

DS #: 4536

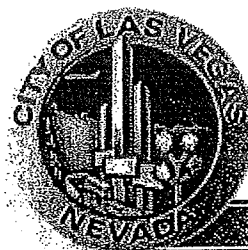
APN: 138-12-301-013

PROJECT: EWING IRRIGATION FACILITY UPGRADES
AND PARCEL MAP

SUBMITTAL: 1ST

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____





CITY OF LAS VEGAS			DATE:
INTER-OFFICE MEMORANDUM			August 25, 2011
TO: Land Development Services Department of Public Works			FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: Ewing Irrigation Facility Upgrades and Parcel Map			COPIES TO: RCI Engineering
Cross Streets:	West of Rancho Drive & Michael Way		Ewing Irrigation
File Number:	F:\Depot\DSMemos\DS4536A.ZNA.doc		Bart Anderson, P.E., DevCo
Parcel Number:	138-12-301-013		CCRFC
Zoning Action:	PMP-XXXXX		NDOT
FEMA Flood Zone	YES X	NO	
Proposed Storm Drain	YES	NO X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	8/18/2011	8/24/2011	See Comments Below	\$400.00	258239: \$400
			TOTAL FEES (LDDRS):		----

REMARKS:

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.

Since the purpose of the subject drainage study is to address the creation of a 2-Lot Parcel Map and building upgrades only, the final approval of this drainage study is limited to the recordation of the Parcel Map. No grading permit will be issued.

The site is within a FEMA Special Flood Hazard Area, Zone A. The proposed improvements are only for building upgrades and existing parking lot striping, no impact to the existing building and FEMA Flood Zone elevation changes are anticipated. Therefore, no submittal to FEMA is required.

1. Provide a copy of the zoning/planning conditions associated with this site with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions. Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
2. The site is within a FEMA designated Special Flood Hazard Area Zone A. Therefore, *Clark County Regional Flood Control District* (CCRFC) concurrence is required prior to the final approval of the drainage study.
3. The proposed public drainage easement (privately maintained) must be granted per the Parcel Map which must be recorded prior to the final approval of the drainage study.

Imp. Plans

4. Provide at least two HEC-RAS stations with base flood elevations (BFEs) labeled on the grading plan per the **Rancho / US95 LOMR Study**. The two stations appear to be STA. 171+73.04 and STA. 165 + 42.69.
5. Label an existing 25.33'-concrete channel drainage easement with recorded document number on the grading plan.
6. Clearly label the proposed lot line on the grading plan.
7. Label the finish floor elevations of existing houses along the west boundary of the subject property.

In an effort to increase administrative efficiency, the City of Las Vegas Public Works Department requires all soil reports, drainage studies and traffic impact analysis submittals to be accompanied by an electronic copy of the submittal. Electronic documents must be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output replicating your submittal to be used for archival or display purposes. This may be more than one file if necessary. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats, but provided it is a high quality digitized replication of the submittal, other formats may be acceptable. If figures are in color, they must be scanned in color and saved as a separate file. The new submittal requirement is effective on **July 1, 2011**. If there are any questions regarding these new requirements, please contact Robert Welch in the Flood Section at (702) 229-2177 or Rick Schroder in Traffic Engineering at (702) 229-6327.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
ays

T/R/S: T20S/R60E/12
AREA L-12

Rec'd: 8/18/11

**TECHNICAL DRAINAGE STUDY
FOR
EWING IRRIGATION FACILITY UPGRADES
AND PARCEL MAP**

DS 4536

Prepared for:

**Ewing Irrigation
6330 Annie Oakley Drive
Las Vegas, NV 89120
Phone: (702) 547-9430
Fax: (702) 547-4330**

L-12

\$400.

August 2011

PROJECT 4200.0001

**RCI Engineering
3281 S. Highland Drive Suite 810 * Las Vegas, NV 89109
Tel: 702.453.0800 * Fax: 702.453.0801
www.rcicnevada.com**

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Ewing Irrigation Facility Upgrades and Parcel Map Date: August 2011

Location of Development: a) Descriptive (Cross Streets) North/South: Rancho Drive

East/West: Gowan Road/ Michael Way

b) Section: 12 Township: 20S Range: 60E

c) APN : 138-12-301-013

Name of Owner: Ewing Irrigation

Telephone No.: 702-547-9430 Fax No.: 702-547-4330 E-Mail Address: _____

Address: 6330 Annie Oakley Drive Las Vegas, Nevada 89120

Contact Person-Name: Chris Zrinyi, P.E. Telephone No.: 702-453-0800

* E-Mail Address: czrinyi@rcinevada.com Fax No.: 702-453-0801

Firm: RCI Engineering and Surveying

Address: 3281 S. Highland Drive Suite 810 Las Vegas, Nevada 89109

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☒	Parcel Map	☐	Planned Unit Development	☒	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		Outdoor Sales Yard

1. Total Owned Land Area: At Site: 3.81 Ac. Being Developed/Disturbed: 0.9 Ac.

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☒ Yes** ☐ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No

4. Proposed type of development (Residential, Commercial, Etc.): Commercial

5. Approximate upstream land area which drains to the subject site: 16.1 +/- sq. miles

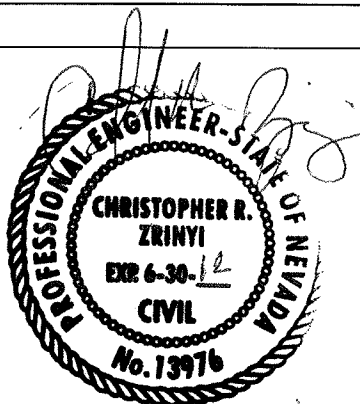
6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: _____

Drainage Report for Parcel Map for the Horn Company (PM 39-96) by the WLB Group

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: _____

South east along Rancho Drive

8. Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal 8/17/11

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*New Required Field

**Review and concurrence of the Clark County Regional Flood Control District is required.

	Revision	Date
Local Entity File No. _____		

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name:	Ewing Irrigation Facility Upgrades and Parcel Map	Map ID:
Firm Name:	RCI Engineering	Engineer: Chris Zrinyi, P.E.
Address:	3281 S. Highland Drive Suite 810	
City:	Las Vegas	State: Nevada Zip: 89109
Phone Number:	453-0800	Fax Number: 453-0801
Property Owner: Ewing Irrigation		
Address: 6330 Annie Oakley Drive		
City: Las Vegas	State: Nevada	Zip: 89120
Reviewed By:	Date Received:	Date Accepted for Review:

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT:

Yes	No	
☒		Design Manual Standard Form 1 with the engineer's seal and signature.
	☒	Design Manual Standard Form 4 .
☒		2 copies of the 24" x 36" Drainage Plan.
	☒	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

Reference:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS

Yes	No	
☒	☐	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
☒	☐	A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.
☐	☒	On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
☒	☐	Vicinity Map with local and major cross streets identified and a north arrow.
☐	☒	Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.

III. DRAINAGE PLAN

Yes	No	
☒	☐	Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
☒	☐	Minimum scale: 1" = 60'.
☒	☐	Project name.
☒	☐	Vicinity Map with local and major cross streets.
☒	☐	Revision box.
☒	☐	North arrow and bar scale.
☒	☐	Engineer's/consultant's address and phone number.
☒	☐	Elevation datum and benchmark.
☒	☐	Legend for symbols and abbreviations.
☒	☐	Cut/fill scarps, where applicable.
☒	☐	Street names, grades, widths.
☒	☐	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
☒	☐	Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.
☒	☐	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
☐	☐	N/A Proposed typical street sections.
☐	☐	N/A Streets with off-set crowns.
☒	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	Property lines.
☒	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	Existing improvements and their elevations.
☐	☐	N/A Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
☐	☐	N/A Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☐	☐	N/A Location and cross-section of street capacity calculations.
☐	☐	N/A Cross-sectional detail for channels, including cutoff wall locations.
☒	☐	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations.
☒	☐	Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
☒	☐	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16"x48". Wrought iron gate is required for flows > 10 cfs.
☐	☐	N/A Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes

No

X

Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood Walls with 8-inch concrete masonry unit.

N/A

Building and/or lot numbers.

X

Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.

X

Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

X

For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.

N/A

Appropriately elevated "humps" 6 inches above the 100-year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.

N/A

Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

IV. HYDROLOGIC ANALYSIS

Yes

No

N/A

Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.

N/A

Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.

N/A

Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.

N/A

Use of correct precipitation values in and around the McCarran Airport Rainfall Area.

N/A

A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.

N/A

A summary table of storm water flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where acceptable.

X

Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.

X

On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
	N/A	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
	N/A	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
	N/A	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
X		Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
	N/A	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
X		Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, which ever is greater.
	N/A	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones.
	N/A	- Field survey data. - Input and output information. - Plotted cross-sections based on survey with proper encroachments. - A map showing the location of the cross-sections. - Analysis of both sub- and super-critical flow segments. - A summary table and a discussion of the results in the text of the report.
	N/A	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
	N/A	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
X		The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.

REFERENCE:

STANDARD FORM 2

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I. INTRODUCTION

Ewing Irrigation is proposing to make improvements to an existing 3.81 +/- acre commercial site adjacent to Rancho Drive within the City of Las Vegas. The improvements will consist of interior fire sprinkler additions to the existing building, construction of an onsite fire line, and construction of an outdoor sales area with a CMU screen wall. Additionally, Ewing Irrigation proposes to subdivide the property with a Parcel Map. The purpose of this report is to accompany the civil improvement plans and parcel map, to provide detailed hydrological and hydraulic analyses for the site, and to determine adequate protection for the project from offsite flows. The following tasks were performed in the preparation of this report:

- ♦ Identify previous drainage studies for the project site and surrounding areas.
- ♦ Identify the FEMA floodplain designation for the project site.
- ♦ Identify existing and proposed regional drainage facilities adjacent to the site.
- ♦ Estimate runoff generated for the peak offsite 100-year return period storm for existing and proposed conditions.
- ♦ Recommend drainage facilities to protect the project from storm runoff.

II. LOCATION AND DESCRIPTION

The Project is located in Section 12, Township 20 South, Range 60 East, M.D.M., in Las Vegas, Nevada. The site is located on the west side of Rancho Drive, south of Gowan Road, and north of Michael Way.

The site is presently developed with an asphalt parking lot and an existing building. The project is bordered by an existing channel to the north, existing residential development to the west (Trilogy), existing Rancho Drive improvements to the east, and an undeveloped lot and an existing office building on the south. Please refer to Figures 1 and 2 for the vicinity and location maps.



EWING IRRIGATION FACILITY UPGRADES
EWING IRRIGATION

FIGURE 1
VICINITY MAP

RCI Engineering

3281 S. HIGHLAND DRIVE SUITE 810, LAS VEGAS, NV 89109
PH#702.453.0800 FAX#702.453.0801



GOWAN ROAD

RANCHO DR

PROJECT SITE

TRILOGY DR

LOT 1
LOT 2

MIRAMAR DR

SANTA CATALINA AVE

MICHAEL WAY

400' 200' 0' 400' 800'



SCALE: 1" = 400'

EWING IRRIGATION FACILITY UPGRADES
EWING IRRIGATION

FIGURE 2
LOCATION MAP

RCI Engineering

3281 S. HIGHLAND DRIVE SUITE 810, LAS VEGAS, NV 89109
PH#702.453.0800 FAX#702.453.0801

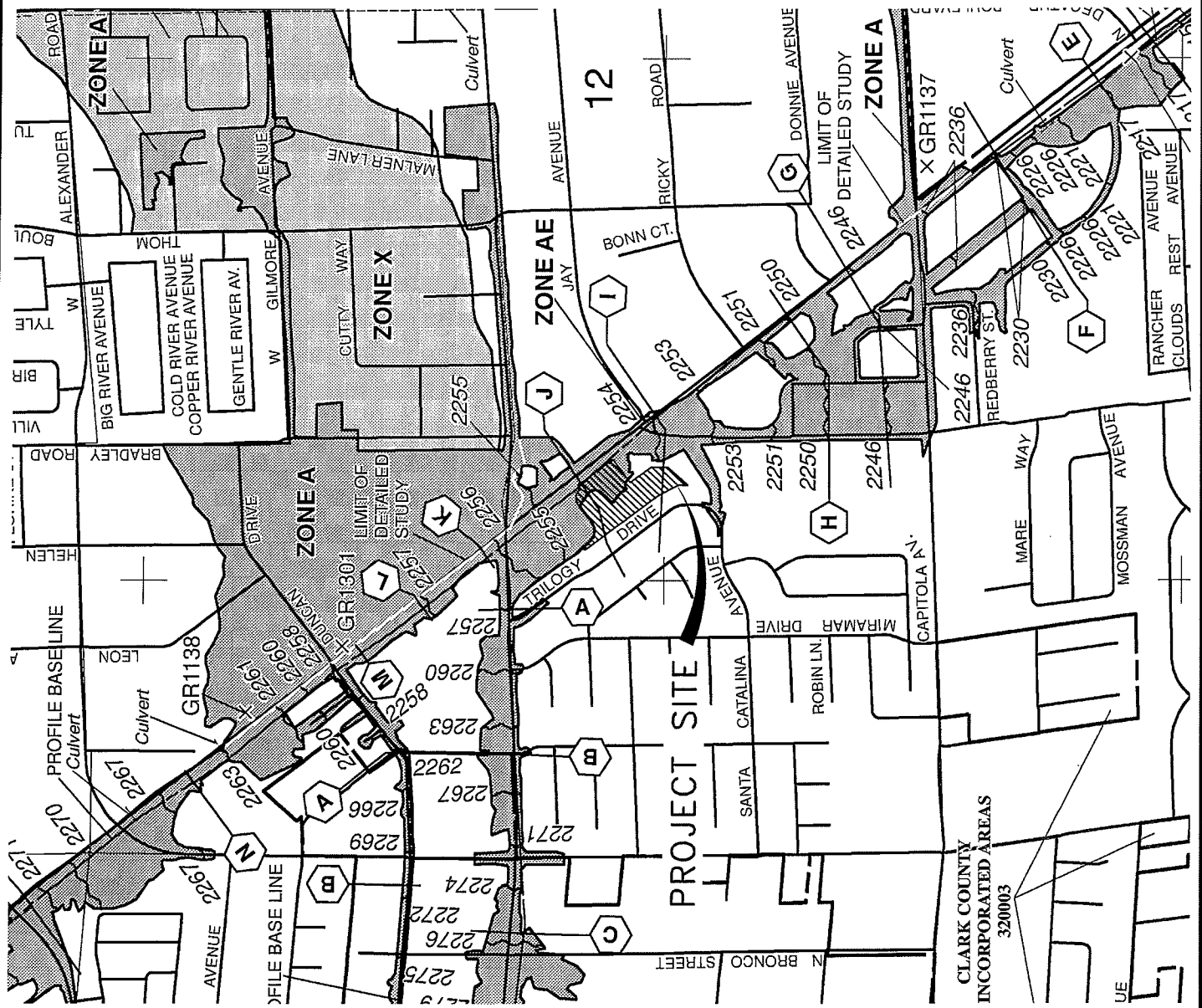
III. FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD HAZARD ANALYSIS

Figure 3 was reproduced from a future Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) containing Community Panel Number 32003C2155 F, dated November 16, 2011. A future FIRM is defined as a map that will become effective within the next 6 months or less. Predesign discussions with the City of Las Vegas staff have determined that for this Project the future FIRM is the best available data and should be used. Review of the FIRM shows that the Project is currently located within Zone AE and Zone X.

