SUMMARY OF EXISTING FLOWS
FOR
LAS VEGAS WASH
LETTER OF MAP REVISION

550-044

October 2007

Prepared for:

Clark County Regional Flood Control District
600 South Grand Central Parkway, Suite 300
Las Vegas, Nevada 89106-4511
Phone: (702) 455-3039
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ENGINEERS PLANNERS SURVEYORS

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I. INTRODUCTION

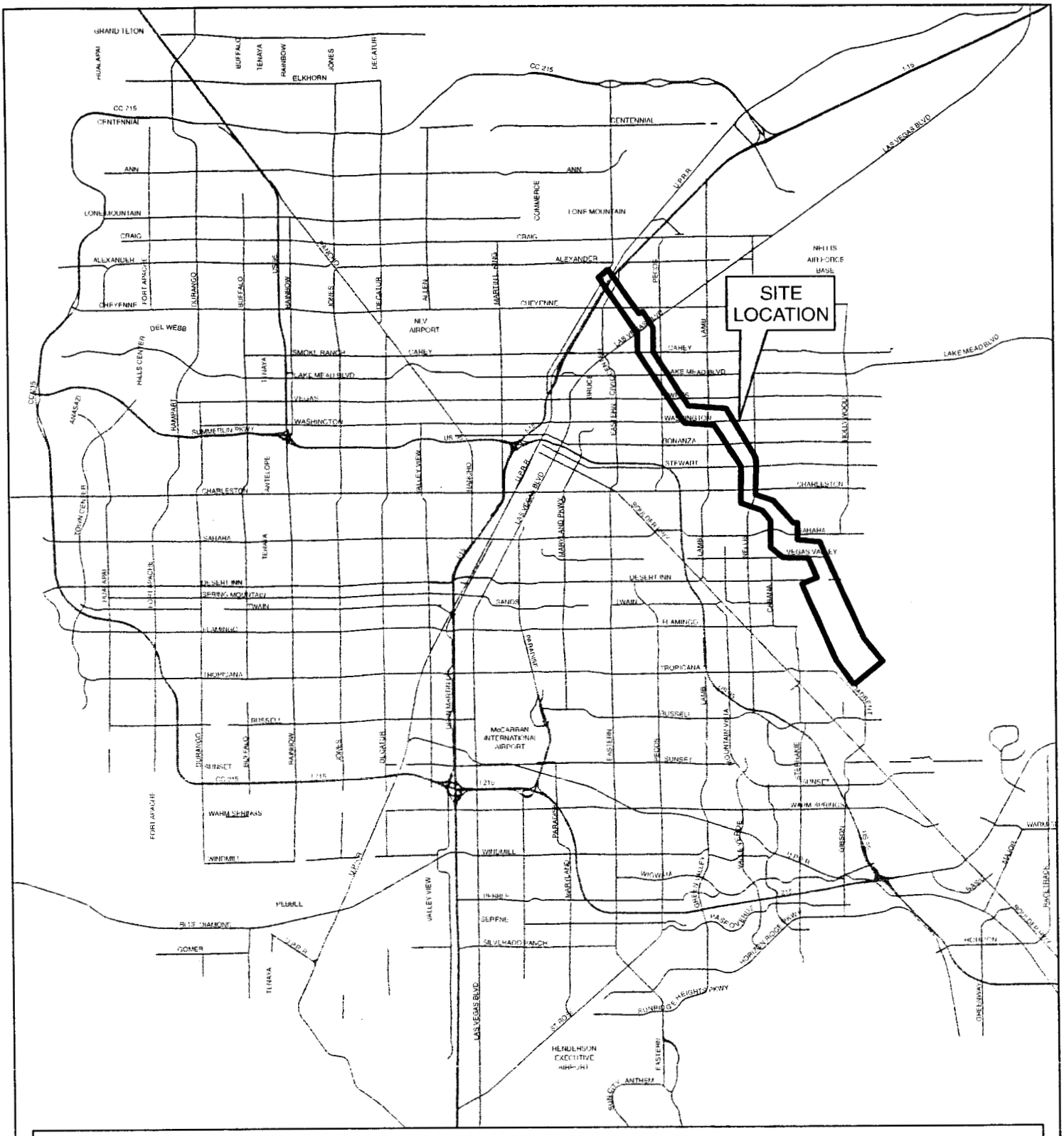
G. C. Wallace, Inc. (GCW) was authorized by the Clark County Regional Flood Control District (CCRFCD) to complete the Las Vegas Wash Letter of Map Revision (LOMR) under contract, *Agreement for Professional Services for the Las Vegas Wash LOMR I-15 to Clark County Wastewater Treatment Plant*, dated March 8, 2007. The purpose of this hydrologic analysis is to determine existing condition 100-year peak flows for the Las Vegas Wash from I-15 to Lake Las Vegas to support proposed revisions to the effective floodplain mapping. Note that the downstream limit of study for the hydraulic analysis is Tropicana Avenue. The study area is shown on Figure 1.

