

DS #: 4800

APN: 139 32 405 027

PROJECT: Hastings & Campbell

SUBMITTAL: 1st Submittal

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		May 19, 2016
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: Hastings & Campbell	COPIES TO: Taney Engineering
Cross Streets:	NEQ of Charleston Blvd. & Campbell Ave.	DAX Contracting, LLC
File Number:	F:\Depot\DSMemos\DS4800A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	139-32-405-027	
Zoning Action:	TMP-62358; WVR-62353; WVR-62356; VAC-62357 & VAR-62407	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES NO X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	5/4/2016	5/18/2016	See Comments Below	\$400.00	442793: \$400
TOTAL FEES (LDDRS):				\$400.00	----

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.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. It appears that the subject development drains to the northeast corner of the site through an adjacent path corridor to the north. Identify an existing public drainage easement on the grading plan and label with *City of Las Vegas* recorded document number or if by any parcel map for verification of the legal perpetuation of onsite drainage.
2. **Figure 7** of the *Study* has identified the subject project site at a wrong location. Review and revise accordingly in the next submittal.
3. The name of the project owner on the grading plan does not match the detail sheet or the *Standard Form 1* in the drainage study. Review and revise accordingly.
4. The proposed finished floor elevation must be set at a minimum six inches (6") above the high side of the adjacent street. The high side of **Lot 4** at **Triple Crown Circle** is 100.63TC. Therefore the finished floor elevation of **Lot 4** must be set at a minimum of $100.63 + 0.5 = 101.13$. Revise and revise the F.F. of **Lot 4** accordingly.

5. It appears that no storm drain is proposed in the subject development. However, construction note number 6 calls for a catch basin, explain where is the storm drain system or is this an error in the construction notes column.
6. Per **Detail Section C/GD1**, there is an existing property wall along the south side of **Lot 3**. Show an existing wall in **Lot 3** on the grading plan.
7. **Sheet GD1**: Section F: Revise the callout for the surface material in the easement to "All Concrete". Revise the callout of all "private" drainage easement to "**PUBLIC**" in all pertinent details.

Detail J: There are two different numbers for the height of the wall opening, 24" and 16". Revise to show 24" only.

8. Label the slope in the cul-de-sac of the private street.
9. The *City Council* of the *City of Las Vegas* recently adopted an amendment to Title 20 of the Municipal Code in which Section 20.10.030 requires all public drainage easements to be concrete lined. Revise the grading plan, construction notes and all pertinent detail sections accordingly.
10. Private streets must be public drainage easements. Provide a note on the grading plans: Note: All private streets are P.U.E., Public Sewer Easements and Public Drainage Easements to be privately maintained by the HOA.
11. All drainage easements must be public drainage easements to be privately maintained and common lots to be labeled on the grading plans and to be dedicated as such in the final map or by separate document. Revise the grading plan, details and all pertinent notes accordingly.
12. The engineer must provide a table on the grading plans that shows a quantity estimate of all drainage improvements within Public Drainage Easements. All drainage improvements within Public Drainage Easements must be bonded and inspected.

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.

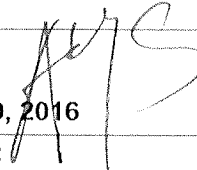
END OF REMARKS
ays

T/R/S: T20S/R61E/32
AREA M-32

 *** FAX TX REPORT ***

TRANSMISSION OK

JOB NO. 4981
 DESTINATION ADDRESS 7023625233
 PSWD/SUBADDRESS
 DESTINATION ID
 ST. TIME 05/19 15:35
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 RESULT OK

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE:  May 19, 2016
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: Hastings & Campbell	COPIES TO:
Cross Streets:	NEQ of Charleston Blvd. & Campbell Ave.	Taney Engineering
File Number:	F:\Depot\DSMemos\DS4800A.doc	DAX Contracting, LLC
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1. It appears that the subject development drains to the northeast corner of the site through an adjacent path corridor to the north. Identify an existing public drainage easement on the grading plan and label with *City of Las Vegas* recorded document number or if by any parcel map for verification of the legal perpetuation of onsite drainage.
2. **Figure 7** of the *Study* has identified the subject project site at a wrong location. Review and revise accordingly in the next submittal.



LAS VEGAS
CITY COUNCIL

CAROLYN G. GOODMAN
MAYOR

STAVROS S. ANTHONY
MAYOR PRO TEM

LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127

**RE: TMP-62358 [PRJ-62201] - TENTATIVE MAP RELATED TO VAR-62407,
WVR-62353 AND VAC-62357
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for a Tentative Map FOR A FOUR-LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION on 2.49 acres located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard (APN 139-32-405-027), R-E (Residence Estates) Zone, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. The applicant is to provide street lighting adjacent to the front of the four residential lots in an acceptable manner to the Department of Planning prior to the issuance of civil improvement plans.
2. Approval of and conformance to the Conditions of Approval for Variance (VAR-62407), Waiver (WVR-62353) and Vacation (VAC-62357) shall be required, if approved.
3. Approval of the Tentative Map shall be for no more than four (4) years. If a Final Map is not recorded on all or a portion of the area embraced by the Tentative Map with four (4) years of the approval of the Tentative Map, this action is void.
4. Street names must be provided in accordance with the City of Las Vegas Street Naming and Address Assignment Regulations, 2009 Edition.
5. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.

CITY OF LAS VEGAS
495 S. MAIN STREET
LAS VEGAS, NEVADA 89101

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6. In conjunction with creation, declaration and recordation of the subject common-interest community, and prior to recordation of the Covenants, Codes and Restrictions ("CC&R"), or conveyance of any unit within the community, the Developer is required to record a Declaration of Private Maintenance Requirements ("DPMR") as a covenant on all associated properties, and on behalf of all current and future property owners. The DPMR is to include a listing of all privately owned and/or maintained infrastructure improvements, along with assignment of maintenance responsibility for each to the common interest community or the respective individual property owners, and is to provide a brief description of the required level of maintenance for privately maintained components. The DPMR must be reviewed and approved by the City of Las Vegas Department of Field Operations prior to recordation, and must include a statement that all properties within the community are subject to assessment for all associated costs should private maintenance obligations not be met, and the City of Las Vegas be required to provide for said maintenance. Also, the CC&R are to include a statement of obligation of compliance with the DPMR. Following recordation, the Developer is to submit copies of the recorded DPMR and CC&R documents to the City of Las Vegas Department of Field Operations.
7. All development is subject to the conditions of City Departments and State Subdivision Statutes.

Public Works

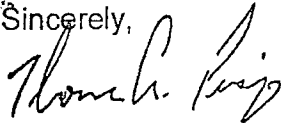
8. A Petition of Vacation such as VAC-62357 shall be recorded prior to the recordation of a Final Map for this site.
9. Prior to the recordation of a Final Map for this site, provide proof of legal access to this site from Campbell Drive.
10. Label the private street as a "Public Sewer Easement to be Privately Maintained" on the Final Map.
11. Revise the statement "E 10' PUBLIC DRAINAGE & SEWER EASEMENT PER P.M. #53-87 TO BE VACATED" to eliminate the reference to drainage, as the existing drainage easement is private, not public.
12. The existing Public Drainage Easement per document number #20100913:03565 shall be within a common lot and labeled as privately maintained on the Final for this site.
13. All existing 8-inch private sewer that is proposed to be Public Sewer shall be bonded for and pass all City inspections for typical public sewer installations. The developer is responsible to repair any existing sewer that does not pass all inspections before the City will release the bond and accept maintenance of the sewer.

Mr. Rick Firmine
805 Land, LLC
TMP-62358 [PRJ-62201] - Page Three
February 18, 2016

14. Grant a 20-foot wide "Public Sewer Easement, Surface to be Privately Maintained" over the existing sewer along the east edge of proposed lot 3. This easement can remain in the backyard, as long as the existing 10-foot wide concrete surface drainage easement remains. Remove the existing manhole from the northeast corner of lot 3.
15. Create a common area and grant a 20-foot wide "Public Sewer Easement, Surface To Be Privately Maintained" between lots 3 and 4. This easement shall be paved to provide drivable access to the existing manhole along the east edge of the development.
16. Grant a 10-foot wide "Private Sewer Easement for the sole benefit of APN 139-32-405-026" along the east edge of the lot 4. This easement shall be within the 10-foot common lot created on the east side of lot 4.
17. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or submittal of any construction drawings, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,



Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Mr. Scott Harwood
DR Horton, Inc.
1081 Whitney Ranch
Henderson, Nevada 89104

Mr. Eric Rietz
Quantum Surveying
6018 South Durango Drive, Suite #110
Las Vegas, Nevada 89113



LAS VEGAS
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BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127 -

**RE: VAR-62407 [PRJ-62201] - VARIANCE RELATED TO WVR-62353, VAC-62357 AND TMP-62358
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for Variance TO ALLOW A 27-FOOT PRIVATE STREET WHERE 47 FEET IS REQUIRED AND TO ALLOW NO AMENITY ZONES AND SIDEWALKS WHERE SUCH ARE REQUIRED FOR A PROPOSED RESIDENTIAL SUBDIVISION on 2.49 acres located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard (APN 139-32-405-027), R-E (Residence Estates) Zone, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
2. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
3. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
4. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

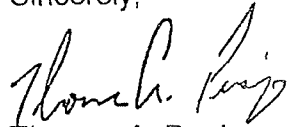
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Mr. Rick Firmine
805 Land, LLC
VAR-62407 [PRJ-62201] - Page Two
February 18, 2016

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas A. Perrigo".

Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Mr. Scott Harwood
DR Horton, Inc.
1081 Whitney Ranch
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Mr. Eric Rietz
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CITY MANAGER

February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127

**RE: VAC-62357 [PRJ-62201] - VACATION RELATED TO VAR-62407, WVR-62353 AND TMP-62358
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for Petition to Vacate a PUBLIC SEWER EASEMENT generally located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. The limits of this Petition of Vacation shall be a 10-foot wide portion of the public sewer easement granted by the map recorded on Book 57, Page 11 of Parcel Maps generally located east of Campbell Road, north of Charleston Boulevard.
2. All public improvements, if any, adjacent to and in conflict with this vacation application are to be modified, as necessary, at the applicant's expense prior to the recordation of an Order of Vacation.
3. The Order of Vacation shall not be recorded until all of the conditions of approval have been met provided, however, that conditions requiring modification of public improvements may be fulfilled for purposes of recordation by providing sufficient security for the performance thereof in accordance with the Subdivision Ordinance of the City of Las Vegas. City Staff is empowered to modify this application if necessary because of technical concerns or because of other related review actions as long as current City right-of-way requirements are still complied with and the intent of the vacation application is not changed. If applicable, a five foot wide easement for public streetlight and fire hydrant purposes shall be retained on all vacation actions abutting public street corridors that will remain dedicated and available for public use. Also, if applicable and where needed, public easement corridors and sight visibility or other easements that would/should cross any right-of-way or easement being vacated must be retained.

CITY OF LAS VEGAS
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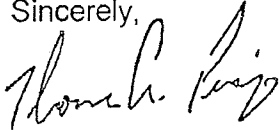
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Mr. Rick Firmine
805 Land, LLC
VAC-62357 [PRJ-62201] - Page Two
February 18, 2016

4. All development shall be in conformance with code requirements and design standards of all City Departments.
5. If the Order of Vacation (or Order of Relinquishment of Interest if a Patent Reservation) is not recorded within one (1) year after approval by the City of Las Vegas or an Extension of Time is not granted by the Planning Director, then approval will terminate and a new petition must be submitted.

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,



Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Mr. Scott Harwood
DR Horton, Inc.
1081 Whitney Ranch
Henderson, Nevada 89104

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ELIZABETH N. FRETWELL
CITY MANAGER

February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127

**RE: WVR-62353 [PRJ-62201] - WAIVER RELATED TO VAR-62407, VAC-62357 AND TMP-62358
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for a Waiver TO ALLOW NO STREETLIGHTS WHERE SUCH ARE REQUIRED FOR A PROPOSED RESIDENTIAL SUBDIVISION on 2.49 acres located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard (APN 139-32-405-027), R-E (Residence Estates) Zone, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. This approval shall be void two (2) years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
2. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
3. A Waiver from of Title 19.02.240 to allow no street lighting where such is required is approved.
4. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
5. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

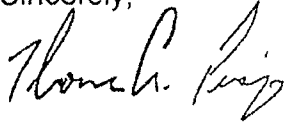
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Mr. Rick Firmine
805 Land, LLC
WVR-62353 [PRJ-62201] - Page Two
February 18, 2016

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas A. Perrigo". The signature is fluid and cursive, with the first name "Thomas" being more prominent.

Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Mr. Scott Harwood
DR Horton, Inc.
1081 Whitney Ranch
Henderson, Nevada 89104

Mr. Eric Rietz
Quantum Surveying
6018 South Durango Drive, Suite #110
Las Vegas, Nevada 89113

Albert Sung

From: Anthony DeLeon <AnthonyD@taneycorp.com>
Sent: Thursday, May 05, 2016 10:46 AM
To: Albert Sung
Subject: FW: DXC-16-058 - Hastings & Campbell Blue Herron
Attachments: PM 57-11.pdf

Hey Albert,

I just wanted to pass this information your way for your records. Per our discussion yesterday during the pre-submittal meeting for this project, there were a couple of missing items. I spoke with the project manager in charge of the plans and he sent the response below.

Always a pleasure working with you. Please let us know if you have any questions or comments.

Respectfully,

Anthony DeLeon Jr, PE, CFM

Office: (702) 362-8844

Direct: (702) 912-0235



Please consider the environment before printing this e-mail.

From: Justin Thorne
Sent: Thursday, May 05, 2016 9:35 AM
To: Anthony DeLeon
Cc: Markella Bilalis
Subject: RE: DXC-16-058 - Hastings & Campbell Blue Herron

Anthony,

I have attached a copy of the parcel map dedicating the 10' private drainage easement as requested. We will add this to the plan set as you discussed in your meeting. We will also adjust the plans to include the following:

1. Show the linework for the existing wall on the south of the site.
2. Indicate the sewer easement as being public between the two eastern parcels.

If you have any questions or if you need anything else please contact me.

Thanks,

S. Justin Thorne, P.E.

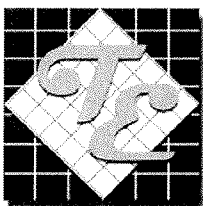
Taney Engineering

6030 S. Jones Blvd.

Las Vegas, NV 89118

(702) 362-8844

JustinT@taneycorp.com



TANEY ENGINEERING

6030 SOUTH JONES BLVD.

LAS VEGAS, NV 89118

TELEPHONE: 702-362-8844

FAX: 702-362-5233

Transmittal

☐ **Priority** ☐ **Must be delivered by:**

☐ **AM**

☐ **PM**

To:	Albert Sung Flood Control-7 th Floor	From:	Janna Felipe jannaf@taneycorp.com
Company:	City of Las Vegas	Date:	May 3, 2016
Address:	333 N. Rancho Las Vegas, NV 89106	Job No.:	DXC-16-058
Project:	Hasting & Campbell	Folder:	Eng\Supporting Reports\Hydrology\Published
Re:	TDS - Initial Submittal	Project #	

Items Attached

1. (1) Technical Drainage Study
2. (1) TDS Improvement Plans
3. (1) Disk of TDS & Plans
4. (1) Technical Drainage Study Initial Submittal fee- \$400.00 Check #1001

COMMENTS:

For Review

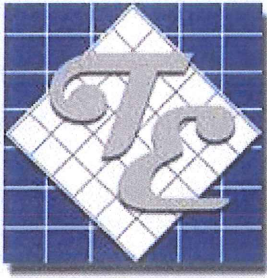
RECEIVED BY

Signature: _____

Print name: _____

Date: _____

Time: _____



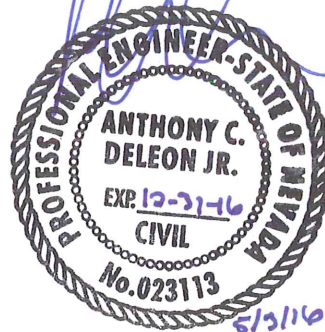
TANEY ENGINEERING

TECHNICAL DRAINAGE STUDY

FOR

Hastings & Campbell

Residential Development



CITY OF LAS VEGAS
NEVADA

May 2016

Prepared by:

Taney Engineering
6030 S. Jones
Las Vegas, Nevada 89118
Telephone: (702) 362-8844
Fax: (702) 362-5233

Prepared for:

Dax Contracting, LLC
4675 W Teco Ave, Ste 250
Las Vegas, NV 89118
Telephone: (702) 256-8866
Fax: (702) 256-8862

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Hastings & Campbell Date: May 3, 2016

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

East/West: Hastings Avenue

b) Section: 32 Township: 20S Range: 61E

c) APN: 139-32-405-027

Name of Owner: DAX Contracting, LLC

Telephone No.: (702) 256-8866 Fax No.: (702) 256-8862 E-Mail Address: _____

Address: 4675 W Teco Ave STE 250 Las Vegas, NV 89118

Contact Person-Name: Anthony Deleon Jr., PE, CFM Telephone No.: (702) 362-8844

* E-Mail Address: AnthonyD@taneycorp.com Fax No.: (702) 362-5233

Firm: Taney Engineering

Address: 6030 S. Jones Blvd, Las Vegas NV 89118

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		

1. Total Owned Land Area: At Site: 2.49+/- acres Being Developed/Disturbed: 2.49+/- acres

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

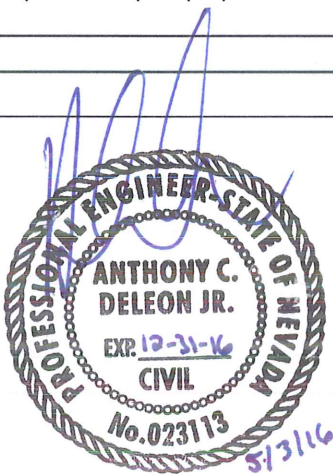
4. Proposed type of development (Residential, Commercial, Etc.): Residential

5. Approximate upstream land area which drains to the subject site: 7.55+/- acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Storm Drain Report for Busch Residence(DS#4430)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: To the northeast corner of the site through the existing 20-foot wide Drainage Easement.

8. Briefly describe your proposed schedule for the subject project: A.S.A.P



Engineer's Seal

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



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 (CCRFCDD) 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 CCRFCDD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCDD 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.)
☒		Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
		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. ☒ AD 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	
☒		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
☒		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.
☒		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.)

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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	
X		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.
	N/A	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.

