YES			

Comments: **BID #13 OUTLET WORKS**
*** DESIGN STRENGTH 3000 AT 7 DAYS**

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

Rec'd 9/20/95 MAP

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY **VICKI A. WOODARD**
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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report SEPTEMBER 13, 1995
Job No. 2745JC249
Event/Invoice No. 17 Lab No. 27450450-5
Authorized By W. THOMAS Date 08-14-95
Sampled By P. LLEWELLYN Date 08-15-95
Submitted By P. LLEWELLYN Date 08-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS, STA. 0+77.50 TO-0+97.50, FOOTINGS
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 775/406635 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @28 days Water Added Before Sampling 0 gallons
Time In Mixer 1 hours minutes Ambient Air Temperature 96 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 142.8 lbf/cu.ft. Temperature: ASTM C1064 88 °F
Air Content; % Slump; ASTM C143 6-3/4 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Compressive Strength: Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
2A	08-23-95	8	137500	4860				JW
2B	08-23-95	8	136000	4810				JW
2C	09-12-95	28	165000	5840				SG
2D	09-12-95	28	167000	5910				SG
	AVERAGE	8		4840				
	AVERAGE	28		5880	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAY

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

RLC 9/20/95

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
(SIGNED COPY ON FILE)

Western Technologies Inc.
The Quality People
Since 1955

1514 Gold Rush Road, C258
Bullhead City, Arizona 86442
(520) 758-8378 • fax 758-1666

SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report SEPTEMBER 13, 1995
Job No. 2745JC249
Event/Invoice No. 17 Lab No. 27450450-6
Authorized By W. THOMAS Date 08-14-95
Sampled By P. LLEWELLYN Date 08-15-95
Submitted By P. LLEWELLYN Date 08-16-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS, STA. 1+57.50 TO 1+77.50, FOOTINGS
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS
Truck/Ticket No. 746/406708 Mix Identification W261FA Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 0 gallons
Time In Mixer hours 44 minutes Ambient Air Temperature 103 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH ASTM C172
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 142.8 lbf/cu.ft. Temperature: ASTM C1064 89 °F
Air Content; % Slump; ASTM C143 7 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH ASTM C31
No. of Specimens Molded 4 Diameter/Length 6 in.x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH ASTM C31 & C39

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength: Maximum Load lbf	Compressive Strength: Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
3A	08-23-95	8	138000	4880				JW
3B	08-23-95	8	134500	4760				JW
3C	09-12-95	28	164000	5800				SG
3D	09-12-95	28	166000	5870				SG
	AVERAGE	8		4820				
	AVERAGE	28		5840	YES			

Comments: BID #13 OUTLET WORKS
DESIGN STRENGTH 3000 PSI AT 7 DAY/4000 PSI AT 28 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **SEPTEMBER 13, 1995**
Job No. **2745JC249**
Event/Invoice No. **17** Lab No. **27450450-7**
Authorized By **W. THOMAS** Date **08-14-95**
Sampled By **P. LLEWELLYN** Date **08-15-95**
Submitted By **P. LLEWELLYN** Date **08-16-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client **GREINER, INC., SOUTHWEST**
Project **HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location **LAUGHLIN, NEVADA**
Source of Sample **OUTLET WORKS, STA. 3+17.50 FOOTINGS**
Architect/Engineer **BLACK & VEATCH**
Contractor **AMERICAN ASPHALT & GRADING**
Supplier **WMK MATERIALS**
Truck/Ticket No. **M48/406743** Mix Identification **W261FA** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **15** gallons
Time In Mixer hours **54** minutes Ambient Air Temperature **109** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **143.9** lbf/cu.ft. Temperature: **ASTM C1064** **88** °F
Air Content; % Slump; **ASTM C143** **7-3/4** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **4** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength – Maximum Load lbf	Compressive Strength – Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
4A	08-23-95	8	117500	4160				JW
4B	08-23-95	8	119000	4210				JW
4C	09-12-95	28	160000	5660				SG
4D	09-12-95	28	162000	5730				SG
	AVERAGE	8		4190				
	AVERAGE	28		5700	YES			