Zone AE areas are defined as 100-year floodplains that are determined in the FIS by detailed methods. Zone X areas are defined as areas outside of the 100-year floodplains; areas of 100 year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100 year flood.

The Base Flood Elevation (BFE) and detailed hydraulic analysis used for the FIRM map preparation was the Rancho Drive / US 95 LOMR Study prepared by the Louis Berger Group (Reference 1, hereinafter referred to as the LOMR Study). Pertinent excerpts from that study have been included for reference in the Appendix of this report. Sheets C9R and C10R from the LOMR Study show the AE Flood Zone boundaries relative to the Project.

Since a portion of the property is located within a FEMA-designated Special Flood Hazard Area (SFHA) Zone AE, CCRFCD concurrence of this drainage study will be required. Upon conditional approval by the City of Las Vegas, this drainage study will be submitted to CCRFCD.



IV. CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT FACILITIES

Figure 4 is reproduced from Figure F-26 of the 2008 *Clark County Regional Flood Control District (CCRFCD) Master Plan Update* (Reference 2, hereinafter referred to as the 2008 MPU). This figure depicts the project site in relation to existing and proposed CCRFCD facilities. As shown on the figure, the site is not adjacent to or crossed by an existing or proposed CCRFCD facility. The nearest CCRFCD facility (GOOF 0486) located in Gowan Road is approximately 500 feet north of the site.

V. HYDROLOGY

The methodology presented in this study is in compliance with the *CCRFCD Hydrologic Criteria and Drainage Design Manual* (Reference 3, hereinafter referred to as the Manual). Hydrological models were presented in the LOMR Study for the 100-year flow rates in Rancho Drive. An additional HEC-1 model was not prepared since flow rates determined in the LOMR Study are the best available data for the site. The LOMR Study analyzed an SDN3 and an SDN5 rainfall distribution to determine the controlling storm centering for the flow rates to the Rancho / Gowan intersection. The SDN5 model produced the controlling flow rate. Excerpts from the model have been included in the Appendix for reference. The LOMR Study determined that 761 cfs will continue south along Rancho Drive just south of Gowan Road during a 100-year storm event. This flow rate was shown as LWRRNCH in the HEC-1model and includes a tributary area of 16.08 square miles. Approximately 400 cfs of the 761 cfs weirs over Rancho Drive and the remaining 361 cfs continues south along Rancho Drive. This flow combines with 79 cfs from the channel along the northern boundary of the site for a total flow rate of 440 cfs along the west side of Rancho Drive adjacent to the Project. This flow rate was shown as Concentration Point CBDV1 in the HEC-1model. The 440 cfs is the controlling flow that will be used to set required easement widths and to verify that the existing building is adequately protected during a 100-year storm event.

VI. EXISTING CONDITIONS

Under existing conditions the site is fully developed with a single story metal building located on the north side of the parcel. The building was constructed based on improvement plans entitled US Rentals prepared by Carter Burgess (Reference 4 hereinafter referred to as the US Rentals plans). A Technical Drainage Study entitled PM 39-96 by the WLB Group (Reference 5 hereinafter referred to as the WLB Study) was approved after the US Rentals plans were approved. The WLB Study updated the HEC-2 run that was prepared for the US Rentals site. Pertinent references from the WLB Study have been included in the Appendix. The HEC-2 run from the WLB Study included cross sections on the north (Section 9) and south (Section 8) sides of the building. Both sections were based on a 100-year flow rate of 597 cfs. Section 9 showed a 100-year water surface elevation of 52.44 and Section 8 showed a 100-year water surface elevation of 52.39. The finish floor of the building was shown at elevation 54.5 which produced approximately two feet of freeboard above the calculated 100-year water surface elevation. Please note that the water surface elevations and finish floor elevation as presented in the WLB study appears to be based on a lower datum than the elevations as presented in the LOMR Study and shown on the attached improvement plans for the Project. These elevations were only mentioned in this report to show that previous references established that the existing building finish floor elevation was sufficiently elevated above the 100-year water surface elevation.

Existing condition drainage patterns that determined the Zone AE floodplain limits along the Project as shown on the FEMA FIRM were analyzed in detail in the LOMR Study. Figure 5 depicts the existing condition flow patterns, Zone AE, and existing improvements. The LOMR Study showed a flow rate of 440 cfs along Rancho Drive adjacent to the Project during a 100-year storm event. This flow rate is lower than the 597 cfs analyzed in the WLB Study. The reduction in flow rates is based upon updated hydrological and hydraulic modeling that includes constructed flood control improvements and extensive flow split analyses at upstream locations. The LOMR is the best available data for the site and will supercede the flow rates and HEC-2 modeling as presented in the WLB Study.

VIII. ULTIMATE CONDITIONS

Under ultimate conditions future upstream CCRFCD facilities will be in place that would reduce or eliminate the flood zone along Rancho Drive. Figure F-14 from the City of Las Vegas Northwest Neighborhood Study by PBS&J (Reference 6 hereinafter referred to as the CLV Study) shows a future condition 100-year flow rate of 375 cfs in Rancho Drive south of Gowan Road at the same location where the LOMR study showed 761 cfs. The LOMR Study used the lateral weir option in HECRAS to develop a rating curve that shows 400 cfs of the 761 cfs will weir over Rancho Drive prior to combining with the flow from the channel north of the site. The LOMR Study showed 79 cfs in this channel for a total flow rate of 440 cfs at the Projects northern boundary. The CLV Study shows 155 cfs in the channel north of the site for a total flow rate of 530 cfs (375 + 155) at the Project boundary along the west side of Rancho Drive. The ultimate condition flow rate of 530 cfs from the CLV Study is higher than the flow rate of 440 cfs as presented in the LOMR Study. However, RCI believes the flow rate of 530 cfs is no longer valid since the CLV Study was prepared in 1997 and does not account for changes in the regional master plan that would reduce flow rates tributary to the west side of Rancho Drive. Additionally, the CLV Study does not account for a flow split in Gowan Road at Jones Boulevard west of Rancho Drive that was modeled in the LOMR Study and the CLV Study doesn't account for the flow that weirs over Ranch Drive north of the Project.

For comparison purposes the rating curve used in the LOMR Study was interpolated to determine how much of the 375 cfs shown in the CLV Study could weir over Rancho Drive prior to the Project boundary. The calculation (included in the Appendix) shows that 162 cfs of the 375 cfs will weir over Rancho Drive and the remaining 213 cfs would combine with the flow rate of 155 cfs in the northern channel (CLV Study) for a total flow rate of 368 cfs which would be less than the 440 cfs shown at this point in the LOMR Study. Please note that this calculation conservatively does not account for the flow split in Gowan Road at Jones Boulevard west of Rancho Drive that was included in the LOMR Study. Since the finish floor of the existing building is elevated approximately 1.7-feet above the 100-year water surface elevation based on the flow rate of 440 cfs flows, no additional flood protection measures will be required.

IX. CONCLUSIONS AND RECOMMENDATIONS

1. Methodology used in this report is in compliance with the Clark County Regional Flood Control District (CCRFCD) criteria.
2. The proposed project lies within a FEMA Zone X and FEMA Zone AE. Therefore, a portion of the Project is currently located in a FEMA-designated Special Flood Hazard Area and CCRFCD concurrence will be required.
3. The proposed onsite improvements do not significantly alter existing peak flows or the character of flows downstream of the development.
4. The existing building on the site has adequate freeboard to be protected from storm flows conveyed along Rancho Drive.
5. The proposed Parcel Map will include a public drainage easement that will encompass the entire Zone AE Special Flood Hazard Area.

X. REFERENCES

1. The Louis Berger Group, Inc. *Rancho Drive / US95 LOMR*. November 2006.
2. Post, Buckley, Schuh & Jernigan Inc., Louis Berger Group, and Parsons Brinckerhoff, *Clark County Regional Flood Control District - The 2008 Las Vegas Valley Master Plan Update*. September 2008.
3. Clark County Regional Flood Control District *Hydrologic Criteria and Drainage Design Manual*, updated August 1999.
4. Carter Burgess. *Improvement Plans for US Rental*. September 1996.
5. WLB Group, *Technical Drainage Study for PM 39-96*. December 1996.
6. Post, Buckley, Schuh & Jernigan Inc., *City of Las Vegas Northwest Neighborhood Study Phase 1*. December 1997.

RANCHO DRIVE / US 95 LOMR

Prepared For:

**CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
731 S. FOURTH STREET
LAS VEGAS, NV 89101**

Prepared By:

**THE LOUIS BERGER GROUP, INC.
500 E. AMIGO COURT, SUITE 100
LAS VEGAS, NV 89119**

November 13, 2006



For this LOMR, Berger extended the SDN3 storm boundary (north of Gowan Road) up to a maximum of 8 square miles to include the area outlined in blue on Figure 4. The SDN3 flows controlled along Rancho Drive north Gowan Road, and the SDN5 event controlled at all other locations. The new flood control facilities have reduced the SDN5 flow along Rancho Drive between Alexander Road and Gowan Road to a point where the SDN3 flow now controls in this reach.

5.2 Effective and Proposed HEC-1 Files and Documentation

Four hydrologic models from the Effective FISR and FIS were used as a base for modeling in this LOMR. The models are listed in Table 1.

Table 1 Effective HEC-1 Models

Reference	Model	Rainfall Distribution	Watershed Boundary
US 95 and Rancho Drive FISR	EX3R.dat	SDN3	Figure 4 (Red)
US 95 and Rancho Drive FISR	EXA5R.dat	SDN5	Figure 3 (Red)
NLV FIS	WASH.dat	SDN3	Figure 4 (yellow)
NLV FIS	CAREY-F.dat	SDN5	Figure 3 (yellow)

Berger created a new SDN5 model for the watershed area shown on Figure 5 by combining EXA5R.dat (north of Gowan Road) from the US 95 and Rancho Drive FISR and CAREY-F.dat (south of Gowan Road) from the NLV FIS. The boundaries and routing were revised to reflect the new flood control facilities. This model is referred to herein as the "Proposed SDN5" model. The HEC-1 output for Proposed SDN5 model is provided in Appendix C1. The HEC-1 input file, named PROPSDN5.dat, is provided on the enclosed CD ROM under the "Proposed HEC-1 files" directory.

For this LOMR, two SDN3 events were modeled: 1) north of Gowan Road; and, 2) south of Gowan. The drainage basins for the models were based on the effective EX3R.dat and WASH.dat models. The boundaries of the storm areas are shown on Figure 4. In this report, the models are referred to as the "Proposed Upper and Lower Rancho SDN3" HEC-1 models, respectively. The HEC-1 output for the Proposed SDN3 models is provided in Appendix C2 and C3, respectively. The HEC-1 input files, UPPRSDN3.dat and LOWRSDN3.dat, are provided on the enclosed CD ROM under the "Proposed HEC-1 files" directory.



6.0 COMPARISON OF EFFECTIVE AND PROPOSED HEC-1 MODEL RESULTS

Figure 7 is an annotated flood zone map showing the Effective and Proposed 100-year flow rates along the US 95, Gowan Road and Rancho Drive corridors. The flow rates in the study area are also shown on the Work Maps in Appendix A. Proposed flow rates are shown in blue and are above the flow arrow. An asterisk denotes that the SDN3 event controlled that flow rate. Flow rates without an asterisk denote the SDN5 event controlled. Effective flow rates are red and below the flow arrow. Red flow rates in parenthesis denote flow from the NLV FIS. These flows may be either SDN3 from WASH.dat or SDN5 from CAREY-F.dat.

Additional information related to the Proposed flow rates is provided on Table E1 in Appendix E. Table E1 compares the SDN3 and SDN5 flow rates for each node and identifies the controlling (highest) storm event for use in the HECRAS modeling.

The following subsections discuss the differences between the Effective and Proposed flow rates along US 95, Gowan Road and Rancho Drive.

6.1 US 95 Effective and Proposed HEC-1 Results

The new flood control projects shown on Figure 2 did not affect flow rates along US 95 north of Red Coach Avenue. Therefore, for this LOMR, Red Coach Avenue is the northern limit of study along US 95. US 95 was the eastern limit of study and Gowan Road was the southern limit.