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III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
☒		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.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Hastings & Campbell	Map ID:		
Firm Name: Taney Engineering	Engineers: Anthony DeLeon Jr., PE, CFM		
Address: 6030 S Jones Blvd			
City: LAS VEGAS	State: NV	Zip: 89118	
Phone Number: (702) 362-8844	Fax Number: (702) 352-5233		
Property Owner: Dax Contracting LLC			
Address: 4675 W Teco Ave, Ste 250			
City: Las Vegas	State: NV	Zip: 89118	
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 the items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

Yes	No	
<u> X </u>	<u> </u>	Design Manual Standard Form 1 with the engineer's seal and signature.
<u> X </u>	<u> </u>	Design Manual Standard Form 4
<u> X </u>	<u> </u>	2 Copies of the 24"x36" Drainage Plan
<u> </u>	<u> N/A </u>	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

<u> X </u>	<u> </u>	A copy of a current Flood Insurance Map (FIRM) with the site delineated.
<u> X </u>	<u> </u>	A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental area with the site delineated.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes	No	
<u> X </u>	<u> </u>	Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
<u> X </u>	<u> </u>	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.
<u> X </u>	<u> </u>	Vicinity Map with local and major cross streets identified and a north arrow.

II. DRAINAGE PLAN

Yes	No	
<u> X </u>	<u> </u>	Sheet size: 24"x36" sealed by a registered engineer in the State of Nevada
<u> X </u>	<u> </u>	Minimum scale: 1" = 60'
<u> X </u>	<u> </u>	Project Name.
<u> X </u>	<u> </u>	Vicinity Map with local and major cross streets.
<u> X </u>	<u> </u>	Revision box.
<u> X </u>	<u> </u>	North arrow and bar scale.
<u> X </u>	<u> </u>	Engineer's/consultants's address and phone number
<u> X </u>	<u> </u>	Elevation datum and benchmark
<u> X </u>	<u> </u>	Legend for symbols and abbreviations
<u> X </u>	<u> </u>	Cut/fill scarps, where applicable
<u> X </u>	<u> </u>	Street names, grades, widths.
<u> X </u>	<u> </u>	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.
<u> X </u>	<u> </u>	Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where applicable.
<u> X </u>	<u> </u>	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
<u> X </u>	<u> </u>	Proposed typical street sections

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
<u> </u>	N/A	Streets with off-set crowns.
<u> X </u>	<u> </u>	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes
<u> X </u>	<u> </u>	Property Lines
<u> X </u>	<u> </u>	Right-of-way lines and widths, existing and proposed.
<u> X </u>	<u> </u>	Existing improvements and their elevations.
<u> X </u>	<u> </u>	Delineation of proposed on-site drainage basin(s) indicating area and 10-year and 100-year storm peak flows at basin concentration points.
<u> X </u>	<u> </u>	Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
<u> X </u>	<u> </u>	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
<u> X </u>	<u> </u>	Location and cross-section of street capacity calculations.
<u> X </u>	<u> </u>	Cross-sectional detail for channels. Including cutoff wall locations.
<u> X </u>	<u> </u>	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) starting size, material, shape, and slope with plan and profile and HGL calculations.
<u> X </u>	<u> </u>	Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
<u> X </u>	<u> </u>	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs.
<u> X </u>	<u> </u>	Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
<u> X </u>	<u> </u>	Perimeter retaining wall locations. All existing and proposed walls (retaining, screen & flood) must be shown with adjacent elevations. Flood wall with 8-inch concrete masonry unit.
<u> X </u>	<u> </u>	Building and/or lot numbers
<u> </u>	N/A	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
<u> </u>	N/A	Limits of existing floodplain based on current FIRM or best available information, limits of proposed floodplains based on best available information

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
_____	N/A	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 flood elevations must be a minimum of 18 inches above BFE.
_____	N/A	Appropriately elevated "humps" 6 inches above the 100 year water surface elevations at site accesses where the intent is to protect the site from the Q_{100} flows.
X	_____	Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
_____	N/A	Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required)

IV. HYDROLOGIC ANALYSIS

Yes	No	
X	_____	Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
X	_____	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.
X	_____	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.
X	_____	Use of correct precipitation values in and around the McCarran Airport rainfall area.
X	_____	A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
X	_____	A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.
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
_____	N/A	Calculation for impervious area for parking lots and LIDs (if required)

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.
X	_____	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 rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the grading plan.
X	_____	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.)
X	_____	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and fee 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 be provided with 18 inches of freeboard above 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. • Field survey data. • Input and output information. • Plotted cross sections based on survey with proper encroachments. • A map showing the location of 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 calculations 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 fully developed condition, must be addressed.
_____	N/A	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2



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1 INTRODUCTION AND GENERAL INFORMATION

1.1 Introduction

DXC Contracting LLC is proposing to develop a new residential community on the east side of Campbell Drive, between Charleston Boulevard and Palomino Lane. This residential development covers approximately 2.5 acres and will include 4 residential homes. This technical drainage study presents detailed hydrologic and hydraulic analyses for the existing and proposed onsite and offsite development, as required in the *Clark County Regional Flood Control District Hydrologic Criteria and Design Manual (HC&DDM)*.

1.2 Location of Property

In general, the subject site is located east of Campbell Drive, south of Palomino Lane and north of Charleston Boulevard in Las Vegas, Nevada. The site is located within a portion of the Southern Half (S 1/2) of the Southwest Quarter (SW ¼) of Section 32, Township 20 South, Range 61 East, M.D.M., in the City of Las Vegas, Nevada. See Figure 1, *Vicinity Map*, and Figure 2, *Location Map*.

1.3 Description of Property

The project site consists of one parcel, totaling approximately 2.5 acres. Specifically the site includes APN 139-32-405-027. The project site is bordered by residential homes on west and north side, by Wasden Elementary School on the east side, and by Westbay Office Park on the south side. The access to the project site is provided indirectly through an existing private drive off of Campbell. The private drive is paved with curb and gutter and it extends into the site to a cul-de-sac. There is an existing private drainage easement along the east property wall with a “V” ditch that conveys the onsite runoff as well as the and offsite flows from Westbay Office Park north into a private drive and further into Palomino Lane. The site has been previously rough graded and it is sloping from west to east at a slope of approximately one percent.

1.4 Floodplain Information

The Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM), Community Panel Numbers 32003C2170F, effective November 16, 2011, designates the project site as Zone ‘X’. Zone ‘X’ is described as an area determined to be outside the 0.2% annual chance floodplain. The most current panel has been used in this study. See Figure 3, Flood Zone Map in Appendix A.

1.5 Master Planning Information

1.5.1 CCRFCD 2013 Master Plan Update

As shown on *Figure F-31* of the *Las Vegas Valley Flood Control Master Plan Update of the Clark County Regional Flood Control District (MPU)*, the site is not bordered or crossed by any planned or existing regional flood control facilities. See Figures 4, 4A and 5 for reproductions of the MPU figures for the project site.



1.5.2 Northwest Neighborhood Study by City of Las Vegas, revised Sept. 1999

The project site is located on Figures E-9 and F-9 of the *City of Las Vegas Northwest Neighborhood Study*. Refer to Figures 6 and 7 of this study for reproductions of these figures, respectively.

1.6 Topographic Information

Topographic information for this project was gathered from a number of sources including:

1. Aerial and field topographic survey completed by Taney Engineering and consultants at a 1-foot contour interval.
2. Five (5) foot contour data provided by Clark County around 1996.

2 METHODOLOGY AND CRITERIA

2.1 Compliance with Regulations and Adopted Plans

The methodologies utilized in the preparation of this study are in compliance with the Clark County Regional Flood Control District's Hydrologic and Drainage Design Manual, local entity requirements and the approved zoning/planning conditions associated with this site.

2.2 Hydrologic Methodology and Criteria

Hydrologic methodologies used in this study are in accordance with Sections 500 and 600 of the HCDDM. Discussion of specific parameters, methodologies and calculations can be found in Appendix B, Hydrologic Calculations.

2.3 Hydraulic Methodology and Criteria

Hydraulic methodologies used in this study in accordance with the HCDDM. FlowMaster has been used to assist in hydraulic calculations. Excel spreadsheets have also been used for any other necessary calculations. Hydraulic calculations can be found in Appendix C.

3 DRAINAGE SUMMARY

3.1 General Description

The project site is impacted by offsite runoff from the residential house bordering the project site on the west, flow that gets into the private driveway, travels along the driveway via curb and gutter and eventually flows into the existing concrete V-ditch. Offsite flows traveling north from the Westbay Office Park enter the site at the southeast corner into the existing V-ditch. The flows are channeled towards north and exit the project site via wall opening into an existing driveway and further north towards Palomino Lane. The site itself will be developed as residential homes with a minimum lot size of 10,000 sf. There is one east-west street that curves north and ends in a cul-de-sac. The onsite basins will discharge into the existing drainage easement and further north to Palomino Lane.



3.2 Previous Drainage Studies

There were numerous Technical Drainage Studies that have been previously approved in the vicinity of the subject site. Although several studies were reviewed for general information, only the studies of which specific information was referenced are listed below. All reference material can be found in Appendix D.

Technical Drainage Study for Busch Residence, DS-4430

The Busch Residence drainage study was made for the site that the project is proposed on. This study has been reviewed for existing condition and offsite flows. The offsite flows of 1/3 cfs (runoff from west side) and 10/20 cfs (runoff from south side) have been accepted and referenced for use in this study.