Comments: **BID #13 OUTLET WORKS**
DESIGN STRENGTH 3000 PSI AT 7 DAYS/4000 PSI AT 28 DAYS

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **SEPTEMBER 11, 1995**
Job No. **2745JC249**
Event/Invoice No. **14** Lab No. **27450450-1**
Authorized By **K. SMITH** Date **08-10-95**
Sampled By **P. LLEWELLYN** Date **08-11-95**
Submitted By **P. LLEWELLYN** Date **08-12-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client	**GREINER, INC., SOUTHWEST**
Project	**HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location	**LAUGHLIN, NEVADA**
Source of Sample	**OUTLET WORKS, SEEPAGE COLLAR, STA. 1+50**
Architect/Engineer	**BLACK & VEATCH**
Contractor	**AMERICAN ASPHALT & GRADING**
Supplier	**WMK MATERIALS**

Truck/Ticket No. **409** Mix Identification **W261FA**** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **0** gallons
Time In Mixer hours **51** minutes Ambient Air Temperature **88** °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **140.1** lbf/cu.ft. Temperature: **ASTM C1064** **89** °F
Air Content; % Slump; **ASTM C143** **8** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **4** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength – Maximum Load lbf	Compressive Strength – Maximum Load lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
450-1A	08-18-95	7	141000	4990				JH
450-1B	08-18-95	7	138000	4880				JH
450-1C	09-08-95	28	173000	6120				PL
450-1D	09-08-95	28	171000	6050				PL
	AVERAGE	7		4940				
	AVERAGE	28		6090	YES			

Comments: * **BID #13 OUTLET WORKS**
****REQUIRED STRENGTH 3000 AT 7 DAYS**

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

95
MAP

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report **SEPTEMBER 11, 1995**
Job No. **2745JC249**
Event/Invoice No. **14** Lab No. **27450450-2**
Authorized By **K. SMITH** Date **08-10-95**
Sampled By **P. LLEWELLYN** Date **08-11-95**
Submitted By **P. LLEWELLYN** Date **08-12-95**

Client **GREINER, INC., SOUTHWEST**
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client	**GREINER, INC., SOUTHWEST**
Project	**HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)**
Location	**LAUGHLIN, NEVADA**
Source of Sample	**OUTLET WORKS, SEEPAGE COLLAR, STA 0+40**
Architect/Engineer	**BLACK & VEATCH**
Contractor	**AMERICAN ASPHALT & GRADING**
Supplier	**WMK MATERIALS**

Truck/Ticket No. **46/405442** Mix Identification **W261FA**** Maximum Size Aggregate **1** inches
Batch Size **10.0** cubic yards Required Strength **4000** psi @ **28** days Water Added Before Sampling **5** gallons
Time In Mixer **1** hours **5** minutes Ambient Air Temperature **102**°F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: **SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.**

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; **ASTM C138** **142.9** lbf/cu.ft. Temperature: **ASTM C1064** **90** °F
Air Content; % Slump; **ASTM C143** **6** inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded **4** Diameter/Length **6** in.x **12** in. Cross Sectional Area **28.27** sq. in.
Deviations: **SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.**

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
450-2A	08-18-95	7	151000	5340				JH
450-2B	08-18-95	7	146000	5160				JH
450-2C	09-08-95	28	180000	6370				PL
450-2D	09-08-95	28	182500	6460				PL
	AVERAGE	7		5250				
	AVERAGE	28		6420	YES			

Comments: * **BID #13 OUTLET WORKS**
****REQUIRED STRENGTH 3000 AT 7 DAYS**

Distribution : **CLIENT - (5)**
AMERICAN ASPHALT & GRADING (2)