II. INCORPORATED STUDIES

The effective 100-year flows for the Las Vegas Wash were determined in the *1991 Flood Insurance Study for the Las Vegas Valley* (Reference 1, hereafter referred to as the 1991 FIS). The regulatory floodplain mapping shown on the FEMA FIRM panels used these flow rates from the 1991 FIS as the existing condition. Since 1991, the watersheds tributary to the Las Vegas Wash have undergone significant development, as well as changes in methodology and storm centering analyses. Therefore, the 100-year flows specified in the 1991 FIS no longer reflect existing conditions.

The *2002 Las Vegas Valley Flood Control Master Plan Update* (Reference 2, hereafter referred to as the 2002 MPU) prepared ultimate condition hydrologic modeling for the entire Las Vegas Valley, including areas tributary to the Las Vegas Wash. The 2002 MPU differed from previous updates in the way of breaking up the large watersheds into smaller subbasins and routings, with an increased level of detail.

The 2004 Upper Duck Creek Master Plan Amendment (Reference 3) incorporated revisions to the 2002 MPU that included the revised land use west of I-15, Mountain's Edge Master Plan, Duck Creek Railroad Detention Basin, Pyle Avenue storm drain, revised tributary area to the Central Duck Creek Detention Basin, Green Park and Silverado Ranch developments, Rainbow Boulevard Improvements, and Lower Blue Diamond Detention Basin.



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JANUARY 5, 2007

FIGURE 1
STUDY AREA
LAS VEGAS WASH
LOMR

ENGINEERS PLANNERS SURVEYORS

GIS

F:\550-044\DWG\GIS\LOCATION-103007.MXD BD

The 2005 Pittman Watershed – West Henderson Area Master Plan Amendment (Reference 4) incorporated revisions to the 2002 MPU that included the Pittman West Detention Basin with diversion levee and outfall channel, Pittman North Detention Basin with diversion levee and outfall channel.

The 1998 Technical Memorandum on Hydrology for the "A" Channel Lining Project (Reference 5, hereafter referred to as the Black & Veatch Study) provided a storm centering model for the northern part of the study limit. Note that this report was used to size the Cheyenne Peaking Basin.

III. METHODOLOGY

The watersheds tributary to the Las Vegas Wash have undergone significant development since the 100-year effective flow rates were determined in the 1991 FIS. The current condition of the watershed more closely resembles the ultimate condition model of the 2002 MPU than of the 1991 FIS. Therefore, the HEC-1 modeling is based from the 2002 MPU and reduced down to an existing condition by decreasing curve numbers and adjusting lag times and routings to reflect current development. In general, the modeling guidelines followed those used in the 2002 MPU.

A total of nine (9) storm centerings were evaluated to determine controlling flow rates along the study reach of the Las Vegas Wash. The storm centerings are shown in Figure 2.