4 HYDROLOGIC ANALYSIS

4.1 Existing Condition

In the existing condition offsite flow impacts the site from the west, flowing on Triple Crown Circle and from the south through the existing easement along the east property boundary. Refer to Figure 8, *Existing Basin Map*, for basin boundaries and flow paths.

Runoff from referenced REF1* (1/3) and REF2* (10/20) combines with runoff from basins XON1 (1/1) and XON2 (3/6) at combination point XCP (15/30) before exiting the site north towards Palomino. Concentration point XCP is located at the end of the existing 20' public sewer and drainage easement running along the project's eastern boundary.

4.2 Interim Condition

In the interim condition, the subject site becomes developed, and the offsite basins remain in the existing condition. Due to the fact that all the surrounding properties are developed, there is no interim condition to be analyzed.

4.3 Ultimate Condition

In the ultimate condition it is assumed the subject site and all the offsite basins are fully developed. Refer to Figure 9, *Developed Basin Map* for basin boundaries and flow paths.

Basin DON 1 (1/1) and REF1* (1/3) combine their runoff with basin DON 2 before flowing through a proposed 20' public sewer and drainage easement. These flows combine with the flow from REF2* (10/20), and DON 3 (1/2) at combination point DCP yielding 14 cfs for 10-year storm event and 29 cfs for 100-year storm event.



5 HYDRAULIC ANALYSIS

5.1 Street Hydraulics

Hydraulic calculations have been provided for all streets in the developed conditions. See Table 2 for a summary of results; calculations can be found in Appendix C. The location of the hydraulic cross sections can be found on Figures 7 and 8. All street sections meet VxD and depth requirements for the 10-year and 100-year storm events. The interior street is being designed as a 30' crowned private street. The cul-de-sac slopes from west to east at 1.7%.

5.2 Drainage Easements

The project includes two public 20' sewer and drainage easements and one existing 10' private drainage easement running north-south along the eastern boundary. This easement starts as 10' at south end and extends to 20' at the connection to the proposed 20' public drainage easement running west-east. This easement conveys the flow from the cul-de-sac towards the first drainage easement discharging the runoff through wall opening. Cross section B provides worst case hydraulic calculations for the west-east easement and cross section C provides worst case hydraulic calculations for the north-south easement. The north-south easement includes a 10' channel and 3:1 slope on the west side. The west-east easement consists of a 2' valley gutter down the middle for low flows with pavers covering the remainder of the easement.

Weir calculations have also been provided. The adjacent screen walls have been solid grouted to a minimum of 18" above the 100-year weir elevation. Both the public drainage easements are to be publicly maintained and are lined with reinforced concrete.

5.3 Finished Floor Elevations

The proposed finished floor elevations have been set at a minimum vertical distance above the gutter flowline of at least twice the depth of flow in the gutter flowline up to a maximum of 18 inches above the water surface elevation in the street.

The proposed finished floor elevations have also been protected to a minimum of 18" above the water surface elevation and weir elevation where adjacent to drainage easements.



6 SUMMARY TABLES

Table 1: Basin Summary

Existing Condition				Ultimate Condition			
Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)	Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
XON1	0.36	1	1	DON1	0.36	1	1
XON2	2.13	3	6	DON2	1.06	1	3
REF1*	N/A	1	3	DON3	1.07	1	2
REF2*	N/A	10	20	REF1*	N/A	1	3
XCP	N/A	15	30	REF2*	N/A	10	20
				DCP	N/A	14	29

* FLOW REFERENCED FROM DRAINAGE STUDY DS 4430.

Table 2: Cross Section Summary

Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
A - 30 FT PRIVATE DR 100YR-DV	REF1 + DON1	4	1.29	0.32	2.30	0.74
A - 30 FT PRIVATE DR 10YR-DV	REF1 + DON2	2	1.29	0.27	1.99	0.54
B - 20 FT PRIVATE DRAINAGE EASEMENT 100YR-DV	REF1+DON1+DON2+DON3	9	0.87	0.25	3.00	0.75
C - 10 FT VALLEY GUTTER 100YR-DV	DCP	29	0.37	1.12	4.64	5.20
D - 10 FT VALLEY GUTTER 100YR-DV	REF2*	20	0.23	1.06	3.54	3.75

7 CONCLUSIONS AND RECOMMENDATIONS

As detailed in this study, the Hastings and Campbell Residential Development is in compliance with the *HC&DDM*. No adverse effects are expected either upstream or downstream of the subject site. Street and drainage easement criteria will be met. Proposed finished floor elevations are adequately protected and are set a minimum of 18" above the adjacent top of curb elevation.



8 REFERENCES

2008 & 2013 Clark County Regional Flood Control District Flood Control Master Plan Update, PBS&J, G. C. Wallace, and Louis Berger Group.

Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual, August 1999, WRC Engineering (updated by Montgomery Watson).

FlowMaster Version V8i, Haestad Methods, Inc.

Flood Insurance Rate Map Number 32003C2170F, dated November 16, 2011, Federal Emergency Management Agency.

HEC-1 Flood Hydrograph Package Version 4.1, June 1998, U.S. Army Corps of Engineers.

Technical Drainage Study for Busch Residence, Lochsa Engineering, DS-4430, 2010



APPENDICES

APPENDIX A

Figures

APPENDIX B

Hydrologic Calculations

APPENDIX C

Hydraulic Calculations

APPENDIX D

Reference Material

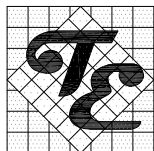
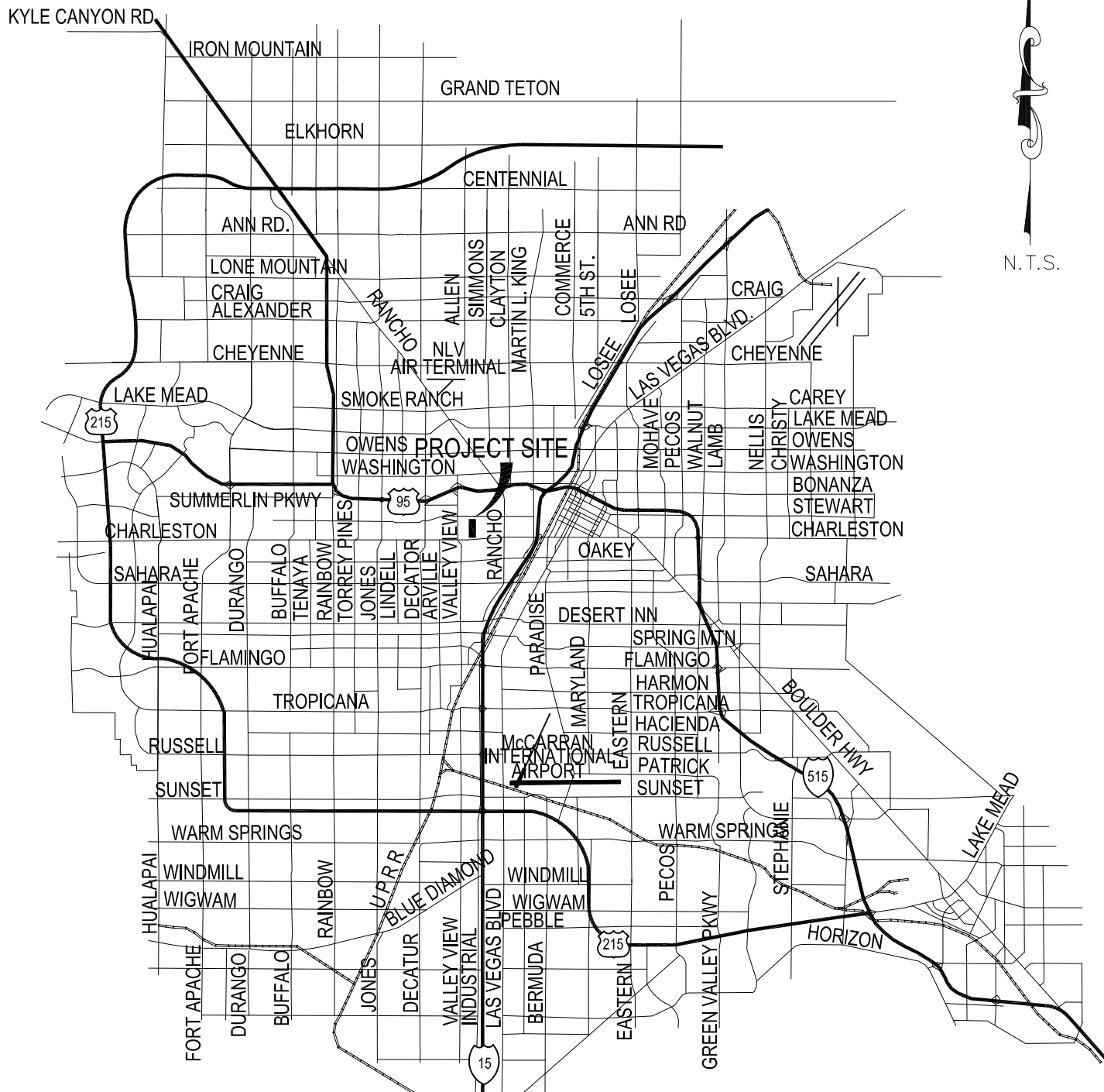
APPENDIX E