95
MAP

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

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SAMPLING / TESTING OF PORTLAND CEMENT CONCRETE

Date of Report SEPTEMBER 11, 1995
Job No. 2745JC249
Event/Invoice No. 14 Lab No. 27450450-3
Authorized By K. SMITH Date 08-10-95
Sampled By P. LLEWELLYN Date 08-11-95
Submitted By P. LLEWELLYN Date 08-12-95

Client GREINER, INC., SOUTHWEST
ATTN: KEN SMITH
3650 SOUTH POINTE CIRCLE, SUITE 203
LAUGHLIN, NV 89028

Client GREINER, INC., SOUTHWEST
Project HIKO SPRINGS WASH DETENTION BASIN (CC BID#3476-94)
Location LAUGHLIN, NEVADA
Source of Sample OUTLET WORKS, SEEPAGE COLLAR, STA. 2+20
Architect/Engineer BLACK & VEATCH
Contractor AMERICAN ASPHALT & GRADING
Supplier WMK MATERIALS

Truck/Ticket No. 747/405523 Mix Identification W261FA** Maximum Size Aggregate 1 inches
Batch Size 10.0 cubic yards Required Strength 4000 psi @ 28 days Water Added Before Sampling 5 gallons
Time In Mixer hours 59 minutes Ambient Air Temperature 106 °F

FRESHLY MIXED CONCRETE SAMPLED IN ACCORDANCE WITH **ASTM C172**
Deviations: SAMPLED FROM THE MIDDLE THIRD OF LOAD BY SINGLE DISCHARGE.

FRESHLY MIXED CONCRETE TESTED IN ACCORDANCE WITH DESIGNATED SPECIFICATIONS
Unit Weight; ASTM C138 142.1 lbf/cu.ft. Temperature: ASTM C1064 90 °F
Air Content; % Slump; ASTM C143 8 inches
Deviations:

CYLINDRICAL CONCRETE SPECIMENS MOLDED & CURED IN THE FIELD IN ACCORDANCE WITH **ASTM C31**
No. of Specimens Molded 4 Diameter/Length 6 in. x 12 in. Cross Sectional Area 28.27 sq. in.
Deviations: SPECIMEN ENVIRONMENT WAS NOT MONITORED BY WT DURING INITIAL CURE.

CYLINDRICAL CONCRETE SPECIMENS CURED & TESTED IN THE LABORATORY IN ACCORDANCE WITH **ASTM C31 & C39**

Specimen Marking If Any	Date Tested	Age In Days	Compressive Strength — Maximum Load lbf	lbf per sq.in.	Conformance Indicated?	Type Fracture If Other Than Cone	Defects In Specimens/Caps If Any	Tested By
450-3A	08-18-95	7	122000	4320				JH
450-3B	08-18-95	7	119000	4210				JH
450-3C	09-08-95	28	157500	5570				PL
450-3D	09-08-95	28	161000	5700				PL
	AVERAGE	7		4270				
	AVERAGE	28		5640	YES			

Comments: * BID #13 OUTLET WORKS
**REQUIRED STRENGTH 3000 AT 7 DAYS

Distribution : CLIENT - (5)
AMERICAN ASPHALT & GRADING (2)

95 MP

LABORATORY TEST RESULTS REPORTED HEREIN APPLY ONLY TO THE SPECIFIC SAMPLE ON WHICH THE TEST WAS RUN. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE APPROPRIATE STANDARD OF CARE, INCLUDING THE SKILL AND JUDGMENT THAT IS REASONABLY EXPECTED FROM SIMILARLY SITUATED PROFESSIONALS. NO OTHER WARRANTY, GUARANTY, OR REPRESENTATION, EXPRESS OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY VICKI A. WOODARD
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SOIL / AGGREGATE – MOISTURE DENSITY RELATIONS

Job No. 2745JC249-1

Client Greiner, Inc. Project Hiko Springs

Event / Invoice No.