A 100-year, 6-hour duration design storm, with an SDN5 storm distribution was used in the HEC-1 modeling. Depth-Area-Reduction-Factors (DARF) were applied in the HEC-1 models in relation to the tributary area to each combination point, based on Table 502 of the CCRFCD Manual (Reference 6). The precipitation values were obtained from NOAA Atlas data, and adjusted by a factor of 1.43 as specified in the CCRFCD Manual. The adjusted rainfall depths range from approximately 2.30 inches to 4.30 inches in the Las Vegas Valley watershed. Most areas have a rainfall depth of 2.77 inches or higher except for the extreme northwest portion of the Valley between the Sheep and Spring Mountains.

Curve numbers were determined by extracting curve number data from the ultimate condition HEC-1 models from the 2002 MPU, 2004 Upper Duck Creek MPA, and 2005 Pittman West MPA, and reducing them down based on aerial photos to reflect

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

LAS VEGAS WASH LOWR

CONTROLLING STORM CENTERINGS

DRAWING FIG-3 OF SHTS

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Burton Ritchie

PROJECT NO. 550-044

DESIGN: FAM
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PLOT DATE: 10-30-07
PLOT TIME: 10:04:04

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LEGEND

HEC-1 COMBINATION POINT ●1

STORM CENTERING

TABLE 1
SUMMARY OF HEC-1 MODELING

PT	LOCATION/ DESCRIPTION	STORM CENTERING	HEC-1 NODE	AREA (SQ MI.)	DARF	2007 LOMR Q_{100} (CFS)	1991 FIS Q_{100} (CFS)
1	GOWAN ROAD	B-V	3C99B-7	72.0	0.64	9112	6730
2	CHEYENNE PEAKING BASIN	B-V	CHYPKIN	72.0	0.64	9136	6730
3	CHEYENNE AVENUE	B-V	CHYPEAK	72.3	0.64	6977	6730
4	LAS VEGAS BOULEVARD	B-V	2CLVB1A-4	72.3	0.64	7573	6730
5	LAKE MEAD BLVD. - L1	MPU1	2CLVB1B-2	43.0	0.70	7800	6730
6	OWENS AVENUE	MPU1	CCK-C	58.5	0.67	7881	6730
7	SANDHILL ROAD	MPU1	CLVW01	60.1	0.66	11314	6730
8	LAMB BOULEVARD	MPU1	CCLVW03	63.5	0.66	11948	6730
9	MARRON DRIVE	MPU1	CLVW04-C	63.8	0.66	11948	6730
10	BONANZA ROAD	MPU1	CCSN15-C	67.7	0.65	12706	6730
11	CEDAR AVENUE - CHANNEL	MPU1	CCSN16-C	67.5	0.65	12754	6730
12	CHARLESTON BOULEVARD	MPU1	CCST03-C	68.0	0.64	13326	6730
13	NELLIS BOULEVARD	MPU1	CONEL04-2	73.0	0.64	13515	6730
14	CHRISTY LANE	MPU1	CONEL06	74.3	0.64	13861	6730
15	SAHARA AVENUE	MPU1	CFW37	77.3	0.64	13861	6730
16	FLAMINGO WASH - L3	MPU6	FLAMWASH	124.4	0.58	18601	7100
17	SLOAN LANE	MPU1	CSLOAN	125.4	0.57	18672	7100
18	VEGAS VALLEY DRIVE - L4	MPU1	CLLV020	126.3	0.57	18718	7100
19	DESERT INN ROAD	MPU1	CLLV060	127.7	0.57	18718	7100
20	MONSON CHANNEL	MPU1	CLLV140	138.1	0.56	18718	7100
21	TROPICANA AVENUE	MPU1	CLLV170	138.7	0.56	18798	7100
22	DUCK CREEK - L5	MPU1	CLLV200	178.1	0.53	20690	11500
23	LAKE LAS VEGAS	MPU1	CLLV410	228.8	0.51	22530	NA

MPU1

MPU6

B-V

NORTH

SCALE 5000 0 5000 10000 FEET

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a current, existing condition. A percent developed was assigned as either 0, 25, 50, 75, or 100 percent. Drainage basins with more than 50 percent of total area developed were considered "developed" in the Standard Form 4 calculations. Drainage basins with less than 50 percent of total area developed were considered "existing" in the Standard Form 4 calculations.