Improvement Plans



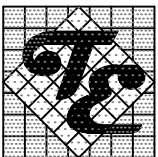
APPENDIX A

Figures



TANEY ENGINEERING
 6030 S. JONES BLVD STE#100
 LAS VEGAS, NV 89118
 (702) 362-8844 FAX: (702) 362-5233

FIGURE 1
VICINITY MAP
HASTING & CAMPBELL



TANEY ENGINEERING
6030 S. JONES BLVD STE#100
LAS VEGAS, NV 89118
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**FIGURE 2
LOCATION MAP
HASTING & CAMPBELL**

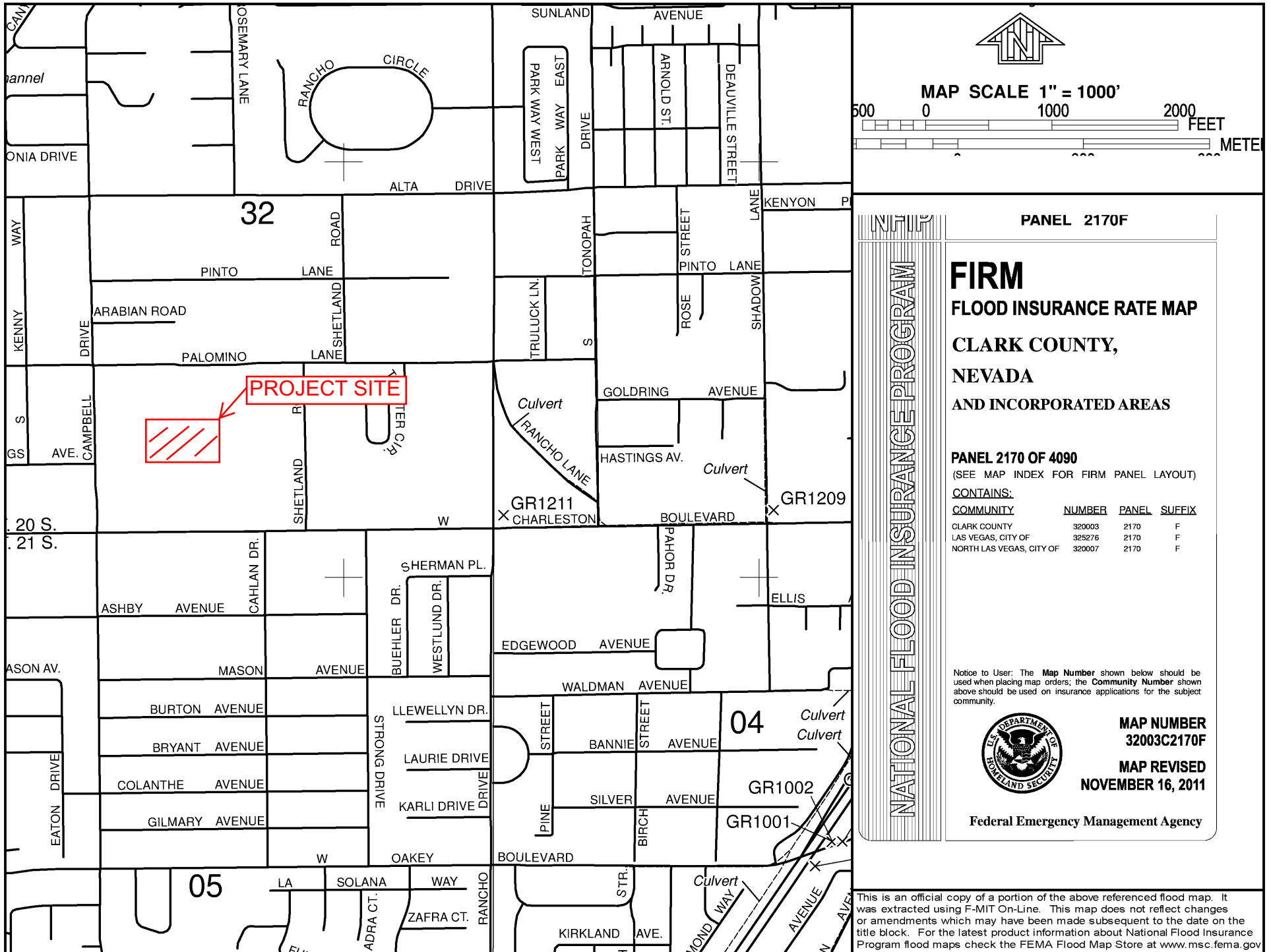


FIGURE 3 FIRM MAP

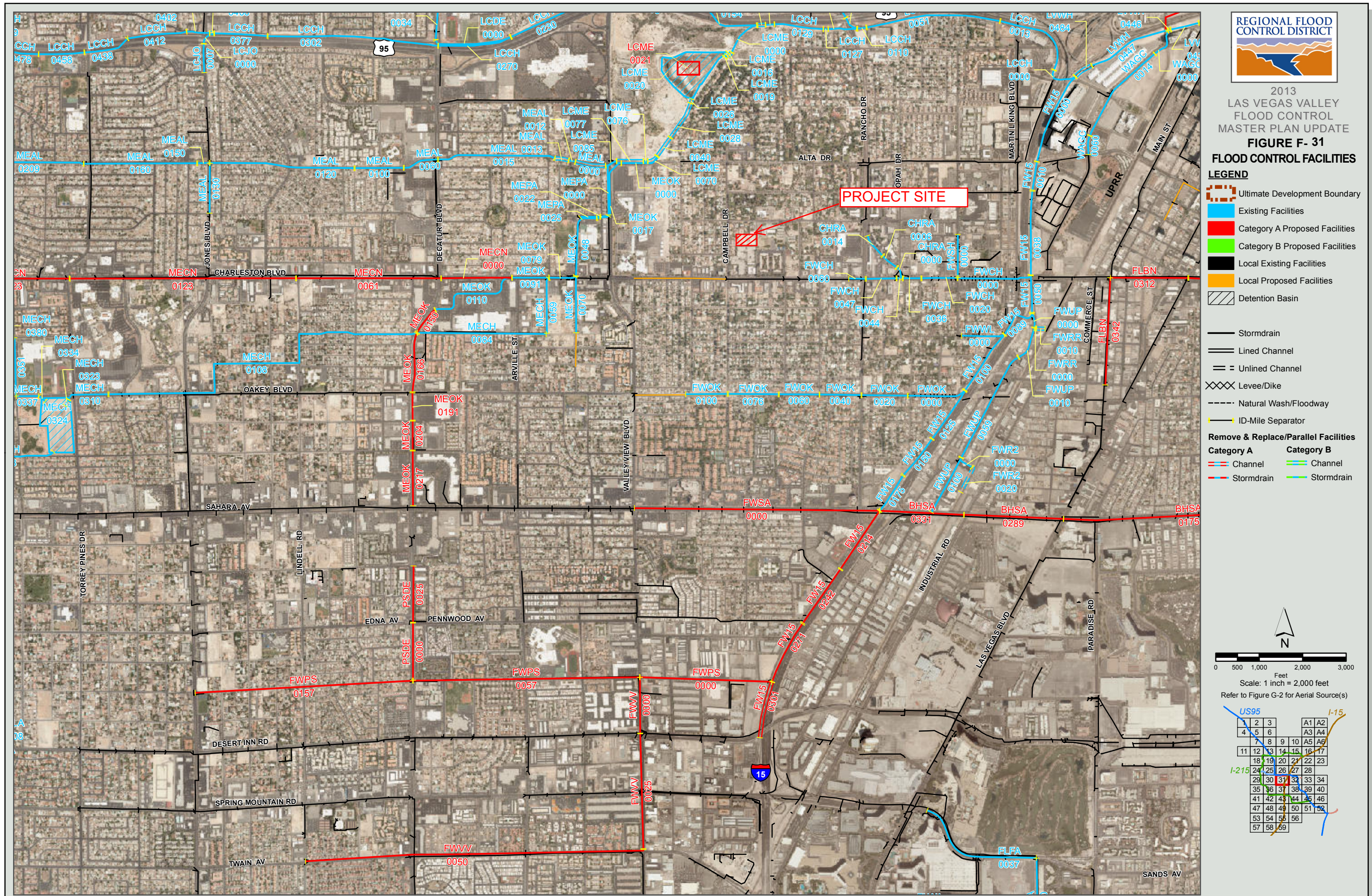


FIGURE 4 FMAP

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BHSA		BOULDER HIGHWAY SAHARA AVENUE						
0000	P2	14' X 10' RCB	1350	3837	CSA13*	SW3	7.93	0.50
0026	P1	14' X 11' RCB	4000	3837	CSA13*	SW3	7.93	1.30
0075	P1	12' X 11' RCB	5280	3837	CSA13*	SW3	7.93	2.11
0175	P1	14' X 14' RCB	6000	3837	CSA13	SW3	7.93	0.67
CABZ		CEDAR AVENUE - BONANZA						
0000	E	72" RCP	525					0.30
0010	E	60" RCP	1450					0.30
CACH		CEDAR AVENUE CHANNEL						
0000	E	Conc Chnl 10"W 8'D 1.5:1 SS	1681	1544	CCA10-C	SW3	1.81	0.20
0027	E	2: 15'X5' RCBC @ Marion	82	1544	CCA10-C	SW3	1.81	0.35
0029	E	Conc Chnl 10"W 8'D 1.5:1 SS	1284	1544	CCA10-C	SW3	1.81	0.37
0051	E	2: 15'X5' RCBC @ Page	64	1544	CCA10-C	SW3	1.81	0.38
0053	E	Conc Chnl 10"W 6'D 1.5:1 SS	1275	1544	CCA10-C	SW3	1.81	0.38
0079	E	2: 12' X 6' RCBC @ Lamb	100	1387	CCA08-C	SW3	1.61	0.38
0081	E	Conc Chnl 12"W 6'D 1.5:1 SS	2562	1387	CCA08-C	SW3	1.61	0.20
0127	E	3: 12'X4' RCBC @ Sandhill	80	1387	CCA08-C	SW3	1.61	0.20
0129	E	Conc Chnl 10"W 8'D 1.5:1 SS	971	1387	CCA08-C	SW3	1.61	0.26
0146	E	2: 12' X 5.5' RCBC @ Honolulu	62	1387	CCA08-C	SW3	1.61	0.53
0148	E	Conc Chnl 10"W 8'D 1.5:1 SS	959	1387	CCA08-C	SW3	1.61	0.53
CACN		CEDAR AVENUE - CHARLESTON						
0000	E	72" RCP (Replace w/ CACN0001)	1867	933	CCA05	SW3	0.96	0.41
0001	P1	10' X 9' RCB (Replaces CACN0000)	1867	933	CCA05	SW3	0.96	0.41
0034	E	2: 48" RCP (Replace w/ CACN0035)	685	254	CA05	SW3	0.24	0.30
0035	P0	6' X 6' RCB (Replaces CACN0034)	685	254	CA05	SW3	0.24	0.30
0049	E	66" RCP (Replace w/ CACN0050)	2146	254	CA05	SW3	0.24	0.60
0050	P0	6' X 5' RCB (Replaces CACN0049)	2146	254	CA05	SW3	0.24	0.60
CNST		CEDAR AVENUE CHANNEL - STEWART						
0000	P1	8' X 7' RCB	2120	690	CCA04	SW3	0.72	0.90
COLM		COLORADO / LAMB						
0000	E	72" RCP	1500	470	CCH94	SW3	0.63	0.87
FLAG		FLAMINGO WASH - ALGONQUIN						
0000	E	72" RCP	1080	513	FW21	FLAM3A	0.47	0.50
0020	E	66" RCP	460	513	FW21	FLAM3A	0.47	1.00
FLBN		FLAMINGO - BOULDER HIGHWAY NORTH						
0001	E	5: 10' X 6' RCB	350	4784	CCFR03	BOULDER4	11.13	0.58
0008	E	3: 14' X 12' RCB	1055	4784	CCFR03	BOULDER4	11.13	0.20
0028	E	3: 14' X 12' RCB	275	4784	CCFR03	BOULDER4	11.13	0.20
0033	E	3: 14' X 12' RCB	500	4784	CCFR03	BOULDER4	11.13	0.20
0038	P1	15' X 10' RCB	6600	2448	CFR03	SW3	3.46	0.59
0167	P1	2: 10' X 6' RCB	700	2046	CCH68-C	SW3	2.86	1.14
0180	P1	2: 10' X 6' RCB	1300	1799	CCCH67-C	SW3	2.55	1.31
0205	P1	10' X 6' RCB	4000	1461	CCH63-C	SW3	1.88	2.30
0281	P1	10' X 7' RCB	3100	1259	CCH56	SW3	1.64	1.33
0312	P1	7' X 4' RCB	1800	555	CCH52	SW3	0.55	4.20
0342	P1	7' X 4' RCB	2500	555	CCH52	SW3	0.55	4.20
FLBS		FLAMINGO - BOULDER HIGHWAY SOUTH						
0000	E	Unlined Median Chnl 0"W 6.5'D 4.5:1 SS	4060	945	CB4	FLAM3A	1.38	1.30
0167	E	Unlined Median Chnl 0"W 3.5'D 9:1 SS	8850	452	CB4N	FLAM3A	0.63	0.90
FLDN		DESERT INN DRAIN EAST						
0000	E	60" RCP (Replace w/ FLDN0001)	6160	1267	CFW30AW	FLAM3A	2.12	1.22
0001	P0	12' X 6' RCB (Replaces FLDN0000)	6160	1267	CFW30AW	FLAM3A	2.12	1.22
0116	E	54" RCP (Replace w/ FLDN0117)	2330	1178	CFW29	FLAM3A	1.82	1.77
0117	P0	10' X 6' RCB (Replaces FLDN0116)	2330	1178	CFW29	FLAM3A	1.82	1.77
0160	E	48" RCP (Replace w/ FLDN0160)	2950	906	CFW28	FLAM3A	1.51	1.28
0161	P0	10' X 6' RCB (Replaces FLDN0161)	2950	906	CFW28	FLAM3A	1.51	1.28

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
FLMP		FLAMINGO WASH-MARYLAND PARKWAY SYSTEM						
0000	P1	8' X 6' RCB	3800	492	CCH60A-C	SW3	0.75	0.49
FLSP		FLAMINGO WASH - SPENCER						