South of Red Coach Avenue, the flows were significantly reduced due to diversions into the Ann Road (CAM10) Detention Basin, Beltway Channel, Gowan North Lone Mountain Channel, Gowan North Buffalo Branch and Ann Road (CAM10) Detention Basin. The 100-year flow along US 95 was reduced on average by approximately 40 percent. For example, the Effective flow at Alexander Road was 2,640 cfs compared to the Proposed flow of 1,679 cfs.

6.2 Gowan Road Effective and Proposed HEC-1 Results

Although there is not an Effective floodplain or HECRAS model for Gowan Road, the Effective HEC-1 models routed flow along Gowan Road. The flow in Gowan Road was reduced by approximately 35 percent (see Figure 7).

* There are three locations where flow breaks out of Gowan Road: 1) Maverick Street; 2) Jones Boulevard, and 3) the True Value Hardware alleyway. At Maverick Street, the neither of the Effective studies had a diversion. A diversion was added in this LOMR based on the HECRAS model for Gowan Road. *



Proposed HEC-1 models, 188 cfs is diverted north on Maverick Street to Duncan Road then east to Rancho Drive.

* [At Jones Boulevard, flow breaks out from Gowan Road, turns east on the first two streets parallel to Gowan, and eventually drains to the intersection of Rancho Drive and Michael Way. The Jones Boulevard diversion rating curve from the FISR was not revised for this LOMR. The flow diversion in the Effective FISR HEC-1 model is 871 cfs compared to 442 in the Proposed model. The diversion in the NLV FIS was 830 cfs. Floodplain mapping for Jones Boulevard was not conducted in the Effective studies or this LOMR.] *

6.3 Rancho Drive Effective and Proposed HEC-1 Results

Along Rancho Drive, the LOMR flood control projects did not affect flow rates north Craig Road. Therefore, Craig Road is the northern limit of study for this LOMR. Rancho Drive was the eastern limit of study for this LOMR. The boundary of the Effective Zone A south of Vegas Drive is the southern limit of study.

Between Craig Road and Alexander Road, the Proposed flow is within 30 cfs of the Effective flow. Significant reductions occur south of Alexander Road where the Proposed flow is up to 60 percent less than the Effective flow. For example, south of Alexander Road the Effective flow is 1353 cfs and the Proposed flow is 541 cfs.

At Duncan Drive, the Proposed flow diverted from Gowan Road to Maverick Street joins Rancho Drive flow. Downstream of Duncan Drive, the Effective FISR flow is 293 cfs and the Proposed flow is 279 cfs.

The total flow to the Gowan Road / Rancho Drive intersection has been reduced significantly by this LOMR. There are three flow splits in the immediate vicinity of the intersection. Estimates of the flow splits significantly differ between the two prior Effective studies and this LOMR.

The US 95 and Rancho Drive FISR Effective "rating curve" for this intersection had 100 percent of any flow less than 1,142 cfs continuing across Rancho Drive. All flow greater than 1,142 cfs (966 cfs) went south along Rancho Drive. The True Value in the NLV FIS was removed in the FISR. No water went into the Gowan Outfall. Below is an excerpt from the EXA5R.dat file:



depth exceeded the east top of curb. Five weirs were used. Weir #1 is between stations 38+36 and 28+01. Weir #2 is between 28+01 and 22+08. Weir #3 is between 19+32 and 14+56. Weir #4 is between stations 9+83 and 7+43. The fifth weir is between stations 2+26 and 0+00. Station 0+00 corresponds to the south curb line of Gowan Road and is identical to Station 177+03.33 of the Lower Rancho Drive model. The rating curves of these lateral weirs were combined with the rating curves of any culverts also located in the vicinity to develop the rating curves used in the HEC-1 model. Table 3 shows how the HEC1 diversions were developed.

Table 3 Source of HEC-1 Flow Diversions

Lateral Weir	Culvert Number	HEC-1 Diversion
Weir #1	#30	D6RCHO
Weir #2	#31	D7RCHO
Weir #3		DDUNCAN
Weir #4	#32	D8RCHO
Weir #5		DEASTGOWAN

7.4 Creation of the Rancho Drive South of Gowan Road HECRAS Model

There is an Effective HEC-1 model for Rancho Road south of Gowan but not an Effective HECRAS model. BERGER used GEO-HECRAS to extract cross-section from the new topographic data and create a HECRAS model. This model was not combined with the northern Rancho Drive model in order to preserve the existing cross-section names from the 1998 US 95 FISR Effective model north of Gowan Road. The upstream end of the Lower Gowan model exactly matches the downstream end of Upper Rancho Drive model. Driveway culverts were field measured (not surveyed) and included in the Proposed model.

* One lateral weir was used to develop a rating curve for the HEC-1 model. This weir is between 177+03.33 and 174+97.06 of the Lower Rancho Drive model. The HEC-1 diversion is called D9RCHO. *

The land slopes from east to west in the vicinity of this study. The east side of Rancho Drive is lower than the road and continues to fall for several miles to Lake Mead. Ineffective flow areas at the east curblin were used to prevent HECRAS from using the area east of Rancho Drive as effective flow area. The cross-sections were not cut off at that curblin because this would have caused

**TABLE E1 - RANCHO/US95 CONDITIONAL LETTER OF MAP REVISION
HIGHEST FLOW FROM SDN3 AND SDN5 STORMS**

	HECRAS X-SECTION (ft)	HEC1 NODE	PROPOSED SDN5 PROPSDN5.OUT (cfs)	PROPOSED UPPER RANCHO SDN3 UPPRSDN3.OUT (cfs)	PROPOSED LOWER SDN3 RANCHO DR. LWRSDN3.OUT (cfs)	CONTROLLING FLOW	CONTROLLING SDN#
LOWER RANCHO DRIVE (BELOW GOWAN RD INTERSECTION)							
	17703	LWRRNCH	761	671	NA	761	5
	17497.06	CENTRL1	360		NA	360	5
	17173.04	CBDV1	439	end	NA	439	5
	16542.69	CBDVMORB	830	of	NA	830	5
	16236.51	CBCX5	723	model	127	723	5
*not used in HECRAS	15031.36	DVWR2	463	N/A	90	463	5
	14411.04	CX4X3	462	N/A	533	533	3
	12719.33	RX341	495	N/A	322	495	5
	11608.09	CX1X4	742	N/A	668	742	5
	11200	RX342	1	N/A	1	1	3
	n/a	N2	106	N/A	131	131	3
*not used in HECRAS	n/a	CN1	211	N/A	261	261	3
	8765.93	COMM	63	N/A	60	63	3
	7977.18	CXK	64	N/A	150	150	3
	7607.41	RXLM	0	N/A	1	1	3
		RNCHMEAD	545	N/A	654	654	3
		LMSD1	545	N/A	573	573	3
	6800	CBMED	0	N/A	81	81	3
	6584.1	MEAD	0	N/A	0	0	3
*not used in HECRAS	6400	DV6X3	0	N/A	0	0	3
*not used in HECRAS	5670	DV2ND6X3	0	N/A	0	0	3
*not used in HECRAS		DV24"	0	N/A	0	0	3
	5560.18	CBJ2	97	N/A	141	141	3
	4255.94	DVCOR	97	N/A	138	138	3
	1723.77	CBVEG	252	N/A	364	364	3
*not used in HECRAS	1523	VDSD	27	N/A	14	27	5
	907.91	DVWGS	15	N/A	8	15	5

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 11JAN06 TIME 10:35:32
*
*****

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*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

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X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXX 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 -AMSK- 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

1

HEC-1 INPUT

PAGE 1

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

*DIAGRAM

*** FREE ***

```

1 ID RANCHO/US95 CLOMR
2 ID FOR: CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
3 ID
4 ID THIS IS THE PROPOSED HEC1 MODEL FOR US95/RANCHO DRIVE CLOMR FOR THE SDN5 STORM.
5 ID FILENAME:PROPSDN5.DAT
6 ID COMBINED PBS&J MODEL EXA5R.DAT AND COE & VAN LOO (CVL) CAREY.DAT-F MODELS
7 ID MODIFIED BY LBG 07/07/2005
8 ID
9 ID ADD INTERIM BELTWAY AND GOWAN NORTH PHASE III
10 ID BY MODIFYING THE CRAIG SUBBASIN FROM PBS&J MODEL
11 ID
12 ID LVRA0000 (PEAK CHANNEL AND RANCHO DRIVE IMPROVEMENTS) ADDED BY DIVERTING
13 ID FLOW FROM CONCENTRATION POINT CX1X4
14 ID
15 ID TRUVAL FLOW SPLIT REPLACED BY LBG
16 ID
17 ID JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
18 ID
19 ID 100-YEAR, 6-HOUR STORM, SDN5
20 ID DARF RATIOS FOR AREAS OF 0, 4, 10, 15, 20, 25, 30, 35, AND 40 SQUARE MILES
21 ID FOR THE 100-YEAR EVENT.
22 IT 5 0 0 300
23 IO 5 0 0
24 IN 5
25 JR PREC 1.00 0.91 0.86 0.825 0.79 0.765 0.74 0.725 0.71
*
* END WESTERN BELTWAY MODEL

26 KK ANN
27 PB 2.85
28 BA 0.259
29 PC 0.000 0.020 0.059 0.080 0.110 0.144 0.150 0.160 0.168 0.171
30 PC 0.180 0.182 0.187 0.190 0.197 0.202 0.210 0.220 0.230 0.241
31 PC 0.250 0.259 0.265 0.280 0.290 0.300 0.305 0.309 0.310 0.317
32 PC 0.321 0.327 0.333 0.346 0.361 0.381 0.408 0.430 0.477 0.514
33 PC 0.561 0.630 0.710 0.720 0.731 0.752 0.779 0.790 0.795 0.804
34 PC 0.810 0.820 0.826 0.840 0.859 0.889 0.910 0.938 0.966 0.970
35 PC 0.974 0.979 0.981 0.983 0.985 0.989 0.990 0.992 0.993 0.996
36 PC 0.997 0.999 1.000
37 LS 0 76.8
38 UD 0.499
*

39 KK RANN
40 KM ROUTE TO GD29B
41 RK 2600 0.015 0.015 0 TRAP 100 2
*

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HEC-1 INPUT

PAGE 2

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

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42 KK GD29B
43 PB 2.77
44 BA 0.138
45 LS 0 74.3
46 UD 0.298
*

47 KK CGD29B
48 HC 2
*

49 KK RGD29B

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*
1041 KK DMAV
1042 KM RETRIEVE FLOW FROM MAVERICK
1043 DRMAVERICK
*

1044 KK RMAV
1045 KM ROUTE TO CPT5A6
1046 RK 3180 0.0064 0.015 0 TRAP 60
*

1047 KK CMAV
1048 HC 2
*

1049 KK DPT5A7
1050 KM DIVERT FLOW ACROSS RANCHO AS WEIR FLOW NEAR DUNCAN ROAD, BETWEEN
1051 KM CROSS-SECTIONS 1932 AND 1456. RATING CURVE BY LBG 7-13-2005 USING LATERAL WEIR
1052 KM IN HECRAS. REMAINING FLOW CONTINUES SOUTHEAST ALONG THE WEST SIDE OF RANCHO
1053 DT DDUNCAN
1054 DI 0 146 200 352 552 800
1055 DQ 0 35 77 139 297 460
*

1056 KK PTA7
1057 PB 2.77
1058 BA 0.074
1059 LS 0 84.4
1060 UD 0.351
*

1061 KK C5A7
1062 HC 2
*

1063 KK R5A7
1064 KM ROUTE TO 8REMAIN (UPPER RANCHO HECRAS STA 9+83)
1065 RK 473 0.004 0.03 0 TRAP 80 2
*

1066 KK 8REMAIN
1067 KM DIVERT 24 CFS EAST ACROSS RANCHO IN A 24" CMP (CULVERT 32).
1068 KM REMAINING FLOW CONTINUES SOUTH ON THE WEST SIDE OF RANCHO
1069 KM REVISED TO 23 CFS BY LBG. WEIR FLOW ACROSS RANCHO CALCULATED
1070 KM USING HECRAS LATERAL WEIR #3 BETWEEN X-983 AND X-743.
1071 DT D8RCHO
1072 DI 0 24 100 200 300 400 500 600
1073 DQ 0 23 23 54 122 200 273 346
*

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1

HEC-1 INPUT

PAGE 33

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

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1074 KK 8REMAIN
1075 KM ROUTE TO C5A9 (UPPER RANCHO HECRAS STA 0+00)
1076 RK 983 0.003 0.025 0 TRAP 20 2
*

1077 KK PT5A9
1078 PB 2.77
1079 BA 0.045
1080 LS 0 85.7
1081 UD 0.246
*

1082 KK C5A9
1083 HC 2
*

1084 KK C2PT5A9
1085 KM GOWAN & RANCHO
1086 HC 2
*

1087 KK GOWAN5
1088 KM FROM 90% SUBMITTAL DRAINAGE STUDY ADDENDA I [SIC]
1089 KM BY FOGGEMEYER DESIGN GROUP, INC
1090 KM DIVERT MAXIMUM OF 1 CFS INTO GOWAN OUTFALL AT RAINBOW
1091 KM REMAINING FLOW TRAVELS EASTWARD ON GOWAN ROAD
1092 KM REVISED BY LBG. GOOF IS FULL.
1093 DT GOOF5
1094 DI 0 49 5000
1095 DQ 0 1 1
*

1096 KK DEASTGOWAN
1097 KM FLOW SPLIT AT GOWAN AND RANCHO INTERSECTION. DIVERT MAJORITY OF FLOW TO RANCHO
1098 KM SOUTH OF GOWAN RD BETWEEN CROSS-SECTIONS 983 AND 0. THE REMAINING FLOW
1099 KM TRAVELS EAST ON GOWAN. (THIS IS A LITTLE STRANGE. THE DIVERTED FLOW IS
1100 KM WHAT ACTUALLY CONTINUES ON RANCHO SOUTH!) DIVERTED FLOW RENAMED FROM
1101 KM "GOWAN" TO "LWRRNCH". NODE RENAMED FROM "DRANCHO" TO "DEASTGOWAN"
1102 DT LWRRNCH
1103 DI 0 400 600 1000 1200 1400 1600 2000 2400
1104 DQ 0 372 502 717 827 955 1068 1305 1553
*
* LBG REMOVED THIS BASIN
*
* KKALEX
* PB2.80
* BA0.191
* LSO 83.2
* UDO.456