Lag times were calculated using Standard Form 4 from the CCRFCD Manual. Lag times were referenced from HEC-1 models in the previous studies listed above and were adjusted to reflect existing conditions. Initial lengths for "existing basins" were extended to 500 feet. Travel lengths were shortened when initial lengths were lengthened to maintain consistent total travel lengths in the lag time analysis.

Routings were verified by comparing the facility alignments from the 2002 MPU with the aerial photos to determine if flood control facilities were operational. Note that in the 2002 MPU, most routings through flood control facilities used the Muskingum-Cunge method. Routings for existing regional facilities were not changed. Routings for proposed storm drain were changed to street flow if aerial photos showed existing street alignments. Muskingum routings were used when street alignments did not exist. Routings for proposed open channels were revised by adjusting the Manning's "*n*" to represent a natural wash or unlined channel, as shown on the aerial photos. Local storm drain was assumed to exist if street improvements could be verified by aerial photo. Routings for local storm drain was changed to Muskingum routing if no street improvements were shown.

A CD containing HEC-1 models and supporting data and calculations is attached.

IV. CONCLUSIONS

Three of the nine storm centerings controlled with respect to the revised 100-year flows in the Las Vegas Wash, as shown in Figure 3. The storm centering from the Black & Veatch study, B-V, controlled the northern reach from I-15 to Las Vegas Boulevard. Storm centering MPU6 controlled only at the Flamingo Wash confluence. The remaining study reaches were controlled by storm centering MPU1. A qualitative description of flow increases compared to the 1991 FIS is outlined below:

- Cheyenne Avenue to Owens Avenue reach shows only a minor increase from the 1991 FIS due to peak reduction from the Cheyenne Peaking Basin.

TABLE 1
SUMMARY OF HEC-1 MODELING

PT	LOCATION/ DESCRIPTION	STORM CENTERING	HEC-1 NODE	AREA (SQ MI.)	DARF	2007 LOMR Q_{100} (CFS)	1991 FIS Q_{100} (CFS)
1	GOWAN ROAD	B-V	3C99B-7	72.0	0.64	9112	6730
2	CHEYENNE PEAKING BASIN	B-V	CHYPKIN	72.0	0.64	9136	6730
3	CHEYENNE AVENUE	B-V	CHYPEAK	72.3	0.64	6977	6730
4	LAS VEGAS BOULEVARD	B-V	2CLW1A-4	72.3	0.64	7573	6730
5	LAKE MEAD BLVD. - L1	MPU1	2CLV1B-2	43.0	0.70	7800	6730
6	OWENS AVENUE	MPU1	CCK-C	58.5	0.67	7861	6730
7	SANDHILL ROAD	MPU1	CLVW01	60.1	0.66	11314	6730
8	LAMB BOULEVARD	MPU1	CCLVW03	63.5	0.66	11948	6730
9	MARION DRIVE	MPU1	CLVW04-C	63.8	0.66	11948	6730
10	BONANZA ROAD	MPU1	CCBN15-C	65.7	0.65	11948	6730
11	CEDAR AVENUE CHANNEL	MPU1	CCCA10-C	67.5	0.65	12706	6730
12	STEWART AVENUE - L2	MPU1	CCST03-C	68.0	0.65	12754	6730
13	CHARLESTON BOULEVARD	MPU1	CNEL04-2	73.0	0.64	13326	6730
14	NELLIS BOULEVARD	MPU1	CCNEL06	74.3	0.64	13515	6730
15	CHRISTY LANE	MPU1	CLVCH	76.9	0.64	13861	6730
16	SAHARA AVENUE	MPU1	CFW37	77.3	0.64	13861	6730
17	FLAMINGO WASH - L3	MPU6	FLAMWASH	124.4	0.58	18601	7100
18	SLOAN LANE	MPU1	CSLOAN	125.4	0.57	18672	7100
19	VEGAS VALLEY DRIVE - L4	MPU1	CLLV020	126.3	0.57	18718	7100
20	DESERT INN ROAD	MPU1	CLLV060	127.7	0.57	18718	7100
21	MONSON CHANNEL	MPU1	CLLV140	136.1	0.56	18718	7100
22	TROPICANA AVENUE	MPU1	CLLV170	139.7	0.56	18798	7100
23	DUCK CREEK - L5	MPU1	CLLV200	178.1	0.53	20690	11500
24	LAKE LAS VEGAS	MPU1	CLLV410	228.8	0.51	22530	NA