0000	E	48" RCP	420	513	FW21	FLAM3A	0.47	1.10
FLWA		FLAMINGO WASH						
0000	E	Grass Chnl 107"W 5'D 2:1 SS (Replace w/ FLWA0001)	4570	10952	CFW36*	FLAM5B	36.14	0.40
0001	P1	Conc Chnl 100"W 7.5'D 1:1 SS (Replaces FLWA0000)	4570	10952	CFW36*	FLAM5B	36.14	0.40
0078	E	3 Span Bridge 108.25"W 5.5'D @ Nellis	120	10952	CFW36	FLAM5B	36.14	0.70
0080	E	Conc Chnl 50"W 8.5'D 1:1 SS	5080	10952	CFW36	FLAM5B	36.14	1.20
0174	E	9: 10' X 6' RCBC @ Lamb	110	10822	CFW34	FLAM5B	35.66	1.40
0176	E	Conc Chnl 60"W 9'D 1:1 SS	1180	10822	CFW34	FLAM5B	35.66	0.70
0200	E	Conc Chnl 70"W 8'D to 12"D w/ Pier 0:1 SS	1245	10822	CFW34	FLAM5B	35.66	0.50
0226	E	Free Span Bridge 100"W 10'D @ I-515	170	10822	CFW34	FLAM5B	35.66	0.80
0228	E	Conc Chnl 70"W 8'D to 12"D 0:1 SS	1500	10788	CFW33	FLAM5B	35.36	0.80
0255	E	2 Span Bridge 150"W 9'D @ Boulder Hwy	65	10788	CFW33	FLAM5B	35.36	1.00
0256	E	Conc Chnl 60"W 7.5'D 0:1 SS	40	8146	CFW33W	FLAM5B	24.23	1.00
0257	E	2 Span Bridge 150"W 9'D @ Boulder Hwy	60	8146	CFW33W	FLAM5B	24.23	1.00
0258	E	Conc Chnl 60"W 7.5'D 0:1 SS	750	8146	CFW33W	FLAM5B	24.23	0.44
0273	E	Free Span Bridge 60"W 9'D @ MMMHP	20	8146	CFW33W	FLAM5B	24.23	0.40
0274	E	Conc Chnl 60"W 8.1'D 0:1 SS	1370	8146	CFW33W	FLAM5B	24.23	1.00
0295	E	Conc Chnl 60"W 8.1'D 0:1 SS	430	7669	CFW31	FLAM5B	22.62	0.80
0307	E	Conc Chnl 60"W 8.1'D 2:1 SS	410	7669	CFW31	FLAM5B	22.62	0.70
0314	E	Conc Chnl 60"W 8.1'D 2:1 SS	1500	7195	CFW30B	FLAM5B	21.25	0.90
0347	E	5: 10' X 8' RCBC @ Mojave	80	7195	CFW30B	FLAM5B	21.25	0.94
0348	E	Conc Chnl 30"W 12'D 1:1 SS	1150	7195	CFW30B	FLAM5B	21.25	0.70
0375	E	5: 10' X 8' RCBC @ Desert Inn	140	7102	CFW30A	FLAM5B	20.96	2.70
0377	E	Conc Chnl 50"W 9.5'D 0:1 SS	1372	6964	CFW23	FLAM5B	19.36	1.04
0399	E	Free Span Bridge 60"W 16'D @ McLeod	120	6964	CFW23	FLAM5B	19.36	0.50
0401	E	Conc Chnl 50"W 11.5'D 0:1 SS	123	6964	CFW23	FLAM5B	19.36	0.50
0406	E	Conc Chnl 33"W 11.5'D 0:1 SS	690	6964	CFW23	FLAM5B	19.36	1.01
0419	E	Conc Chnl 33'-50"W 9.8'D 0:1 SS	200	6964	CFW23	FLAM5B	19.36	2.00
0423	E	Conc Chnl 50"W 9.8'D 0:1 SS	1686	6964	CFW23	FLAM5B	19.36	0.76
0455	E	Conc Chnl 50'-75"W 9.8'D 0:1 SS	169	6964	CFW23	FLAM5B	19.36	1.83
0458	E	Conc Chnl 75'-80"W 9.8'D 0:1 SS	347	6964	CFW23	FLAM5B	19.36	1.50
0471	E	5: 10' X 8' RCBC @ Eastern	110	5781	CFW22W	FLAM5B	14.95	1.30
0472	P1	Add 1: 22' X 8' RCBC @ Eastern	110	5781	CFW22W	FLAM5B	14.95	0.50
0473	E	Grass Chnl 60"W 15'D 2:1 SS	100	5781	CFW22W	FLAM5B	14.95	0.47
0477	E	3 Span Bridge 47"W 15'D	10	5781	CFW22W	FLAM5B	14.95	0.80
0478	E	Grass Chnl 60"W 15'D 2:1 SS	520	5781	CFW22W	FLAM5B	14.95	0.47
0481	E	3: 90" CMAP @ Tioga (Replace w/ FLWA0482)	60	5781	CFW22W	FLAM5B	14.95	0.87
0482	P1	4: 20' X 8' RCBC @ Tioga (Replaces FLWA0481)	60	5781	CFW22W	FLAM5B	14.95	0.87
0483	E	Grass Chnl 60"W 15'D 2:1 SS	300	5781	CFW22W	FLAM5B	14.95	0.63
0492	E	3 Span Bridge 47"W 15'D	10	5781	CFW22W	FLAM5B	14.95	0.50
0493	E	Grass Chnl 60"W 15'D 2:1 SS	1520	5781	CFW22W	FLAM5B	14.95	0.46
0555	E	3 Span Bridge 47"W 15'D	10	5701	CFW21	FLAM5B	14.55	0.50
0556	E	Earth Chnl 60"W 15'D 2:1 SS (Replace w/ FLWA0557)	520	5701	CFW21	FLAM5B	14.55	0.54
0557	P1	Gabion Chnl 30"W 10.5'D 2:1 SS (Replaces FLWA0556)	520	5701	CFW21	FLAM5B	14.55	0.54
LVBS		LAS VEGAS WASH - BONANZA						
0000	P1	2: 12' X 7' RCB	3400	1636	CBN15-C	SW3	2.40	0.40
0064	P1	2: 12' X 6' RCB	2630	1449	CBN12-C	SW3	2.12	0.40
0114	P1	2: 12' X 6' RCB	2740	1266	CBN10-C	SW3	1.79	0.40
0166	E	54" RCP (Replace w/ LVBZ0167)	1095	1051	CBN09	SW3	1.54	0.45
0167	P0	10' X 9' RCB (Replaces LVBZ0166)	1095	1051	CBN09	SW3	1.54	0.45
0187	E	48" RCP (Replace w/ LVBZ0188)	1235	1051	CBN09	SW3	1.54	0.71
0188	P0	9' X 9' RCB (Replaces LVBZ0187)	1235	1051	CBN09	SW3	1.54	0.71
0210	E	42" RCP (Replace w/ LVBZ0211)	704	911	CBN08	SW3	1.30	1.37
0211	P0	8' X 7' RCB (Replaces LVBZ0210)	704	911	CBN08	SW3	1.30	1.37
0223	E	36" RCP (Replace w/ LVBZ0224)	2275	722	CBN03	SW3	1.09	0.72
0224	P0	8' X 7' RCB (Replaces LVBZ0223)	2275	722	CBN03	SW3	1.09	0.72