```

*

1096
1097
1098
1099
1100
1101
1102
1103
1104

*

LWRRNCH
IS FLOW ALONG
RANCHO SOUTH
OF GOWAN
NORTH OF SITE

1162	KK	X3	
1163	BA	0.34	
1164	LS	0	92
1165	UD	0.71	
	*		
1166	KK	CX3	
1167	KM	COMBINE X3 X4 TO X3#	
1168	HC	3	
	*		
1169	KK	DTX4	
1170	KM	RET. DIVERT FLOW X4	
1171	DR	DEVX4	
	*		
1172	KK	RDEX	
1173	KM	ROUTE TO CHEYENNE	
1174	KM	MUSKINGUM X COEFFICIENT (COL 3) ADJUSTED BY LBG TO 0.40 TO PREVENT INSTABILITY	
1175	RM	1 0.1 0.40	
	*		

1

HEC-1 INPUT

PAGE 36

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

1176	KK	BSX5	
1177	BA	0.047	
1178	LS	0	92
1179	UD	0.122	
	*		

1180	KK	CX5	
1181	KM	COMBINE X5 & DEVX4	
1182	HC	2	
	*		

*

[

1183	KK	GOWAN	RETRIEVE DIVERSION GOWAN
1184	DR	LWRRNCH	
	*		

]*

Retrieve flow from GOWAN/Rancho
16.08 DAEF

*

[

1185	KK	CENTRL1	
1186	KM	ADDED BY LBG	
1187	KM	FLOW OVER RANCHO BETWEEN 0+00 OF UPPER RANCHO HECRAS MODEL	
1188	KM	AND 17498 OF THE LOWER RANCHO MODEL.	
1189	KM	(0+00 OF UPPER RANCHO MODEL = 177+03.33 OF LOWER RANCHO MODEL)	
1190	KM	STATIONING OF UPPER RANCHO MODEL CORRESPONDS TO ORIGINAL FIS.	
1191	KM	MOST CROSS-SECTIONS ARE IDENTICAL TO ORIGINAL EFFECTIVE MODEL.	
1192	DT	D9RCHO	
1193	DI	0 100 200 300 400 800 1000 1478	
1194	DQ	0 8 61 121 176 424 522 811	
	*		

]* Rating Curve for
weir flow

*

1195	KK	TRUVAL	
1196	KM	TRUE VALUE DIVERSION DETERMINED WITH HECRAS LATERAL WEIR	
1197	DR	TRUVAL	
	*		

[

1198	KK	CBDV1	COMBINE TRUVAL AND GOWAN
1199	KM	HECRAS STATION 17173.04 OF LOWER RANCHO MODEL	
1200	HC	2	
	*		

]

* Flow AT SITE AFTER
RANCHO OERFLOW to
the north of site

1201	KK	MORBAYRETRIEVE DIVERSION MORBAY (DCY07B FROM JONES/GOWAN)	
1202	KM	MORBAY FROM CVL STUDY, DCY07B IN PBS&J STUDY	
1203	DR	DCY07B	
	*		

1204	KK	CBDVMORBAY	COMBINE GOWAN & MORBAY
1205	KM	HECRAS STATION 17173.04 OF LOWER RANCHO MODEL	
1206	HC	2	
	*		

1207	KK	CENTRL2	
1208	KM	ADDED BY LBG	
1209	KM	2: 6'X2' RCBC UNDER RANCHO JUST SOUTH OF MICHAEL WAY	
1210	KM	ID RAN 190 FROM NORTHWEST NEIGHBORHOOD STUDY	
1211	DT	D10RCHO	
1212	DI	0 21 73 100 1000 2000	
1213	DQ	0 20 72 100 200 200	
	*		

1

HEC-1 INPUT

PAGE 37

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

1214	KK	RTCHY	ROUTE TO CHEYENNE/RANCHO
1215	RM	3 0.32 0.15	
	*		

1216	KK	CBCX5	COMBINE W/ CX5
1217	HC	2	
	*		

1218	KK	DVWR1	
1219	KM	OVERFLOW CHEYENNE/RANCHO INTERSECTION HECRAS STATION 14411.04	
1220	KM	OF LOWER RANCHO MODEL	
1221	DT	DVSTRI	
1222	DI	0 167 261 622 1272	
1223	DQ	0 0 36 180 455	
	*		

1224	KK	DVWR2	
1225	KM	24" PIPE RANCHO	

+	DPTSA7	1.27	1	FLOW TIME	325. 4.17	251. 4.25	231. 4.25	216. 4.25	185. 4.33	159. 4.33	138. 5.00	128. 5.00	122. 5.00
HYDROGRAPH AT													
+	PTSA7	.07	1	FLOW TIME	43. 3.75	37. 3.75	33. 3.75	31. 3.75	29. 3.75	27. 3.75	26. 3.75	25. 3.75	24. 3.75
2 COMBINED AT													
+	C5A7	1.35	1	FLOW TIME	349. 4.17	272. 4.17	247. 4.25	232. 4.25	197. 4.33	173. 5.00	154. 5.00	144. 5.00	137. 5.00
ROUTED TO													
+	R5A7	1.35	1	FLOW TIME	349. 4.17	271. 4.17	247. 4.25	230. 4.25	197. 4.33	172. 5.00	153. 5.00	143. 5.00	137. 5.00
DIVERSION TO													
+	D8RCHO	1.35	1	FLOW TIME	160. 4.17	102. 4.17	86. 4.25	75. 4.25	53. 4.33	45. 5.00	39. 5.00	36. 5.00	34. 5.00
HYDROGRAPH AT													
+	8REMAIN	1.35	1	FLOW TIME	189. 4.17	169. 4.17	161. 4.25	156. 4.25	144. 4.33	127. 5.00	114. 5.00	106. 5.00	102. 5.00
ROUTED TO													
+	R8MAIN	1.35	1	FLOW TIME	188. 4.17	168. 4.25	161. 4.25	156. 4.33	142. 4.33	126. 5.00	112. 5.00	106. 5.08	102. 5.08
HYDROGRAPH AT													
+	PTSA9	.05	1	FLOW TIME	32. 3.67	28. 3.67	25. 3.67	24. 3.67	22. 3.67	21. 3.67	20. 3.67	19. 3.67	18. 3.67
2 COMBINED AT													
+	C5A9	1.39	1	FLOW TIME	201. 4.08	179. 4.08	171. 5.00	164. 5.00	151. 5.00	137. 5.00	123. 5.00	116. 5.00	112. 5.00
2 COMBINED AT													
+	C2PTSA9	16.08	1	FLOW TIME	1701. 4.25	1434. 4.25	1289. 4.33	1190. 4.33	1080. 4.33	998. 4.42	923. 4.42	879. 4.42	840. 4.42
DIVERSION TO													
+	GOOF5	16.08	1	FLOW TIME	1. 2.33	1. 2.83	1. 3.00	1. 3.08	1. 3.17	1. 3.17	1. 3.25	1. 3.25	1. 3.33
HYDROGRAPH AT													
+	GOWAN5	16.08	1	FLOW TIME	1700. 4.25	1433. 4.25	1288. 4.33	1189. 4.33	1079. 4.33	997. 4.42	922. 4.42	878. 4.42	839. 4.42
DIVERSION TO													
+	LWRRNCH	16.08	1	FLOW TIME	1127. 4.25	974. 4.25	883. 4.33	821. 4.33	761. 4.33	716. 4.42	675. 4.42	652. 4.42	630. 4.42
HYDROGRAPH AT													
+	DEASTGOW	16.08	1	FLOW TIME	573. 4.25	459. 4.25	405. 4.33	368. 4.33	319. 4.33	282. 4.42	247. 4.42	227. 4.42	208. 4.42
HYDROGRAPH AT													
+	X4	.70	1	FLOW TIME	225. 5.67	199. 5.67	184. 5.67	174. 5.67	164. 5.67	157. 5.75	150. 5.75	146. 5.75	142. 5.75
HYDROGRAPH AT													
+	X3B	.16	1	FLOW TIME	88. 3.92	77. 3.92	71. 3.92	66. 3.92	62. 3.92	59. 3.92	56. 3.92	54. 3.92	52. 3.92
ROUTED TO													
+	CUL4	.16	1	FLOW TIME	69. 4.25	64. 4.17	62. 4.17	61. 4.08	60. 4.00	58. 4.00	55. 4.00	53. 4.00	52. 4.00
** PEAK STAGES IN FEET **													
1	STAGE TIME	15.14 4.25	15.07 4.17	15.04 4.17	15.02 4.08	15.00 4.00	14.96 4.00	14.88 4.00	14.84 4.00	14.79 4.00			
HYDROGRAPH AT													
+	X3A	.12	1	FLOW TIME	69. 3.83	60. 3.83	55. 3.83	52. 3.83	49. 3.83	46. 3.83	44. 3.92	42. 3.92	41. 3.92
ROUTED TO													
+	CUL8	.12	1	FLOW TIME	40. 5.17	27. 5.33	25. 5.33	24. 5.33	23. 5.33	22. 5.33	21. 5.33	21. 5.33	20. 5.33
** PEAK STAGES IN FEET **													
1	STAGE TIME	22.55 5.17	22.39 5.33	22.11 5.33	21.92 5.33	21.73 5.33	21.60 5.33	21.47 5.33	21.39 5.33	21.31 5.33			
2 COMBINED AT													
+	CX3	.28	1	FLOW TIME	102. 4.50	89. 4.33	85. 4.25	83. 4.25	80. 4.08	76. 4.00	73. 4.00	71. 4.00	69. 4.00
ROUTED TO													
+	RK3AB	.28	1	FLOW TIME	97. 5.42	87. 5.25	82. 5.17	78. 5.08	74. 5.08	71. 5.08	68. 5.08	66. 5.08	64. 5.08
2 COMBINED AT													
+	+	.98	1	FLOW TIME	321. 5.58	281. 5.42	259. 5.33	244. 5.25	228. 5.25	218. 5.25	208. 5.25	202. 5.25	196. 5.25
DIVERSION TO													
+	DEVX4	.98	1	FLOW TIME	100. 4.50	100. 4.58	100. 4.67	100. 4.75	100. 4.83	100. 4.92	100. 5.00	100. 5.17	98. 5.25
HYDROGRAPH AT													
+	DEVX4	.98	1	FLOW TIME	221. 5.58	181. 5.42	159. 5.33	144. 5.25	128. 5.25	118. 5.25	108. 5.25	102. 5.25	98. 5.25
ROUTED TO													