NORTH

1000 0 1000 2000
SCALE FEET

LEGEND

HEC-1 COMBINATION POINT ● 1

JURISDICTION BOUNDARY — — —

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Burton Ritchie

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CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

LAS VEGAS WASH LOMR

SUMMARY OF HEC-1 MODELING

DRAWING
FIG-4
SHT OF SHTS

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- Sandhill Road to Sahara Avenue reach shows an increase of two (2) times the effective 100-year flow from the 1991 FIS.
- Flamingo Wash confluence to Tropicana Avenue reach shows an increase of two and half (2.5) times the effective 100-year flow from the 1991 FIS.
- Duck Creek confluence shows an increase of two (2) times the effective 100-year flow from the 1991 FIS.

The flow increases compared to the 1991 FIS are primarily due to watershed development (increase in curve numbers) and the methodology of the 2002 MPU that uses smaller subbasins. Note that the results from the MPU methodology have been confirmed in recent storm events in highly-gauged watersheds throughout the Las Vegas Valley. The results of the HEC-1 modeling for the Las Vegas Wash are summarized in Figure 4 and Table 1 below:

TABLE 1
Summary of HEC-1 Modeling

Pt*	Location/ Description	Storm Centering	HEC-1 Node	Area (Sq Mi.)	DARF	2007 LOMR Q100 (cfs)	1991 FIS Q100 (cfs)	% Change
1	Gowan Road	B-V	3C99B-7	72.0	0.64	9112	6730	35
2	Cheyenne Peaking Basin	B-V	CHYPKIN	72.0	0.64	9136	6730	36
3	Cheyenne Avenue	B-V	CHYPEAK	72.3	0.64	6977	6730	4
4	Las Vegas Boulevard	B-V	2CLW1A-4	72.3	0.64	7573	6730	13
5	Lake Mead Blvd. – L1	MPU1	2CLV1B-2	43.0	0.70	7800	6730	16
6	Owens Avenue	MPU1	CCK-C	58.5	0.67	7861	6730	17
7	Sandhill Road	MPU1	CLVW01	60.1	0.66	11314	6730	68
8	Lamb Boulevard	MPU1	CCLVW03	63.5	0.66	11948	6730	78
9	Marion Drive	MPU1	CLVW04-C	63.8	0.66	11948	6730	78
10	Bonanza Road	MPU1	CCBN15-C	65.7	0.65	11948	6730	78
11	Cedar Avenue Channel	MPU1	CCCA10-C	67.5	0.65	12706	6730	89
12	Stewart Avenue – L2	MPU1	CCST03-C	68.0	0.65	12754	6730	90
13	Charleston Boulevard	MPU1	CNEL04-2	73.0	0.64	13326	6730	98
14	Nellis Boulevard	MPU1	CCNEL06	74.3	0.64	13515	6730	101
15	Christy Lane	MPU1	CLVCH	76.9	0.64	13861	6730	106
16	Sahara Avenue	MPU1	CFW37	77.3	0.64	13861	6730	106
17	Flamingo Wash – L3	MPU6	FLAMWASH	124.4	0.58	18601	7100	162
18	Sloan Lane	MPU1	CSLOAN	125.4	0.57	18672	7100	163
19	Vegas Valley Drive – L4	MPU1	CLLV020	126.3	0.57	18718	7100	164
20	Desert Inn Road	MPU1	CLLV060	127.7	0.57	18718	7100	164
21	Monson Channel	MPU1	CLLV140	136.1	0.56	18718	7100	164
22	Tropicana Avenue	MPU1	CLLV170	139.7	0.56	18798	7100	165
23	Duck Creek – L5	MPU1	CLLV200	178.1	0.53	20690	11500	80
24	Lake Las Vegas	MPU1	CLLV410	228.8	0.51	22530	NA	NA