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVCA		LAS VEGAS WASH - CHARLESTON						
0000	P1	12' X 9' RCB	4600	1104	CCH77-C	SW3	1.34	0.30
LVCO		COLORADO AVENUE SYSTEM						
0000	E	18' X 8' RCB	610	1015	CNEL06	SW3	1.30	0.24
0012	E	14' X 8' RCB	2560	1015	CNEL06	SW3	1.30	0.24
0064	E	10' X 8' RCB	2165	827	CCCH94	SW3	0.98	0.24
0106	E	10' X 8' RCB	590	394	CCH92-C	SW3	0.35	0.24
0109	E	10' X 5' RCB	2350	394	CCH92-C	SW3	0.35	0.67
LVMD		LAS VEGAS WASH - MIDDLE						
1032	E	Earth Chnl 75W 10'D 1:1 SS (Replace w/ LVMD1033)	715	15156	CNLWY	CLVWASH5	118.28	0.30
1033	P1	Conc Chnl 75W 11'D 1:1 SS (Replaces LVMD1032)	739	15156	CNLWY	CLVWASH5	118.28	0.30
1045	E	5 Span Bridge 75W 10'D 1:1 SS (Replace w/ LVMD1046)	120	15156	CNLWY	CLVWASH5	118.28	0.52
1046	P1	Bridge 75W 9.5'D 1:1 SS @ Nellis (Replaces LVMD1045)	120	15156	CNLWY	CLVWASH5	118.28	0.52
1047	E	Earth Chnl 80W 8'D 2:1 SS (Replace w/ LVMD1048)	340	15083	CCNEL06	CLVWASH5	117.81	0.50
1048	P1	Conc Chnl 120W 8'D 0:1 SS (Replaces LVMD1047)	340	15083	CCNEL06	CLVWASH5	117.81	0.50
1053	E	Earth Chnl 80W 8'D 2:1 SS (Replace w/ LVMD1054)	860	14811	CNEL04-2	CLVWASH5	116.51	0.50
1054	P1	Conc Chnl 120W 8'D 0:1 SS (Replaces LVMD1053)	860	14811	CNEL04-2	CLVWASH5	116.51	0.50
1068	E	5 Span Bridge 90W 6'D 2:1 SS (Replace w/ LVMD1069)	120	14438	CCST03-C	CLVWASH5	114.87	0.50
1069	P1	5 Span Bridge 110W 8'D 2:1 SS (Replaces LVMD1068)	120	14438	CCST03-C	CLVWASH5	114.87	0.50
1070	E	Earth Chnl 90W 10'D 1.5:1 SS (Replace w/ LVMD1071)	2587	14438	CCST03-C	CLVWASH5	114.87	0.43
1071	P1	Conc Chnl 90W 9'D 1.5:1 SS (Replaces LVMD1070)	2587	14438	CCST03-C	CLVWASH5	114.87	0.43
1119	E	5 Span Bridge 90W 12'D 2:1 SS @ Stewart	120	14354	CCCA10-C	CLVWASH5	114.40	0.20
1120	E	Earth Chnl 90W 12'D 1:1 SS (Replace w/ LVMD1121)	1400	14354	CCCA10-C	CLVWASH5	114.40	0.20
1121	P1	Conc Chnl 90W 10.5'D 1:1 SS (Replaces LVMD1120)	1400	14354	CCCA10-C	CLVWASH5	114.40	0.20
1148	E	Earth Chnl 70W 18' 20"D 1.5:1 SS (Replace w/ LVMD1149)	1675	13944	CCBN15-C	CLVWASH5	112.59	0.41
1149	P1	Conc Chnl 70W 10'D 1.5:1 SS (Replaces LVMD1148)	1675	13944	CCBN15-C	CLVWASH5	112.59	0.41
1176	E	5 Span Bridge 110W 20'D 2:1 SS @ Bonanza	120	12690	CLVW04-C	CLVWASH5	108.80	0.57
1178	E	Earth Chnl 90W 18' 20"D 2:1 SS (Replace w/ LVMD1179)	1500	12690	CLVW04-C	CLVWASH5	106.80	0.57
1179	P1	Conc Chnl 60W 9.5'D 2:1 SS (Replaces LVMD1178)	1500	12690	CLVW04-C	CLVWASH5	106.80	0.57
LVNE		LAS VEGAS WASH - NELLIS						
0000	P1	2: 13' X 10' RCB	4675	2303	CNEL02-C	WEST3	3.39	0.20
LVOE		OWENS AVENUE - EAST						
0345	P1	13' X 11' RCB	1685	2369	DLVOE	SW5	22.79	0.60
LVWH		WASHINGTON AVENUE CHANNEL						
0389	E	12' X 8' RCB	2110	1607	(1/2) CV1-C	SW5SC	15.16	0.90
0426	E	16' X 8' RCB	150	1607	(1/2) CV1-C	SW5SC	15.16	1.08
0429	E	Splitter Structure (2: 12' X 8' RCB)	190	2870	DLCL21	SW5	22.79	1.90
0431	E	3: 14.33' X 10' RCB	665	2870	DLCL21	SW5	22.79	0.15
0446	E	Junction Structure	69	2870	DLCL21	SW5	22.79	0.15
0447	E	3: 14.33' X 10' RCB	1955	4978	CCAL93	SW5	22.19	0.15
NLFL		NELLIS FLAMINGO STORM DRAIN						
0028	P0	Add 1: 7' X 6' RCB	1530	338 ^A	CM3 ^A	FLAM3A	1.27	0.39
0029	E	76" & 48" RCP	1530	391 ^A	CM3 ^A	FLAM3A	1.27	0.39
0059	E	60" RCP	1370	143 ^A	CM3 ^A	FLAM3A	1.27	0.30
0060	P0	Add 1: 12' X 6' RCB	1370	586 ^A	CM3 ^A	FLAM3A	1.27	0.34
0084	E	48" RCP	2490	79 ^A	CM2 ^A	FLAM3A	0.98	0.30
0085	P0	Add 1: 11' X 6' RCB	2490	505 ^A	CM2 ^A	FLAM3A	0.98	0.30
0131	E	42" RCP	650	350	M1	FLAM3A	0.51	0.23
0144	E	36" RCP	620	350	M1	FLAM3A	0.51	0.20
NLWY		NELLIS - WYOMING CHANNEL						
0000	E	Conc Chnl 8'W 4'D 1.3:1 SS	260	338	FW35	FLAM3A	0.47	1.71
0004	E	15' X 6' RCAC	80	338	FW35	FLAM3A	0.47	1.30
0006	E	Conc Chnl 8'W 4'D 1.3:1 SS	400	338	FW35	FLAM3A	0.47	0.38
0014	E	12' X 4' RCBC @ Winterwood	70	338	FW35	FLAM3A	0.47	0.40
0015	E	Conc Chnl 8'W 4'D 1.3:1 SS	720	338	FW35	FLAM3A	0.47	0.38
0028	E	12' X 4' RCBC @ Wyoming	90	338	FW35	FLAM3A	0.47	0.80
0030	E	Conc Chnl 8'W 4'D 1.3:1 SS	250	338	FW35	FLAM3A	0.47	0.38
SAEA		SAHARA AVENUE - EASTERN LATERAL						
0000	P1	10' X 8' RCB	1440	564	CFR02	SW3	0.66	0.20