+	RK4	.98	1	FLOW TIME	221. 5.75	180. 5.58	159. 5.50	143. 5.50	128. 5.42	117. 5.50	107. 5.50	101. 5.50	98. 5.50
	HYDROGRAPH AT												
+	X3C	.48	1	FLOW TIME	113. 5.42	96. 5.50	87. 5.50	80. 5.50	74. 5.50	70. 5.50	65. 5.58	63. 5.58	60. 5.58
	DIVERSION TO												
+	SD1A	.48	1	FLOW TIME	14. 5.42	13. 5.50	12. 5.50	11. 5.50	9. 5.50	9. 5.50	8. 5.58	7. 5.58	7. 5.58
	HYDROGRAPH AT												
+	SD1A	.48	1	FLOW TIME	99. 5.42	83. 5.50	75. 5.50	70. 5.50	65. 5.50	61. 5.50	57. 5.58	55. 5.58	53. 5.58
	ROUTED TO												
+	RK3C	.48	1	FLOW TIME	99. 5.67	83. 5.67	75. 5.67	70. 5.67	64. 5.75	61. 5.75	57. 5.75	55. 5.75	53. 5.75
	HYDROGRAPH AT												
+	X3	.34	1	FLOW TIME	190. 4.08	168. 4.08	156. 4.08	148. 4.08	140. 4.08	134. 4.08	128. 4.08	124. 4.08	121. 4.08
	3 COMBINED AT												
+	CX3	1.80	1	FLOW TIME	416. 5.42	354. 5.42	322. 5.33	298. 5.33	274. 5.33	257. 5.33	240. 5.33	230. 5.33	223. 5.33
	HYDROGRAPH AT												
+	DTX4	.00	1	FLOW TIME	100. 4.50	100. 4.58	100. 4.67	100. 4.75	100. 4.83	100. 4.92	100. 5.00	100. 5.17	98. 5.25
	ROUTED TO												
+	RDEX	.00	1	FLOW TIME	100. 5.08	100. 5.08	100. 5.17	100. 5.25	100. 5.42	100. 5.33	100. 5.42	100. 5.42	98. 5.33
	HYDROGRAPH AT												
+	BSX5	.05	1	FLOW TIME	52. 3.50	46. 3.50	43. 3.50	41. 3.50	38. 3.50	37. 3.50	35. 3.50	34. 3.50	33. 3.50
	2 COMBINED AT												
+	CX5	.05	1	FLOW TIME	124. 4.83	121. 4.83	120. 4.83	118. 4.83	115. 4.92	111. 4.92	106. 4.92	103. 4.92	100. 4.92
	HYDROGRAPH AT												
+	GOWAN	.00	1	FLOW TIME	1127. 4.25	974. 4.25	883. 4.33	821. 4.33	761. 4.33	716. 4.42	675. 4.42	652. 4.42	630. 4.42
	DIVERSION TO												
+	D9RCHO	.00	1	FLOW TIME	599. 4.25	509. 4.25	465. 4.33	434. 4.33	400. 4.33	372. 4.42	346. 4.42	332. 4.42	319. 4.42
	HYDROGRAPH AT												
+	CENTRL1	.00	1	FLOW TIME	528. 4.25	464. 4.25	418. 4.33	387. 4.33	361. 4.33	344. 4.42	328. 4.42	320. 4.42	312. 4.42
	HYDROGRAPH AT												
+	TRUVAL	.00	1	FLOW TIME	135. 4.25	111. 4.25	98. 4.33	89. 4.33	79. 4.33	73. 4.42	67. 4.42	64. 4.42	61. 4.42
	2 COMBINED AT												
+	CBDV1	.00	1	FLOW TIME	663. 4.25	576. 4.25	516. 4.33	475. 4.33	440. 4.33	417. 4.42	396. 4.42	384. 4.42	372. 4.42
	HYDROGRAPH AT												
+	MORBAY	.00	1	FLOW TIME	718. 4.17	574. 4.25	496. 4.25	443. 4.33	390. 4.33	355. 4.33	320. 4.33	301. 4.42	282. 4.42
	2 COMBINED AT												
+	CBDVMORB	.00	1	FLOW TIME	1381. 4.25	1150. 4.25	1009. 4.33	918. 4.33	830. 4.33	770. 4.33	715. 4.42	685. 4.42	654. 4.42
	DIVERSION TO												
+	D10RCHO	.00	1	FLOW TIME	200. 3.92	200. 4.08	200. 4.25	191. 4.33	181. 4.33	174. 4.33	168. 4.42	165. 4.42	162. 4.42
	HYDROGRAPH AT												
+	CENTRL2	.00	1	FLOW TIME	1181. 4.25	950. 4.25	809. 4.33	727. 4.33	649. 4.33	596. 4.33	547. 4.42	520. 4.42	493. 4.42
	ROUTED TO												
+	RTCHY	.00	1	FLOW TIME	1119. 4.58	892. 4.58	769. 4.67	690. 4.67	617. 4.75	569. 4.75	523. 4.75	497. 4.83	472. 4.83
	2 COMBINED AT												
+	CBCX5	.05	1	FLOW TIME	1235. 4.58	1009. 4.67	877. 4.67	798. 4.75	723. 4.83	673. 4.83	624. 4.83	596. 4.83	568. 4.92
	DIVERSION TO												
+	DVSTR1	.05	1	FLOW TIME	439. 4.58	344. 4.67	288. 4.67	254. 4.75	223. 4.83	202. 4.83	181. 4.83	170. 4.83	158. 4.92
	HYDROGRAPH AT												
+	DVWR1	.05	1	FLOW TIME	795. 4.58	665. 4.67	589. 4.67	543. 4.75	500. 4.83	471. 4.83	443. 4.83	426. 4.83	410. 4.92
	DIVERSION TO												
+	DVSTR2	.05	1	FLOW TIME	37. 3.00	37. 3.17	37. 3.17	37. 3.25	37. 3.25	37. 3.33	37. 3.33	37. 3.42	37. 3.42
	HYDROGRAPH AT												
+	DVWR2	.05	1	FLOW TIME	758. 4.58	628. 4.67	552. 4.67	506. 4.75	463. 4.83	434. 4.83	406. 4.83	389. 4.83	373. 4.92
	ROUTED TO												

Retrieve
Flow
16.08 PARF
Weir

Remainings

North channel

FLOW ADJACENT
TO SITE

CITY OF LAS VEGAS		DATE:	
OFFICE OF THE ENGINEER		December 23, 1996	
TO: Joel Harris Land Development Services Department of Public Works		FROM: Randy L. Fultz, P.E. <i>[Signature]</i> Flood Control Project Manager Department of Public Works	
SUBJECT: Drainage Study for: PM 39-96		COPIES TO: John McNellis, P.E. WLB Group Horn Company CCRFCD	
FILE NO. LADEPOTDS\DS1987A.ZNA			
FEMA Flood Zone:	YES ☒ No ☐		
Proposed Storm Drain:	YES ☐ No ☒		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	12/18/96	12/23/96	See Below	\$250.00
TOTAL FEES				\$250.00

REMARKS:

The Drainage Study for the subject project has been reviewed and:

☒	is acceptable in concept subject to conformance to all City standards and the following conditions.
☐	must be resubmitted or supplemented including the following:
☐	must have Clark County Regional Flood Control District concurrence

1. The Parcel Map must grant a 60-foot public drainage easement to be privately maintained for the entire length of the proposed flow path.
2. This drainage study was submitted for the recordation of the Parcel Map and Final Map only. Technical drainage study updates with Hec-2 runs must be provided for Lots 1 and 2 prior to issuing grading permits to establish final hydraulics and finish floor elevations.
3. A copy of the Parcel Map must be submitted to the Flood Control Section files prior to recordation of the Parcel Map.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction.

END OF REMARKS

CZ

T/R/S: 20/60/12

AREA L12

1987
L12
\$250

RECEIVED

DEC 18 1996

The
WLB
Group
Inc.

Engineering • Planning
Surveying • Urban Design
Landscape Architecture
CIVIL PUBLIC WORKS
FLOOD CONTROL

December 17, 1996

City of Las Vegas
Engineering Planning
400 East Stewart Avenue
Las Vegas, Nevada 89101

Trilogy PM-39-96

Attn: Flood Control

Re: Drainage Report for "Parcel Map for The Horn Company"
Located at the southwest corner of Rancho Dr. and Michael Way
PM 39-96

The purpose of this drainage report is to present a HEC-II analysis of the flows in the area of the subject parcel map and to establish finished floors and general drainage patterns for future development in the subject lots. It is anticipated that this report will allow for the recordation of the final map and that a Technical Drainage study for the "Education Station" to be constructed on Lot 2 will follow shortly.

Storm flows enter the subject area from the following three primary sources:

* 1. Q(100) in Rancho Road totaling 162 cfs. This flow value was determined by The WLB Group in the Trilogy Drainage Study, dated July 1995. This flow value was also used for the adjacent U.S. Rentals site in a study by Carter & Burgess dated June 11, 1996. *

162
435
597
2. Q(100) in a 25' wide drainage channel totaling 435 cfs. The source of this flow is the same as above.

3. Q(100) in a 40' wide channel totaling 928 cfs. This flow value was determined by The WLB Group in the Trilogy Drainage Study, and was also used in the "Design Report for the Rancho/Gowan Channel #2" by VTN, dated September 26, 1996.

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*****
HEC-2 WATER SURFACE PROFILES
*****
*
* Version 4.6.2; May 1991
*
*
* RUN DATE 18DEC96 TIME 09:10:29
*****

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* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET, SUITE D
* DAVIS, CALIFORNIA 95616-4687
*
* (916) 756-1104

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X X XXXXXX XXXXX XXXXX
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PAGE 1

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*****
HEC-2 WATER SURFACE PROFILES
*****
*
* Version 4.6.2; May 1991
*****