*Refer to Figure 4.

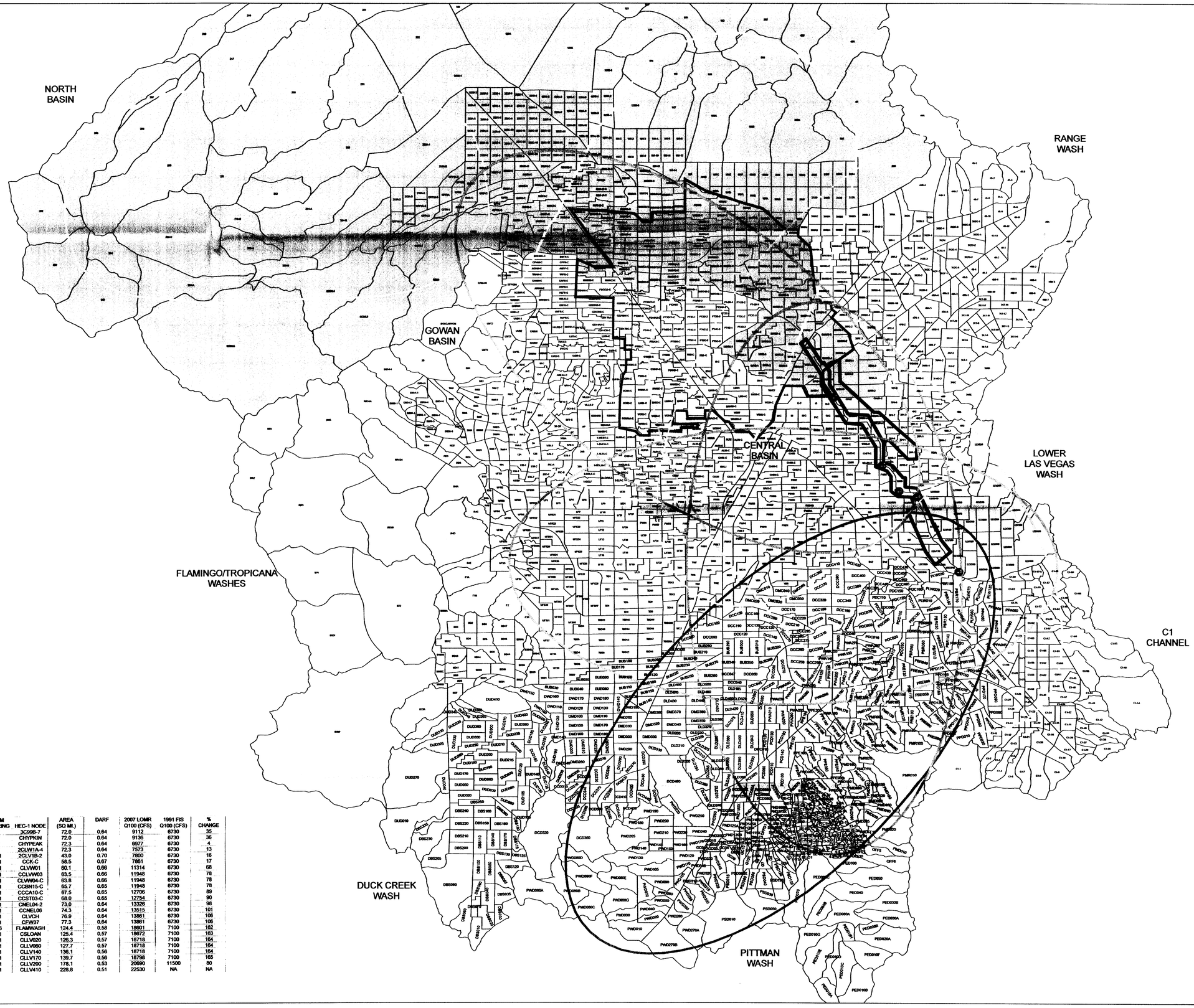

TABLE 1
SUMMARY OF HEC-1 MODELING

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3	CHEYENNE AVENUE	B-V	CHYPEAK	72.3	0.64	6977	6730	4
4	LAS VEGAS BOULEVARD	B-V	2CLW1A-4	72.3	0.64	7573	6730	13
5	LAKE MEAD BLVD. - L1	MPU1	2CLV1B-2	43.0	0.70	7800	6730	16
6	OWENS AVENUE	MPU1	CCIC-C	58.5	0.67	7861	6730	17
7	SANDHILL ROAD	MPU1	CLVW01	60.1	0.66	11314	6730	68
8	LAMB BOULEVARD	MPU1	CCLVW03	63.5	0.66	11948	6730	78
9	MARION DRIVE	MPU1	CLVW04-C	63.8	0.66	11948	6730	78
10	BONANZA ROAD	MPU1	CCBN15-C	65.7	0.65	11948	6730	78
11	CEDAR AVENUE CHANNEL	MPU1	CCCA10-C	67.5	0.65	12706	6730	89
12	STEWART AVENUE - L2	MPU1	CCST03-C	68.0	0.65	12754	6730	90
13	CHARLESTON BOULEVARD	MPU1	CNEL04-2	73.0	0.64	13326	6730	98
14	NELLIS BOULEVARD	MPU1	CCNEL05	74.3	0.64	13515	6730	101
15	CHRISTY LANE	MPU1	CLVCH	76.9	0.64	13861	6730	106
16	SAHARA AVENUE	MPU1	CFW37	77.3	0.64	13861	6730	106