Type of Material Sand w/gravel trace silt Sampled By J. Waddell Date 4/31/9

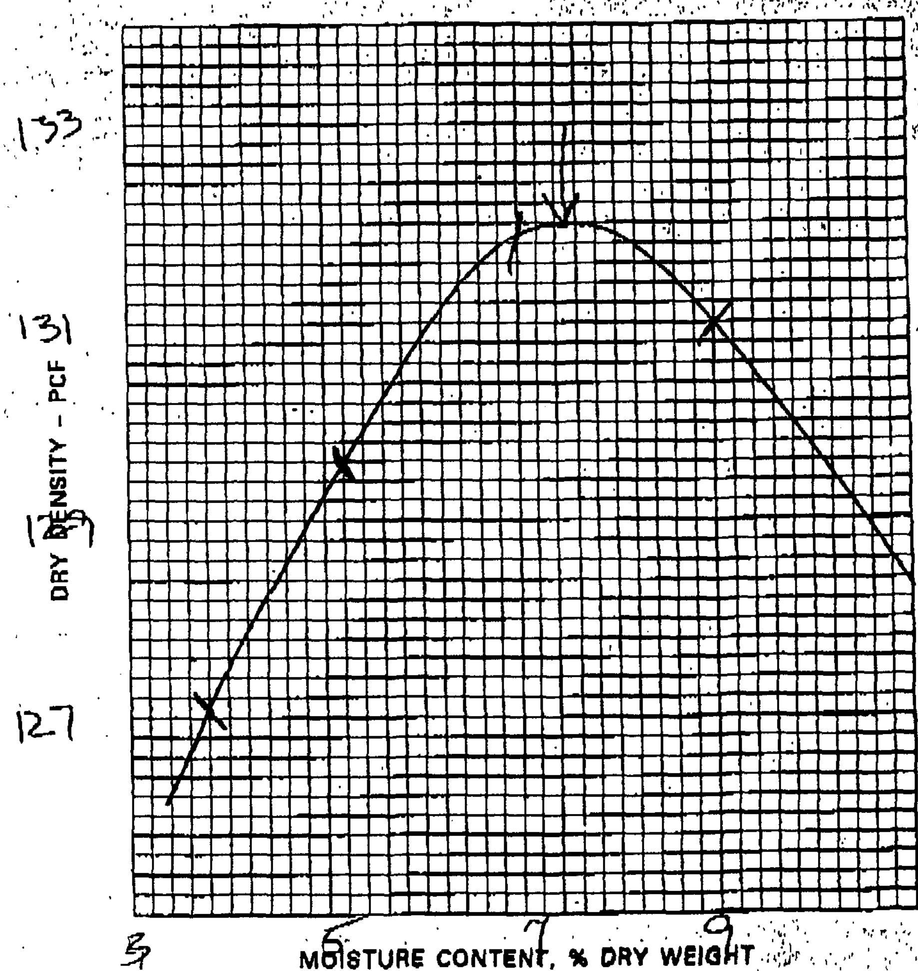
Source of Material Outlet works sta 0+00 5+93 Submitted By Date

Tested / Calc. By Date

Test Procedure ASTM D1557 B Reviewed By Date

Trial No.	1	2	3	4	5	6	7
Water, Estimated %	0	2%	4%	6%			
Water, cc	As is	60	120	180			
Sample + Mold Weight, gms	4009.8	4076.4	4148.8	4173.8			
Mold Weight, gms	2017.0	2017.0	2017.0	2017.0			
Wet Sample Weight, gms	1992.8	2059.4	2131.8	2156.8			
Wet Sample Weight, lbs	4.39	4.54	4.70	4.75			
Wet Density, pcf	131.9	136.3	141.1	142.8			
Moisture Sample Wet, gms	213.2	217.4	228.8	252.6			
Moisture Sample Dry, gms	205.4	206.7	213.8	231.7			
Weight of Water, gms	7.8	10.7	15.0	20.9			
Moisture, %	3.8	5.2	7.0	9.0			
Dry Density, pcf	127.1	129.6	131.9	131.0			

RECEIVED AUG 21 95 GREINER, INC.