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T1 US RENTALS
T2 CARTER & BURGESS- L. PROCTOR - JUNE 1996 - FILE:772SUBDV.H2
T3 DEVELOPED CONDITIONS
T4 SUBCRITICAL ANALYSIS - JOB # 95-V772-010
T5 MULTIPLE STREAM ANALYSIS - COMBINING AT CHANNEL
T6 Q CHANNEL = 435 CFS
T7 Q RANCHO = 162 CFS

```

J1	ICHECK	INQ	NINV	IDIR	STAT	METRIC	HVINS	Q	WSBL	FO
0	2	0	0	-1	0	0	1525	0		

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
0	0	-1	0	0	0	0	0	0		

THE FOLLOWING LINES WERE ADDED BY THE WLS GROUP FILENAME: RANCH01.IH2

NC	.016	.016	.016	0	0	0	0	0	0	0
WLS SECTION #1.1										
X1	1.1	14	149	659.5	0	0	0			
X3	10									
GR	50.90	100	51.44	127	51.94	127	51.94	149	51.44	149.1
GR	50.74	184	48.44	234	48.84	304	49.24	434	50.21	574
GR	51.01	614	50.21	654	50.71	654	50.82	659.5		

WLS SECTION #1.2										
X1	1.2	20	156.5	546.5	160	160	160			
X3	10									
GR	51.80	100	51.70	105.5	51.20	105.5	51.78	134.5	52.28	134.5
GR	52.28	156.5	51.78	156.51	51.04	193.5	51.54	193.5	51.65	199
GR	51.75	222	56.44	222	56.44	316	51.44	316	49.54	341
GR	49.11	461	49.91	501	49.11	541	49.61	541	49.72	546.5

WLS SECTION #1.3										
X1	1.3	20	156.5	513.5	45	45	45			
X3	10									
GR	51.90	100	51.80	105.5	51.30	105.5	51.88	134.5	52.38	134.5
GR	52.38	156.5	51.88	156.51	51.14	193.5	51.64	193.5	51.75	199
GR	51.75	228	56.44	228	56.44	378	51.44	378	48.74	403
GR	49.74	428	49.54	468	49.74	508	49.24	508	49.35	513.5

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PAGE 2

WLS SECTION #1.4										
X1	1.4	17	156.5	473	47	47	47			
X3	10									
GR	52.34	100	52.24	105.5	51.74	105.5	51.88	137.5	52.38	137.5
GR	52.38	156.5	51.88	156.51	51.14	193.5	51.64	193.5	51.74	199
GR	49.21	392	49.11	387.5	48.61	387.5	49.13	427.5	48.13	462.5
GR	48.83	462.5	48.93	473						

Sect

Q WSE

* 361.48	1.700	105.00	.00	.00	49.67	597.00	52.02	.00	52.08	2.73	1.89	109.78
* 96.75	1.800	137.00	.00	.00	49.80	597.00	51.74	51.74	52.23	38.08	5.57	107.16
* 162.16	1.900	122.00	.00	.00	50.04	597.00	52.23	.00	52.49	13.55	4.04	147.71
* 311.81	2.000	40.00	.00	.00	50.44	597.00	52.45	.00	52.51	3.67	2.08	290.20
* 465.65	3.000	15.00	.00	.00	50.11	597.00	52.47	.00	52.51	1.64	1.80	362.23
* 468.84	4.000	32.00	.00	.00	50.12	597.00	52.47	.00	52.52	1.63	1.82	363.33
* 315.06	5.000	136.00	.00	.00	50.44	597.00	52.48	.00	52.55	3.57	2.18	284.60
* 252.55	6.000	16.00	.00	.00	50.41	597.00	52.46	.00	52.56	5.59	2.61	240.76
* 205.04	7.000	32.00	.00	.00	50.42	597.00	52.44	.00	52.58	8.48	3.02	202.30
* 169.46	8.000	17.00	.00	.00	50.47	597.00	52.39	.00	52.60	12.41	3.82	163.17
* 157.17	9.000	60.00	.00	.00	50.68	597.00	52.44	.00	52.60	14.43	4.02	154.38

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.01K	SECH0	XLCH	ELTRD	ELLC	ELMIN	Q	CHSEL	CRWS	EG	10*KS	VCH	AREA
* 135.24	16.000	260.00	.00	.00	51.00	162.00	52.78	.00	52.81	1.41	1.56	112.81
* 333.37	17.000	25.00	.00	.00	50.00	162.00	52.80	.00	52.81	.24	.79	221.39
* 409.68	18.000	40.00	.00	.00	50.00	162.00	52.81	.00	52.81	.16	.50	337.58
* 363.77	19.000	40.00	.00	.00	50.00	162.00	52.81	.00	52.81	.20	.56	308.19
* 135.63	20.000	40.00	.00	.00	50.00	162.00	52.79	.00	52.81	1.43	1.40	122.08
* 130.73	9.000	60.00	.00	.00	50.68	597.00	52.44	.00	52.68	20.86	3.86	153.36
* 72.64	10.000	200.00	.00	.00	50.77	435.00	52.98	52.98	54.03	35.86	8.24	52.78
* 98.78	11.000	73.39	.00	.00	50.96	435.00	53.61	.00	54.33	19.39	6.77	64.24
* 92.79	12.000	125.00	.00	.00	51.28	435.00	53.84	.00	54.61	21.98	7.05	61.71
* 134.75	13.000	68.32	.00	.00	51.10	435.00	54.33	.00	54.80	10.42	5.54	78.55
* 98.97	14.000	68.32	.00	.00	51.64	435.00	54.30	.00	55.01	19.32	6.76	64.32
* 95.99	15.000	41.73	.00	.00	51.75	435.00	54.37	.00	55.11	20.53	6.90	63.07

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DEVELOPED CONDITIONS

SUMMARY PRINTOUT TABLE 150

	SECH0	Q	CHSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	1.100	1525.00	50.01	.00	.00	.00	344.73	.00
*	1.200	1525.00	50.48	.00	.47	.00	222.21	160.00
*	1.300	1525.00	50.78	.00	.30	.00	129.38	45.00
*	1.400	1525.00	51.47	.00	.69	.00	270.61	47.00
*	1.500	1525.00	51.40	.00	-.07	.00	187.74	110.00
*	1.600	597.00	52.05	.00	.65	.00	323.27	45.00
*	1.700	597.00	52.02	.00	-.02	.00	244.00	105.00

Block Wall Opening for Surface flows from Outdoor Sales Area

WEIR		ORIFICE	
Q100 =	2	Q100 =	2
L =	1.3	CLEAR AREA =	1.3
C =	3	C =	0.6
CLOGGING FACTOR	0.5	CLOGGING FACTOR	0.5
		Opening Length =	16
		Opening Height =	12
		Courses	1
			1.5

$$H = (Q/CL)^{2/3}$$

1.00

$$H = (Q/CA)^2 / 64.4$$

0.39

CONTROL =

Ponding Height =

WEIR

1.00

2 cfs capacity at full height with 50% clogging Factor

Ultimate Condition CLV study = 375 cfs

Interpolate to find weir flow over Rancho Drive

LOMR study rating curve

IN	300	400
OUT	121	176

$$\text{Rate of change} = \frac{176 - 121}{400 - 300} = \frac{55}{100} = 0.55$$

D at 375 cfs

$$D = (375 - 300)(0.55) + 121 = 162 \text{ cfs}$$

$$D = 176 - (400 - 375)(0.55) = 162 \text{ cfs}$$

375 cfs in = 162 cfs weir over Rancho Road
213 cfs continues south

Adjusted CLV study

$$213 \text{ cfs} + 155 \text{ cfs in Northern channel} \\ = 368 \text{ cfs}$$

368 cfs < 440 cfs from LOMR study





CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT		
Yes	No	
	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
	N/A	Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
X		An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

II. GRADING PLAN INFORMATION		
Yes	No	
X		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
X		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
X		Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
	N/A	Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
X		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
X		Back of lot elevations and lot drainage pattern for all lots including common lots.
	N/A	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
	N/A	Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

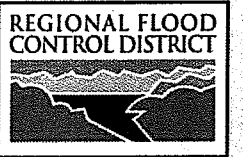
III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
	N/A	Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
X		Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
X		The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
X		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
X		Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
	N/A	Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options.
	N/A	Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

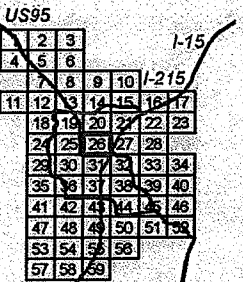
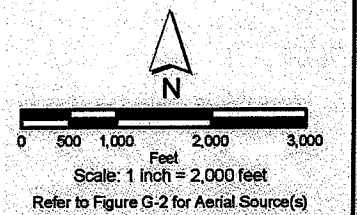


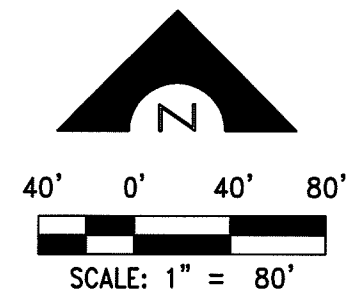
2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE F-26