17	FLAMINGO WASH - L3	MPU6	FLAMWASH	124.4	0.58	18601	7100	162
18	SLOAN LANE	MPU1	CSLOAN	125.4	0.57	18672	7100	163
19	VEGAS VALLEY DRIVE - L4	MPU1	CLLV020	126.3	0.57	18718	7100	164
20	DESERT INN ROAD	MPU1	CLLV060	127.7	0.57	18718	7100	164
21	MONSON CHANNEL	MPU1	CLLV140	136.1	0.56	18718	7100	164
22	TROPICANA AVENUE	MPU1	CLLV170	139.7	0.56	18798	7100	165
23	DUCK CREEK - L5	MPU1	CLLV200	178.1	0.53	20690	11500	80
24	LAKE LAS VEGAS	MPU1	CLLV410	228.8	0.51	22530	NA	NA

FIGURE 2
LAS VEGAS WASH LOMR
STORM CENTERINGS

V. REFERENCES

1. James M. Montgomery Consulting Engineers, Inc. *Master Plan Update of the Las Vegas Valley.* August 1991.

2. PBS&J, G.C. Wallace, Inc., Louis Berger Group. *Las Vegas Valley Flood Control Master Plan Update.* October 2002.

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5. Black & Veatch. *Technical Memorandum on Hydrology for the "A" Channel Lining Project, Addendum No. 1.* February 1998.

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