Maximum Dry Density, pcf 132.0

Optimum Moisture Content, % 7.5

Corrected Density, pcf

Diameter of Mold, in. 4.0

Height of Mold, in. 4.584

No. of Layers 5

Blows Per Layer 25

Weight of Hammer, lbs 10#

Height of Drop 18"

Material Used -3/8

% Oversize 4%

Total #4 14%

SOIL / AGGREGATE – MOISTURE DENSITY RELATIONS

Client GREINER Project HIKO SPRINGS Job No. 2745JC249

Event / Invoice No.

Type of Material SAND W. FEW GRAVEL, TSILT Sampled By Date

Source of Material ON-SITE Submitted By Date

outlet works Sta. 0+00 – 5+93 Tested / Calc. By Date

Test Procedure ASTM D1557 C Reviewed By CA Date

Trial No.	1	2	3	4	5	6	7
Water, Estimated %	0						
Water, cc	AS IS						
Sample + Mold Weight, gms	11403.5						
Mold Weight, gms	6542.6						
Wet Sample Weight, gms	4860.9						
Wet Sample Weight, lbs	10.72						
Wet Density, pcf	142.9						
Moisture Sample Wet, gms	702.5						
Moisture Sample Dry, gms	652.7						
Weight of Water, gms	49.8						
Moisture, %	7.6						
Dry Density, pcf	132.8						

GREINER, INC.

DRAFT

DRY DENSITY – PCF

MOISTURE CONTENT, % DRY WEIGHT

Maximum Dry Density, pcf

Optimum Moisture Content, %

Corrected Density, pcf

Diameter of Mold, in.

Height of Mold, in.

No. of Layers Check point

Blows Per Layer on 249-1

Weight of Hammer, lbs

Height of Drop

Material Used -3/4

% Oversize 11.2%

Total #4

SOIL / AGGREG~~ATE~~ MOISTURE DENSITY RELATIONS

Client: GREINER   Project: HIKO SPRINGS   Job No.: 2745JC249

Event / Invoice No.:

Type of Material: ~~M~~ SAND w/ ~~FE~~ FEW GRAVEL, T SILT   Sampled By: ______ Date: ______

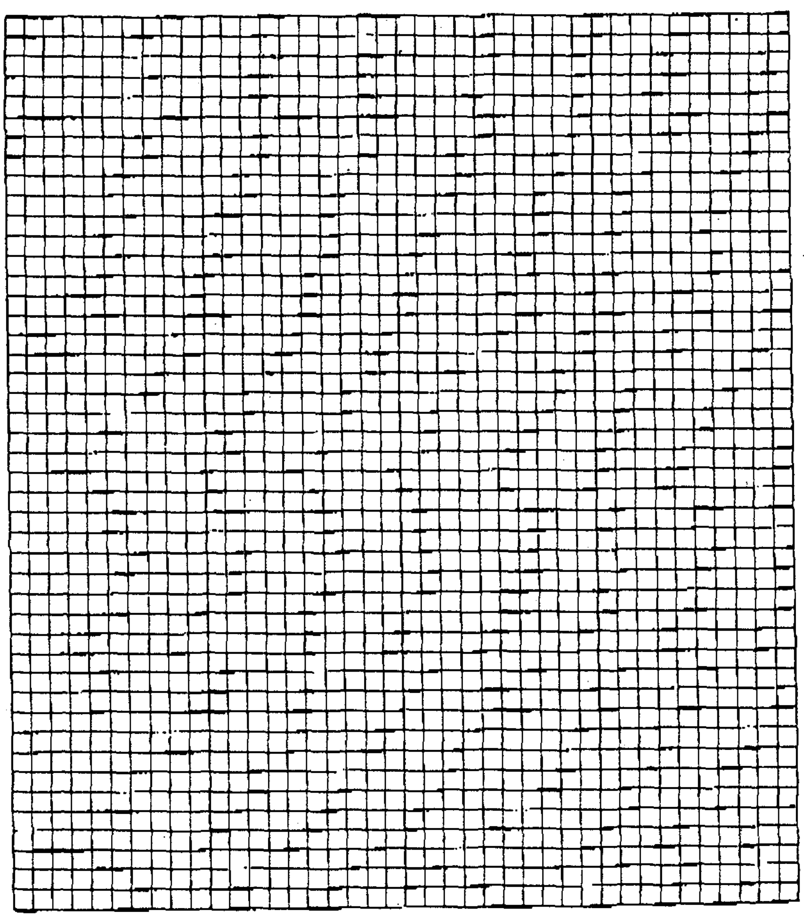
Source of Material: ON-SITE   Submitted By: ______ Date: ______