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Culvert or Bridge Crossing
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator
- Remove & Replace/Parallel Facilities**
- | | |
|------------|------------|
| Channel | Channel |
| Stormdrain | Stormdrain |
| Crossing | Crossing |

FIGURE 4





- 440 CFS → 100 YR FLOW
-  ZONE AE
-  CONCENTRATION POINT

EWING IRRIGATION FACILITY UPGRADES
EWING IRRIGATION

FIGURE 6
PROPOSED CONDITIONS

RCI Engineering

3281 S. HIGHLAND DRIVE SUITE 810, LAS VEGAS, NV 89109
PH#702.453.0800 FAX#702.453.0801

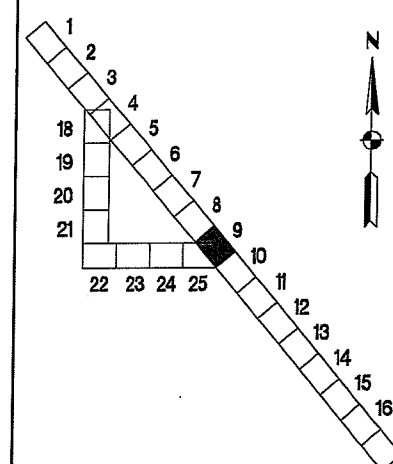
CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS

**RANCHO/US 95 LOMR
FLOODPLAIN DELINEATION**

THE Louis Berger Group, Inc.
500 E. Arroyo Court, Suite 100 Las Vegas, Nevada 89119
Voice: 702-736-6632 Fax: 702-736-0704

LEGEND

- PROPOSED FLOOD ZONE AE
- EFFECTIVE FLOOD ZONE A OR FLOOD ZONE AE
- EFFECTIVE FLOOD ZONE X (SHADED)
- PROPOSED FLOOD ZONE X (SHADED)
- EXISTING CULVERT
- HEC-RAS CROSS-SECTION MARKER, STATION AND 100-YEAR BFE
- WSPG STATION MARKER
- PROPOSED SDNS
- PROPOSED SDNS
- 100-YEAR FLOW INDICATOR
- EFFECTIVE US95 FISR SDNS
- EFFECTIVE US95 FISR SDNS
- EFFECTIVE NLV FIS
- FINISH FLOOR ELEVATION
- AERIAL TOPOGRAPHY SPOT ELEVATION AND MARKER
- 2 FOOT CONTOUR LINES
- HEC-1 NODE
- LIMITS OF RANCHO/US 95 LOMR STUDY



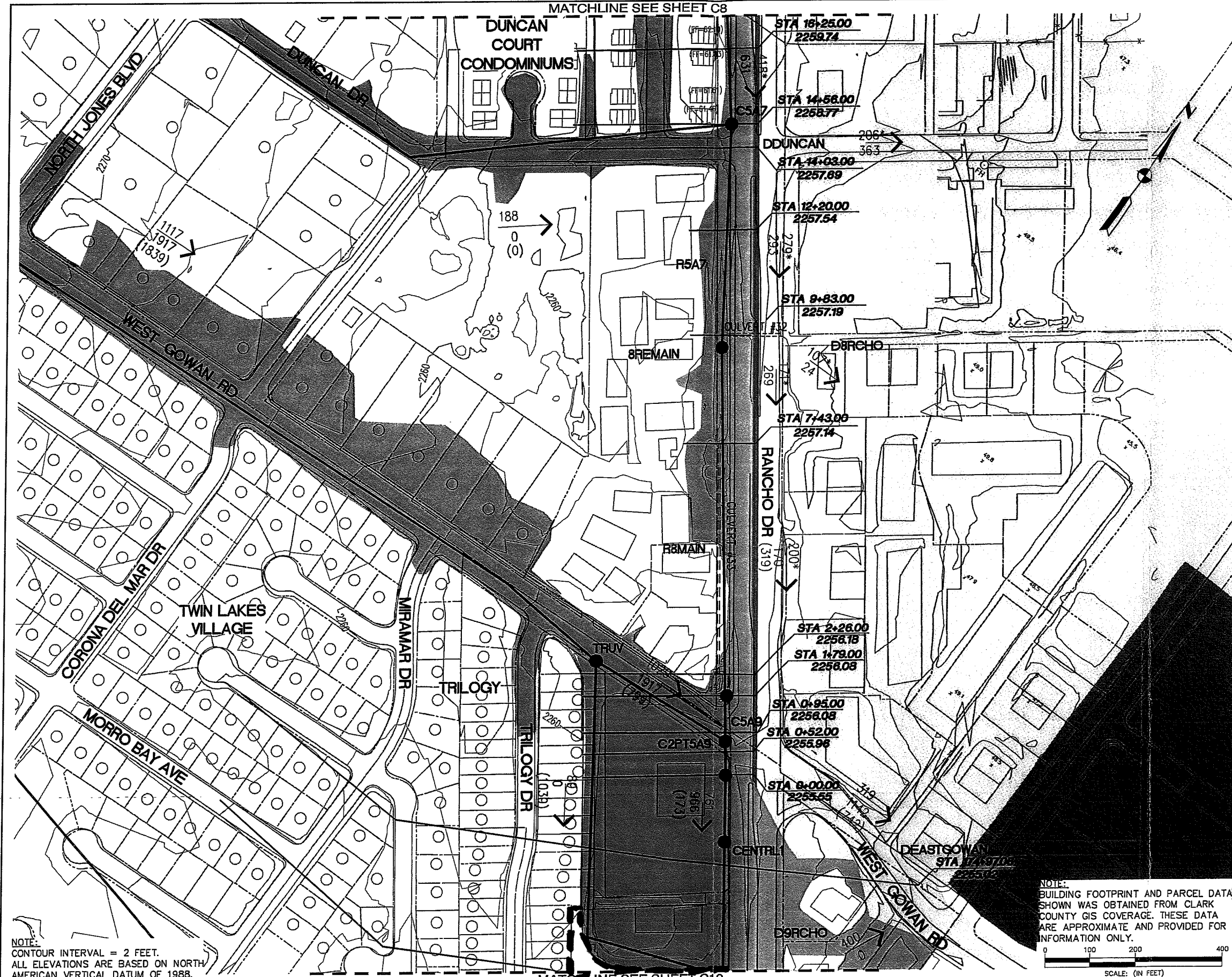
KEY MAP

NTS



REGIONAL FLOOD CONTROL DISTRICT

Drafted by: ARB/FRK	Scale: AS NOTED	Job Number: CB881
Checked by: FRK	File Name: 881-C9.DWG	Sheet Number: C9R
Date: 07/10/09		



PROJECT SITE

PROJECT SITE

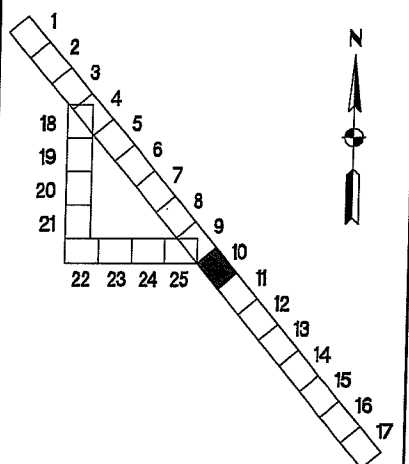
CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS

RANCHO/US 95 LOMR FLOODPLAIN DELINEATION

THE Louis Berger Group, INC.
500 E. Amigo Court, Suite 100 Las Vegas, Nevada 89119
Voice: 702-736-6832 Fax: 702-736-0704

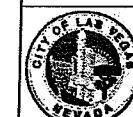
LEGEND

- PROPOSED FLOOD ZONE AE
- EFFECTIVE FLOOD ZONE A OR FLOOD ZONE AE
- EFFECTIVE FLOOD ZONE X (SHADED)
- PROPOSED FLOOD ZONE X (SHADED)
- EXISTING CULVERT
- STA 0+00.00 HEC-RAS CROSS-SECTION MARKER, STATION AND 100-YEAR BFE
- STA 0+00.00 WSPG STATION MARKER
- 1037 PROPOSED SDN3
- 1037* PROPOSED SDN3
- 1037 100-YEAR FLOW INDICATOR
- 1037* EFFECTIVE US95 FISR SDN3
- (1037) EFFECTIVE US95 FISR SDN3
- (FF=24.24) EFFECTIVE NLV FIS
- 20.8 FINISH FLOOR ELEVATION
- 2250 AERIAL TOPOGRAPHY SPOT ELEVATION AND MARKER
- 2 FOOT CONTOUR LINES
- HEC-1 NODE
- LIMITS OF RANCHO/US 95 LOMR STUDY



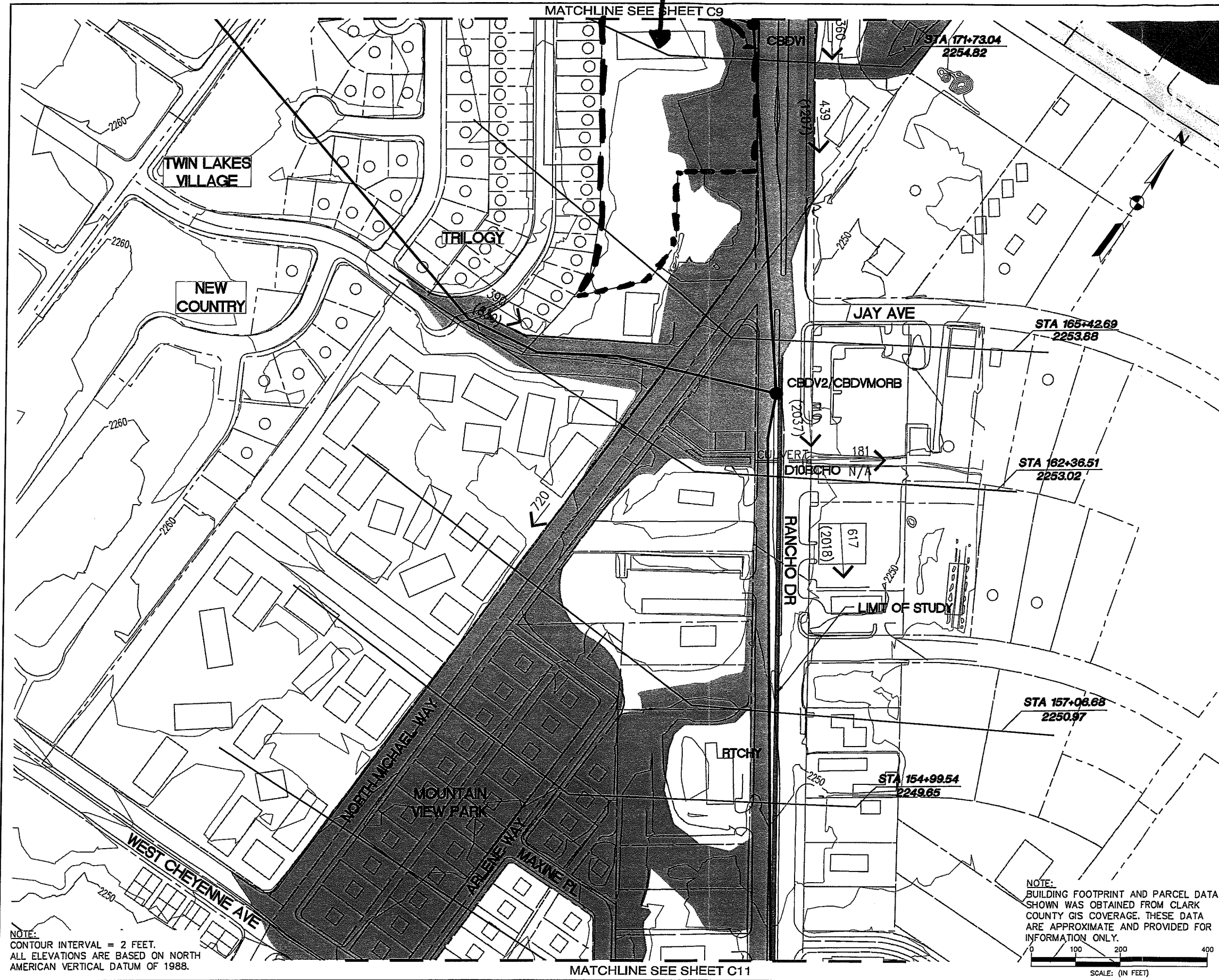
KEY MAP

NTS



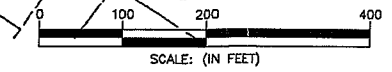
REGIONAL FLOOD CONTROL DISTRICT

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Checked by: FKR	File Name: B81-C10.DWG	Sheet Number: C10R
Date: 07/10/09		

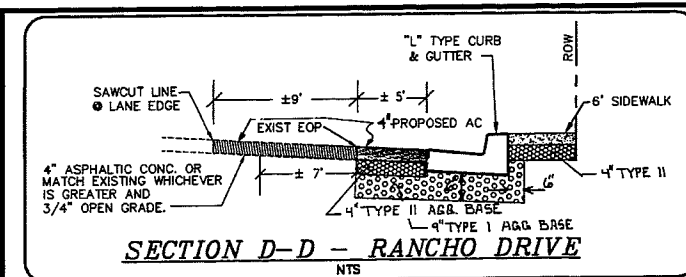


NOTE:
CONTOUR INTERVAL = 2 FEET.
ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988.

NOTE:
BUILDING FOOTPRINT AND PARCEL DATA SHOWN WAS OBTAINED FROM CLARK COUNTY GIS COVERAGE. THESE DATA ARE APPROXIMATE AND PROVIDED FOR INFORMATION ONLY.



MATCHLINE SEE SHEET C11

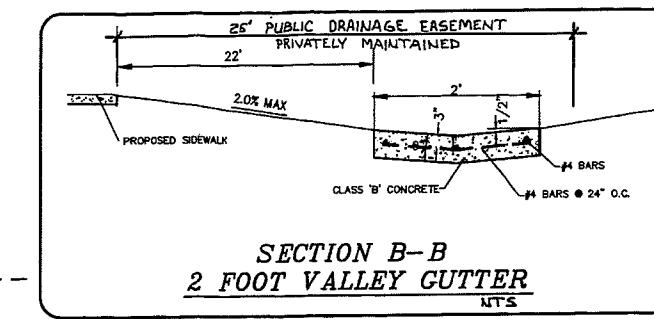


ESTIMATE OF OFFSITE QUANTITIES

4" ASPHALTIC CONCRETE PAVING	235 SY
TYPE I GRAVEL BASE	70 CY
TYPE II GRAVEL BASE	91 CY
8" VALLEY GUTTER	1344 SF
L TYPE CURB & GUTTER	130 LF
4" SIDEWALK	1554 SF

GENERAL NOTE
THE ENTIRE US RENTALS SITE IS IN FLOOD ZONE A.

BENCHMARK:
CITY OF LAS VEGAS BM #11V00-1254
BEING A RIVET & PLATE IN TOP OF CURB, NE CORNER OF
OF CHEYENNE AVE. AND MICHAEL WAY.
ELEVATION: 2251.20 FEET NAVD 88.
686.1680 METERS

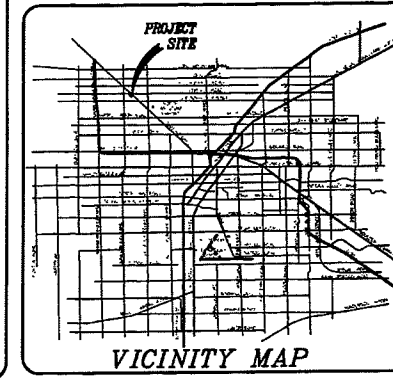
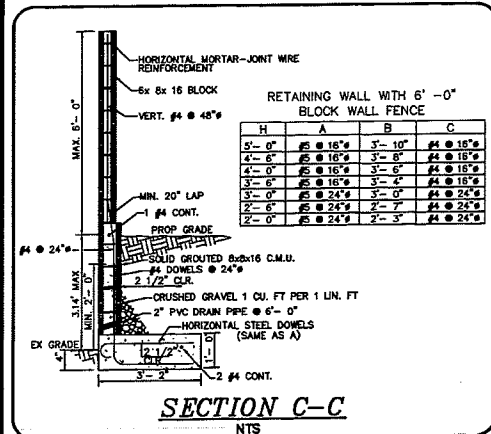


CONSTRUCTION NOTES

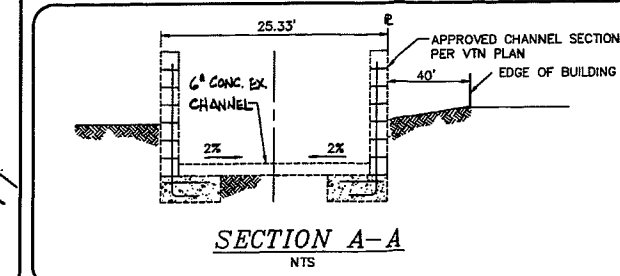
- CONSTRUCT "L" TYPE CURB AND GUTTER PER UNIFORM STD. DWG. NO. 216.
- CONSTRUCT "A" TYPE CURB PER UNIFORM STD. DWG. NO. 219.
(TYP. UNLESS NOTED OTHERWISE.)
- CONSTRUCT 6" HIGH WROUGHT IRON FENCE
- CONSTRUCT 3" ASPHALT CONCRETE W/ FOG SEAL ON 6" TYPE II AGGREGATE BASE WITH PRIME COAT. SEE DETAIL A THIS SHEET
- CONSTRUCT R1-1 SIGN (STOP)
- CONSTRUCT 6 FOOT SIDEWALK PER UNIFORM STD. DWG. NO. 234.
- CONSTRUCT CROSS GUTTER PER UNIFORM STD. DWG. NO. 228.
- EXISTING AC
- CONSTRUCT 4" WIDE WHITE STRIPE.
- CONSTRUCT 6" HIGH CHAIN LINK FENCE PER UNIFORM STD. DWG. NO. 222.
- CONSTRUCT 2" ASPHALT CONCRETE W/ FOG SEAL ON 6" TYPE II AGGREGATE BASE WITH PRIME COAT. SEE DETAIL A THIS SHEET
- CONSTRUCT SLIDING GATE.
- CONSTRUCT SIDEWALK RAMP PER NDOT STANDARDS R-5.1.1.2(613) TYPE D. (A=8', B=8')
- CRUSHED GRAVEL
- CONSTRUCT 2 FOOT VALLEY GUTTER WITHIN PUBLIC DRAINAGE EASEMENT TO BE PRIVATELY MAINTAINED. SEE SECTION B-B.
- CONSTRUCT COMMERCIAL DRIVEWAY PER UNIFORM STD. DWG. # 222A.
- CONSTRUCT APPROXIMATELY 14 FEET OF ADDITIONAL AC TO MATCH PROPOSED CURB AND GUTTER. SEE SECTION D-D. SAWCUT 9" INTO EXIST. AC.
- CONSTRUCT 6 INCH WIDE CURB OPENING FOR DRAINAGE.
- CONSTRUCT RAMP 4 FEET WIDE BY 7 FEET LONG.

LEGEND

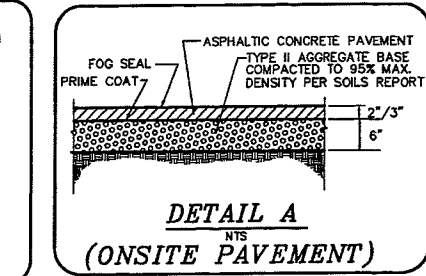
- R (XX.XX) PROPERTY LINE
- HP EXISTING ELEVATION
- TRW HIGH POINT
- EP TOP OF RETAINING WALL
- EG EDGE OF PAVEMENT
- FG GRADE BREAK
- FL EXISTING GRADE
- FT FLOW LINE
- FC FINISHED FLOOR
- TC TOP OF CURB
- FG FINISHED GRADE
- SAW CUT LINE
- SIGHT VISIBILITY EASEMENT
- EXISTING EOP
- CONCRETE
- CENTER LINE
- PROPERTY LINE - (N.A.P.)
- RETAINING WALL
- PROPOSED CONTOUR
- EXISTING CONTOUR
- EXISTING BLOCK WALL
- PROJECT PROPERTY LINE
- HANDICAPPED ACCESS ROUTES



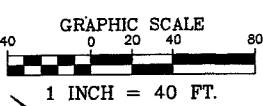
LEGAL DESCRIPTION
A PORTION OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 12, TOWNSHIP 20 SOUTH, RANGE 60 EAST, W.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.



BASIS OF BEARINGS:
N 88°21'49" E, BEING THE SOUTH LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 12, TOWNSHIP 20 SOUTH, RANGE 60 EAST W.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY A MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER IN BOOK 64 OF PLATS, AT PAGE 79.



NOTE:
I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.
Paul J. Tim 1/2/16
DATE



BUILDING ADDRESS
U.S. RENTALS
3521 N. RANCHO DR.
LAS VEGAS, NV

Call before you Dig
1-800-227-2600
AMERICAN SOCIETY OF CIVIL ENGINEERS

Call before you Overhead
SAFETY ALERT
593-6111
OVERHEAD SERVICE ALERT

REVISIONS

No.	Date	Description
1	1/20/16	ISSUE FOR PERMITTING
2	1/20/16	ISSUE FOR PERMITTING

DESIGNED: JLT
DRAWN: JLT
CHECKED: JLT
DATE: 1/20/16

US Rentals
"AMERICAN SOCIETY OF CIVIL ENGINEERS"

PROJECT: U.S. RENTALS

DESCRIPTION: GRADING PLAN

SHEET: 3 OF 5

DATE: 1/20/16

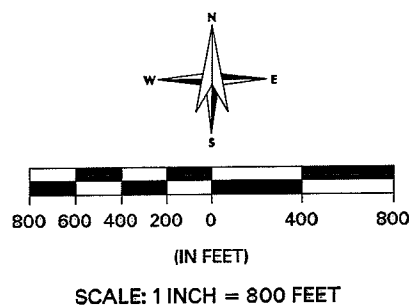
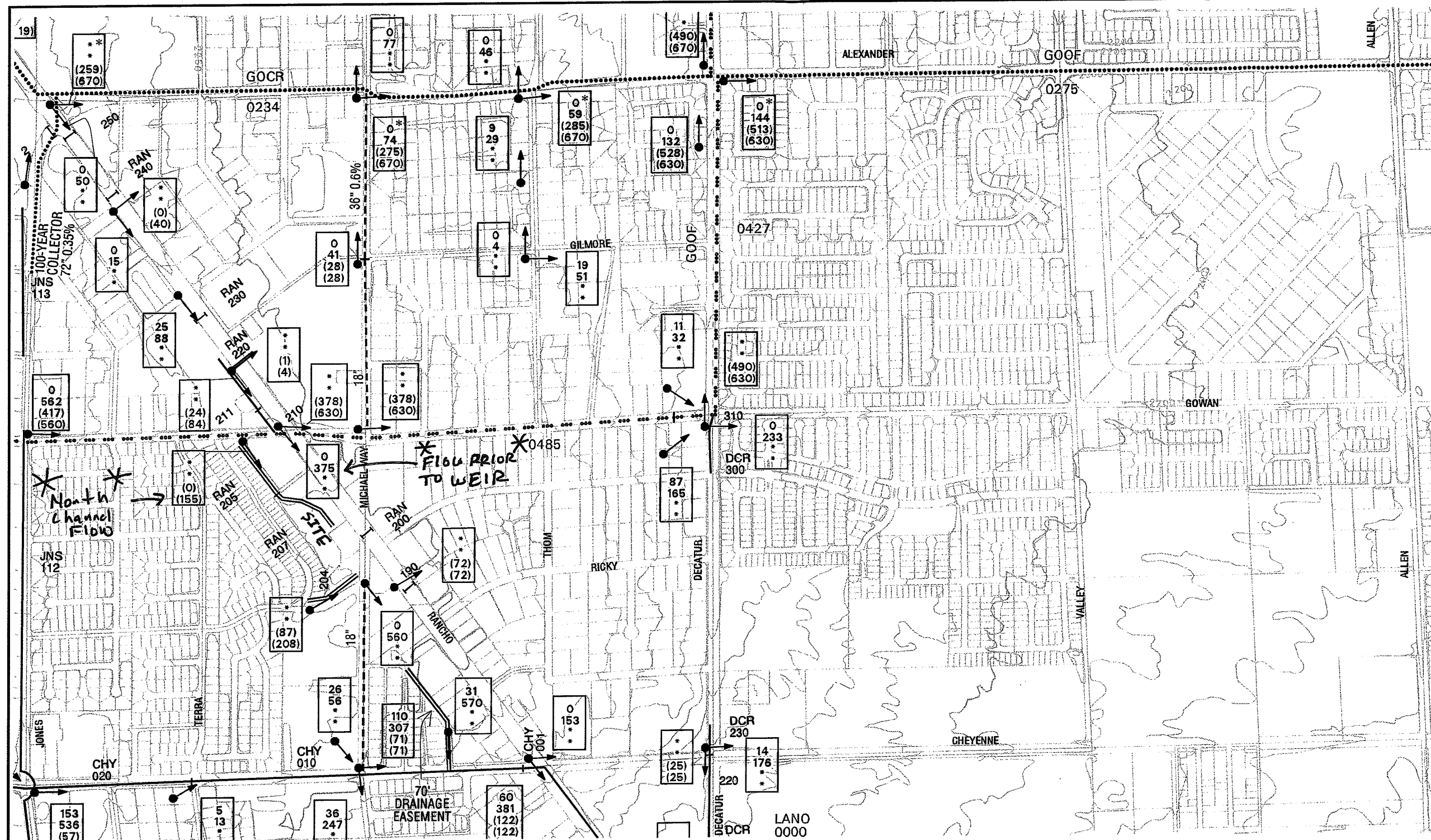