Tested / Calc. By: ______ Date: ______

Test Procedure: ASTM D1557 C   Reviewed By: CA   Date: ______

Trial No.	1	2	3	4	5	6	7
Water, Estimated %	~~0~~						
Water, cc	AS IS						
Sample + Mold Weight, gms	11403.5						
Mold Weight, gms	6542.6					95MMP	
Wet Sample Weight, gms	4860.9						
Wet Sample Weight, lbs	10.72						
Wet Density, pcf	142.9						
Moisture Sample Wet, gms	702.5						
Moisture Sample Dry, gms	652.7						
Weight of Water, gms	49.8						
Moisture, %	7.6						
Dry Density, pcf	132.8						

DRAFT



Maximum Dry Density, pcf ______

Optimum Moisture Content, % ______

Corrected Density, pcf ______

Diameter of Mold, in. ______

Height of Mold, in. ______

No. of Layers ______

Blows Per Layer ______

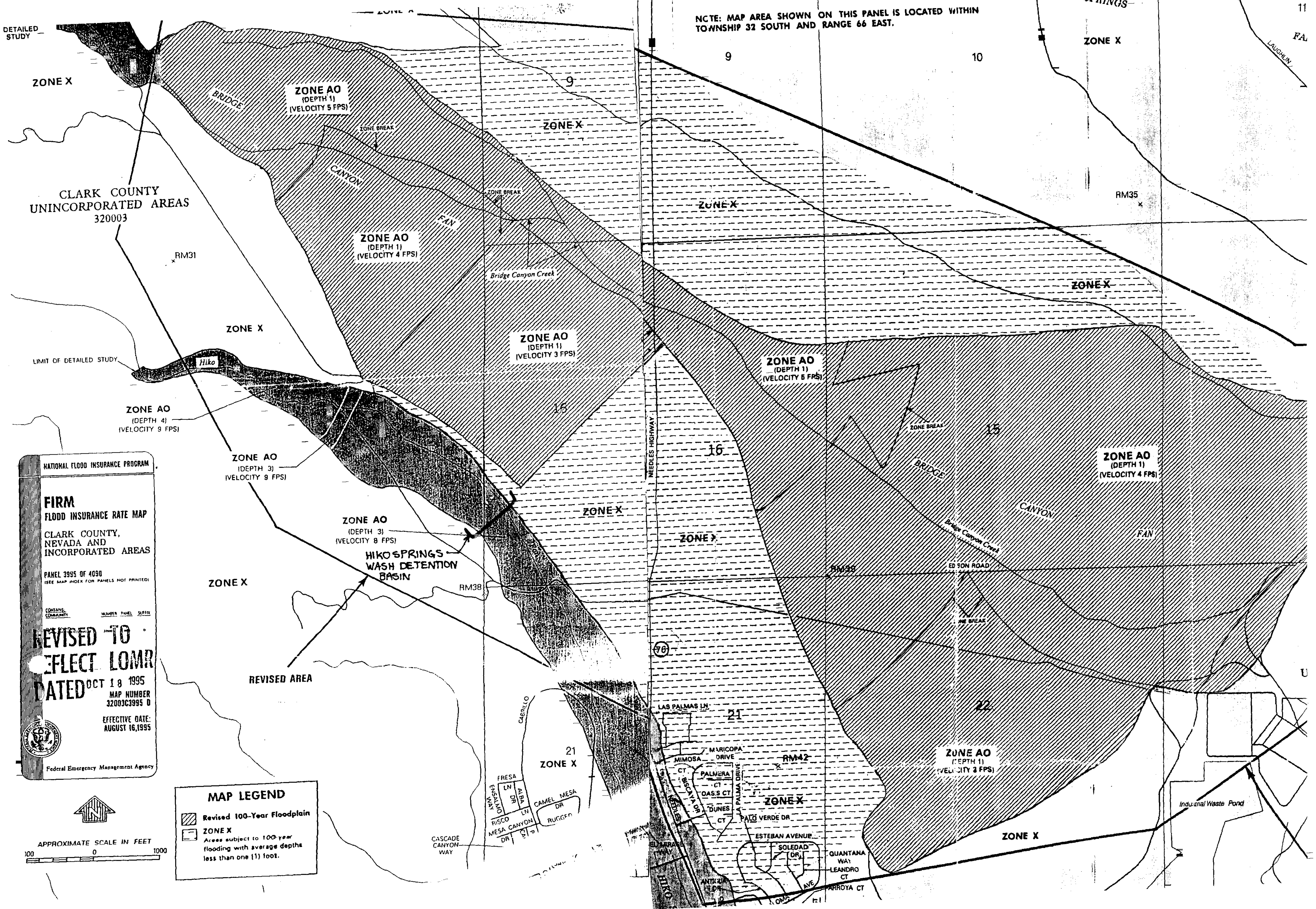
Weight of Hammer, lbs ______

Height of Drop ______

Material Used: -3/4

% Oversize: 11.2%

Total #4 ______


NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 32 SOUTH AND RANGE 66 EAST.
DETAILED STUDY
ZONE X
ZONE AO (DEPTH 1) (VELOCITY 5 FPS)
BRIDGE CANYON FAN
ZONE BREAK
ZONE AO (DEPTH 1) (VELOCITY 4 FPS)
ZONE AO (DEPTH 1) (VELOCITY 3 FPS)
ZONE AO (DEPTH 1) (VELOCITY 5 FPS)
ZONE AO (DEPTH 1) (VELOCITY 4 FPS)
ZONE AO (DEPTH 1) (VELOCITY 3 FPS)
Bridge Canyon Creek
CLARK COUNTY UNINCORPORATED AREAS 320003
RM31
RM35
RM38
RM39
RM42
LIMIT OF DETAILED STUDY
Hiko
ZONE AO (DEPTH 4) (VELOCITY 9 FPS)
ZONE AO (DEPTH 3) (VELOCITY 9 FPS)
ZONE AO (DEPTH 3) (VELOCITY 8 FPS)
HIKO SPRINGS WASH DETENTION BASIN
REVISED AREA
NEEDLES HIGHWAY
EDISON ROAD
76
LAS PALMAS LN
MARICOPA DRIVE
MIMOSA
PALMERA CT
OASIS CT
DUNES CT
LA PALMA DRIVE
PALO VERDE DR
ESTEBAN AVENUE
SOLEDAD DR
QUANTANA WAY
LEANDRO CT
ARROYA CT
CABRILLO
FRESA LN
ALBA DR
ENSALMO WAY
CAMEL MESA DR
RUGGED
RISCO
MESA CANYON DR
CASCADE CANYON WAY
Industrial Waste Pond
LAUGHLIN
9
10
15
16
21
22
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY, NEVADA AND INCORPORATED AREAS
PANEL 3995 OF 4090
(SEE MAP INDEX FOR PANELS NOT PRINTED)
REVISED TO REFLECT LOMR DATED OCT 18 1995
MAP NUMBER 32003C3995 D
EFFECTIVE DATE: AUGUST 16, 1995
Federal Emergency Management Agency
MAP LEGEND
Revised 100-Year Floodplain
ZONE X
Areas subject to 100-year flooding with average depths less than one (1) foot.
APPROXIMATE SCALE IN FEET
1000 0 1000