NORTHWEST NEIGHBORHOOD STUDY

LEGEND

- EXISTING REGIONAL DETENTION BASINS
- PROPOSED REGIONAL DETENTION BASINS
- EXISTING LOCAL DETENTION BASINS
- EXISTING REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES
- EXISTING LOCAL BRIDGES
- EXISTING REGIONAL CULVERT
- PROPOSED REGIONAL CULVERT
- EXISTING LOCAL CULVERT
- EXISTING REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE
- EXISTING LOCAL PIPELINE
- PROPOSED LOCAL PIPELINE
- EXISTING REGIONAL CHANNEL
- PROPOSED REGIONAL CHANNEL
- EXISTING LOCAL CHANNEL
- PROPOSED REGIONAL PIPELINE (Not Included in 1996 MPU)
- PROPOSED REGIONAL CHANNEL (Not Included in 1996 MPU)
- EXISTING REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE
- EXISTING LOCAL DIKE/LEVEE
- EXISTING STORM WATER PUMPING STATION
- PROPOSED BELTWAY ALIGNMENT

FIGURE F-14



- 250 10-YEAR STREET FLOW
 - 500 10-YEAR STREET FLOW
 - 300 10-YEAR FACILITY FLOW
 - 800 10-YEAR FACILITY FLOW
- (FLOWS IN CFS)

NOTE:
Ultimate drainage conditions are based on future CN values with all flood control facilities in place

* The capacity of the proposed regional facility is based on the "1996 Clark County Regional Flood Control Master Plan Update for the Las Vegas Valley." The facility may need to be enlarged in final design.

FUTURE DRAINAGE CONDITIONS



POST, BUCKLEY, SCHUH & JERNIGAN, INC.

ENGINEERING PLANNING SURVEYING GIS
901, N. Green Valley Pkwy, Ste 100, Henderson NV 89014
Phone: (702) 263-7275 Fax: (702) 263-7200

RAJAPAI	FT. APACHE	BURRANGO	BUFFALO	RAMBOW	JONES	DECATUR	ELKHORN
1	2	3	4	5	6	7	CENTENNIAL
8	9	10	11	12	13	14	ANN
15	16	17	18	19	20	21	LONE MOUNTAIN
22	23	24	25	26	27	28	ALEXANDER
29	30	31	32	33	34	35	CHEYENNE
36	37	38	39	40	41	42	SMOKE RANCH

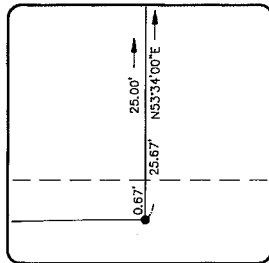
PARCEL
DRAWING NUMBER
FILE 85
PAGE 43
PLAN HOLD CORPORATION - IRVINE, CALIFORNIA
REGISTERED MAPLE DESIGN
REGISTERED MAPLE DESIGN
REGISTERED MAPLE DESIGN

DRAWING NUMBER

DRAWING NUMBER

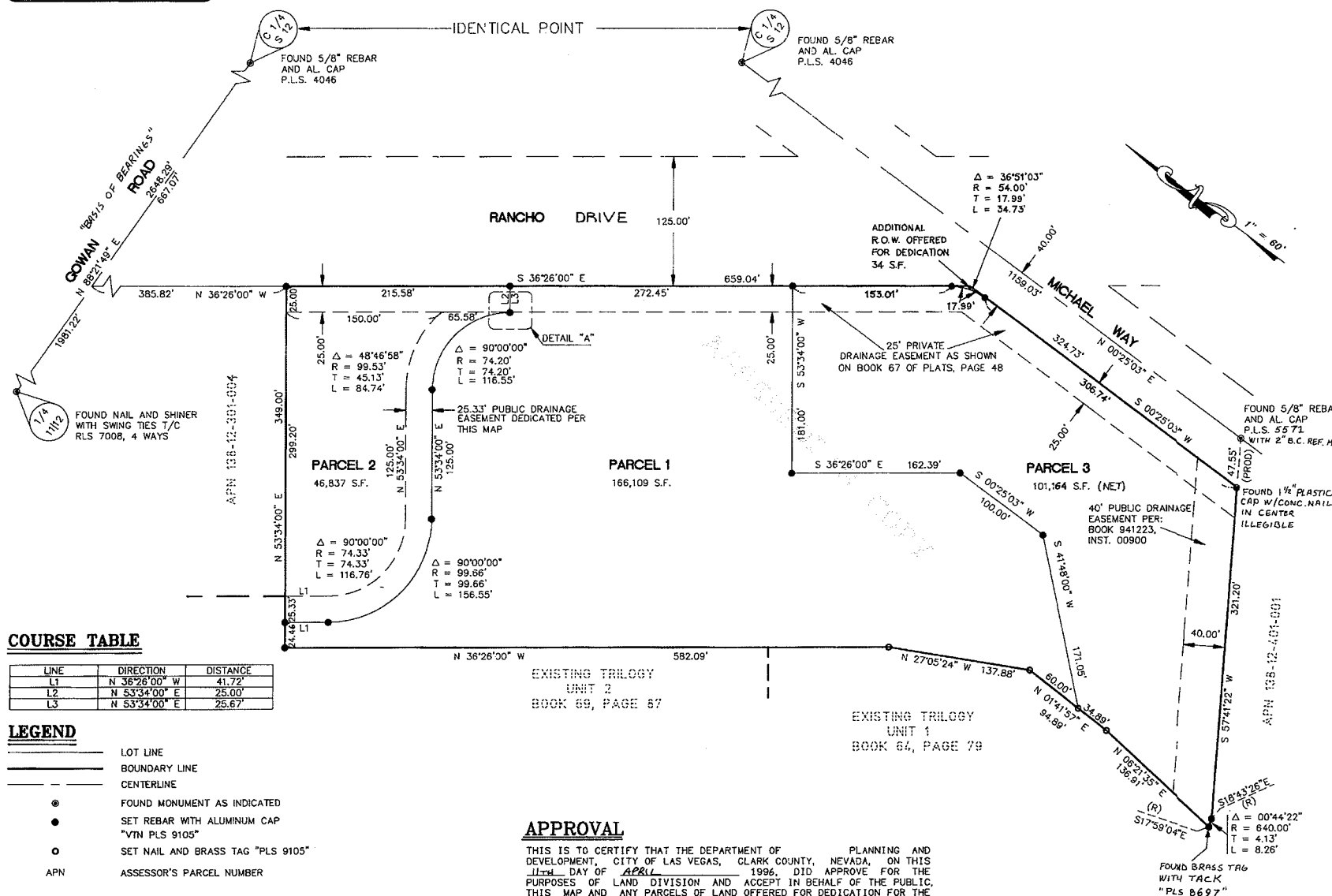
DRAWING NUMBER

DETAIL "A"



PARCEL MAP

BEING A PORTION OF THE SOUTHWEST QUARTER (SW 1/4) OF
SECTION 12, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M.,
CITY OF LAS VEGAS, CLARK COUNTY, NEVADA



COURSE TABLE

LINE	DIRECTION	DISTANCE
L1	N 36°26'00" W	41.72'
L2	N 53°34'00" E	25.00'
L3	N 53°34'00" E	25.67'

LEGEND

- LOT LINE
- BOUNDARY LINE
- CENTERLINE
- FOUND MONUMENT AS INDICATED
- SET REBAR WITH ALUMINUM CAP "VIN PLS 9105"
- SET NAIL AND BRASS TAG "PLS 9105"
- APN ASSESSOR'S PARCEL NUMBER

REFERENCE MAPS

RECORD OF SURVEY FILE 75, PAGE 10
PARCEL MAP FILE 50, PAGE 09
FINAL MAP BOOK 64, PAGE 79
AMENDED FINAL MAP BOOK 67, PAGE 48
FINAL MAP BOOK 69, PAGE 87

BASIS OF BEARINGS

N.88°21'49"E, BEING THE SOUTH LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 12, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY A MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER IN BOOK 64 OF PLATS, AT PAGE 79.

COUNTY RECORDER'S OFFICE

ANY SUBSEQUENT CHANGES TO THIS MAP SHOULD BE EXAMINED AND MAY BE DETERMINED BY REFERENCE TO THE COUNTY RECORDER'S CUMULATIVE MAP INDEX NRS 278.5695

APPROVAL

THIS IS TO CERTIFY THAT THE DEPARTMENT OF PLANNING AND DEVELOPMENT, CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, ON THIS 11th DAY OF APRIL 1996, DID APPROVE FOR THE PURPOSES OF LAND DIVISION AND ACCEPT IN BEHALF OF THE PUBLIC. THIS MAP AND ANY PARCELS OF LAND OFFERED FOR DEDICATION FOR THE PUBLIC USE IN CONFORMITY WITH THE TERMS OF THE OFFER OF DEDICATION PER N.R.S. 278.010 THROUGH 278.630 INCLUSIVE.

Donna H. Kristaponis - DIRECTOR
DEPARTMENT OF PLANNING AND DEVELOPMENT
CITY OF LAS VEGAS, NEVADA.

MAP APPROVED FOR THE PURPOSE OF LAND DIVISION THIS 12th DAY OF APRIL 1996.

Rita M. Lunos
CITY OF LAS VEGAS SURVEYOR
NEVADA CERTIFICATE NO. 5094



SURVEYOR'S CERTIFICATE

I, STEPHEN P. GURLIDES, A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF NEVADA, CERTIFY THAT:

- THIS PLAT REPRESENTS THE RESULTS OF A SURVEY CONDUCTED UNDER MY DIRECT SUPERVISION, AT THE INSTANCE OF THE HORN COMPANY, A NEVADA CORPORATION.
- THE LANDS SURVEYED LIE WITHIN THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 12, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AND THE SURVEY WAS COMPLETED ON 10-6-95.
- THIS PLAT COMPLIES WITH THE APPLICABLE STATE STATUTES AND ANY LOCAL ORDINANCES IN EFFECT ON THE DATE THAT THE GOVERNING BODY GAVE ITS FINAL APPROVAL.
- THE MONUMENTS DEPICTED ON THE PLAT ARE OF THE CHARACTER SHOWN, OCCUPY THE POSITIONS INDICATED AND ARE OF SUFFICIENT NUMBER AND DURABILITY.

Stephen P. Gurlides
STEPHEN P. GURLIDES, P.L.S.
NEVADA CERTIFICATE NO. 9105

OWNER'S CERTIFICATE

THE HORN COMPANY, A NEVADA CORPORATION, AND U.S. RENTALS, INC., A CALIFORNIA CORPORATION DO HEREBY CERTIFY THAT BEING THE OWNERS OF THE LAND SUBDIVIDED WITHIN THE BOUNDARY SHOWN HEREON, CONSENT TO THE PREPARATION AND RECORDATION OF THIS PARCEL MAP AND HAVE CAUSED THE LAND TO BE SURVEYED AND PLATTED INTO PARCELS. STREETS AS SHOWN HEREON AND DO HEREBY OFFER AND DEDICATE TO THE CITY OF LAS VEGAS, ITS SUCCESSORS AND ASSIGNS, STREETS AS SHOWN HEREON, TO AND FOR THE USE OF THE PUBLIC, AND EASEMENTS AS SHOWN HEREON, FOR THE CONSTRUCTION AND MAINTENANCE OF SURFACE AND SUBTERRANEAN UTILITIES, AND SUCH GRADING AND DRAINAGE AS REQUIRED PER N.R.S. 278.010 TO 278.630 AND CONFORMANCE WITH FLOOD CONTROL DIVISION REQUIREMENTS.

THE HORN COMPANY, A NEVADA CORPORATION BY:

Eric L. Horn - PRESIDENT

U.S. RENTALS, INC., A CALIFORNIA CORPORATION BY:

William T. Locklin

ACKNOWLEDGEMENT

STATE OF NEVADA } > SS
COUNTY OF CLARK }

THIS INSTRUMENT WAS ACKNOWLEDGED BEFORE ME ON April 23, 1996, BY ERIC L. HORN AS PRESIDENT OF THE HORN COMPANY, A NEVADA CORPORATION.

Suzie B. Stuenkel
Suzie B. Stuenkel
NOTARY PUBLIC IN AND FOR SAID COUNTY AND STATE
MY COMMISSION EXPIRES

ACKNOWLEDGEMENT

STATE OF California } SS
COUNTY OF Plumas }

THIS INSTRUMENT WAS ACKNOWLEDGED BEFORE ME ON 30 Nov 1995, BY William Locklin Vice President OF U.S. RENTALS INC., A CALIFORNIA CORPORATION.

Brian K. Allen
BRIAN K. ALLEN
NOTARY PUBLIC IN AND FOR SAID COUNTY AND STATE
MY COMMISSION EXPIRES

VTN CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102
(702) 873-7550 FAX (702) 362-2597

PARCEL MAP

FOR

THE HORN COMPANY
BEING A PORTION OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 12, T. 20 S., R. 60 E., M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA

SCALE: 1"=60' W.O.# 4931 DATE: 11/2/95 SHEET 1 OF 1
FILE: 4931PM.DWG DRN. BY: TZ/ARR REV: CKD. BY: SPG

PM-60-95

NO. 0121
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