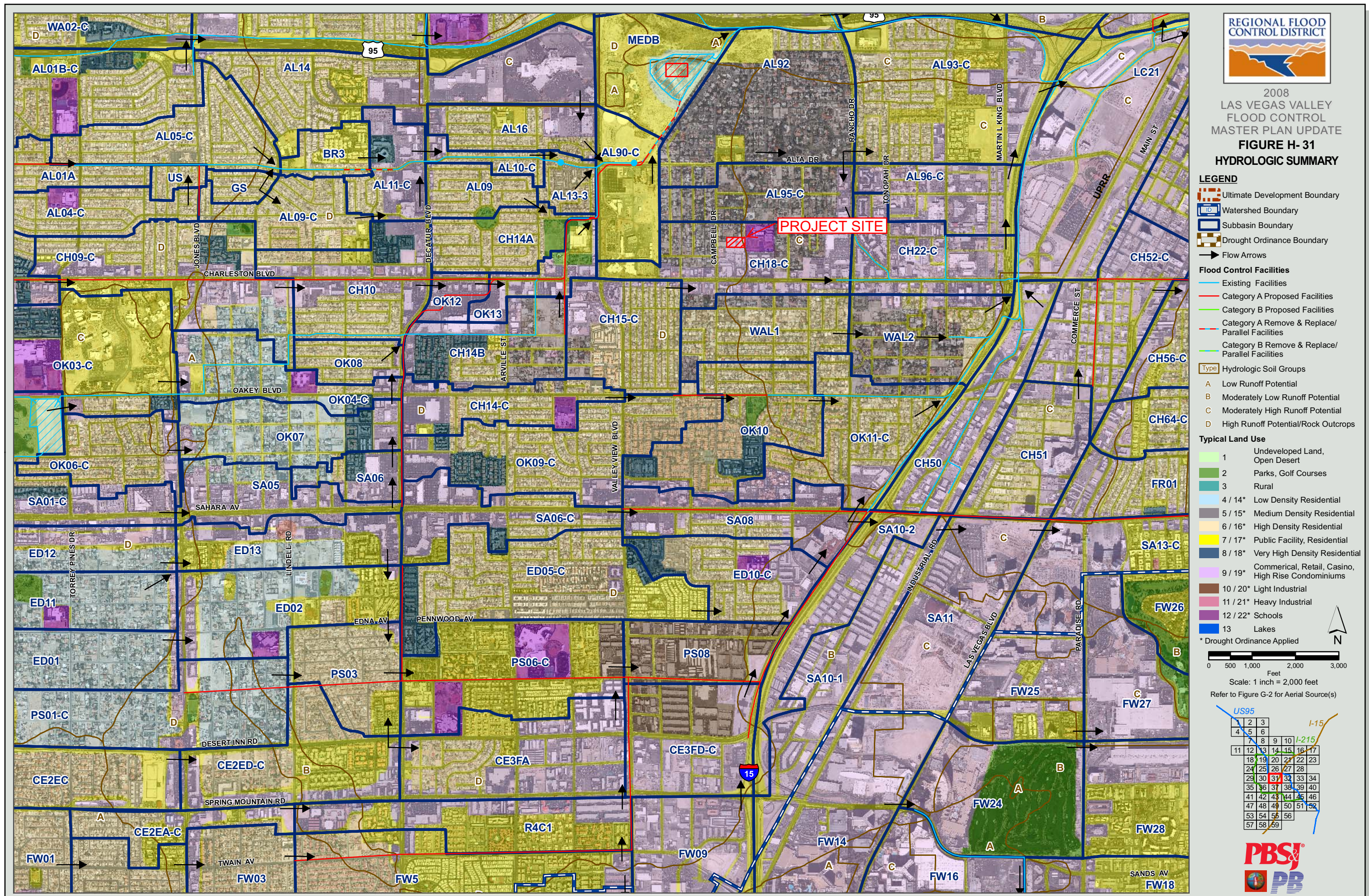


FIGURE 5 HMAP



City of Las Vegas

CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

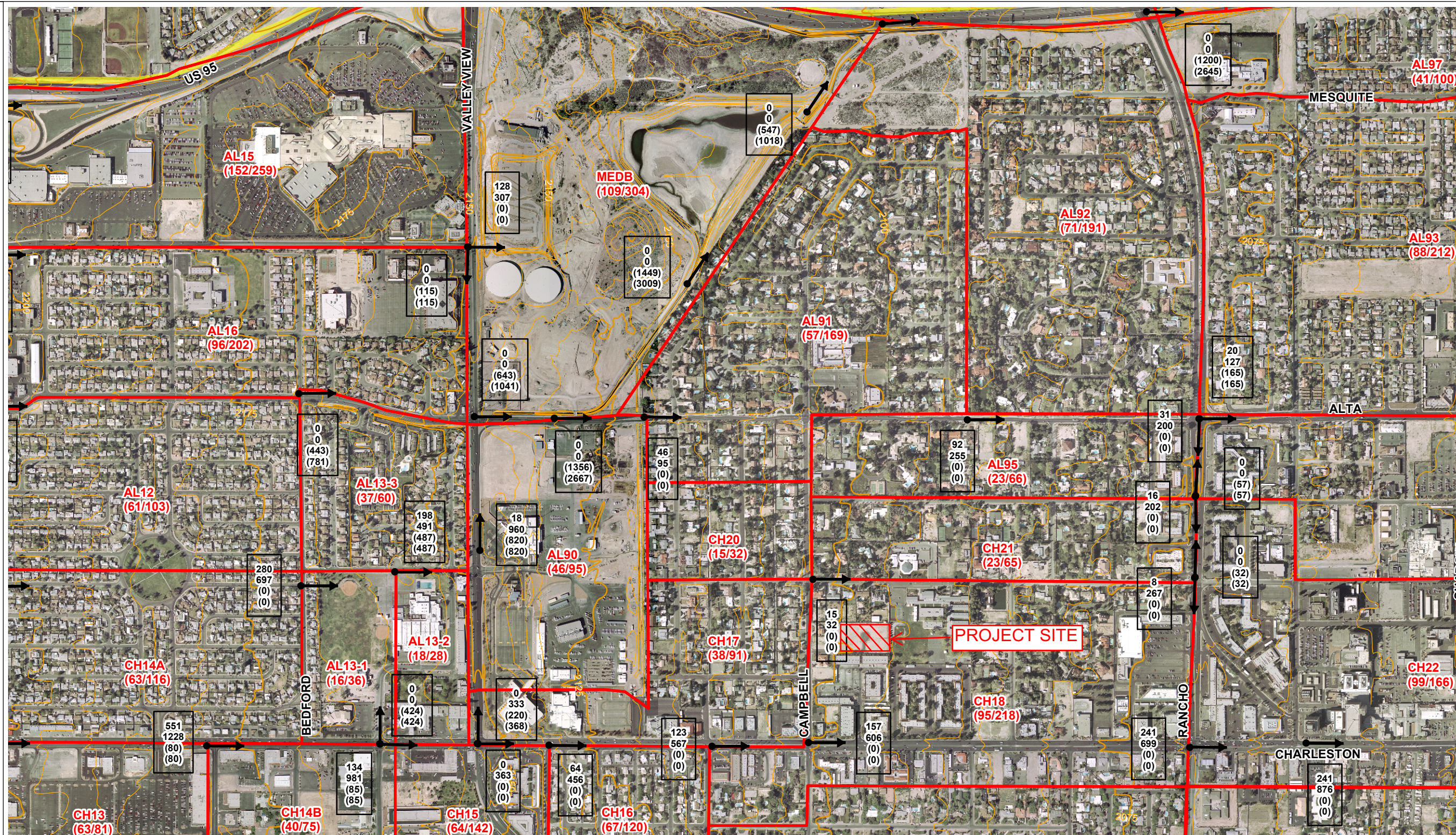
LEGEND

- Sub-basin Boundary
- LV12** Basin ID
- (10yr./100yr.)** Contributing flow from the basin (cfs)
- Flow Arrow
- | | |
|-------|------------------------|
| 250 | 10-Year Street Flow |
| 500 | 100-Year Street Flow |
| (300) | 10-Year Facility Flow |
| (800) | 100-Year Facility Flow |

(Flows in CFS)
- Study Area Limit

PHOTO DATE: SPRING 2004

FIGURE E-9



EXISTING DRAINAGE CONDITIONS

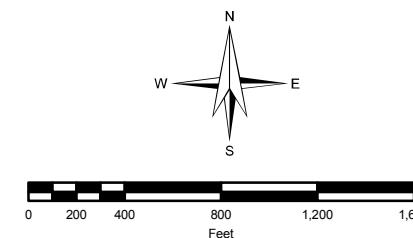


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	Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
Lake Mead				1	2		
Washington				3	4	5	6
Charleston	7	8	9	10	11	12	
Sahara	13	14	15	16	17		
Desert Inn		18	19				

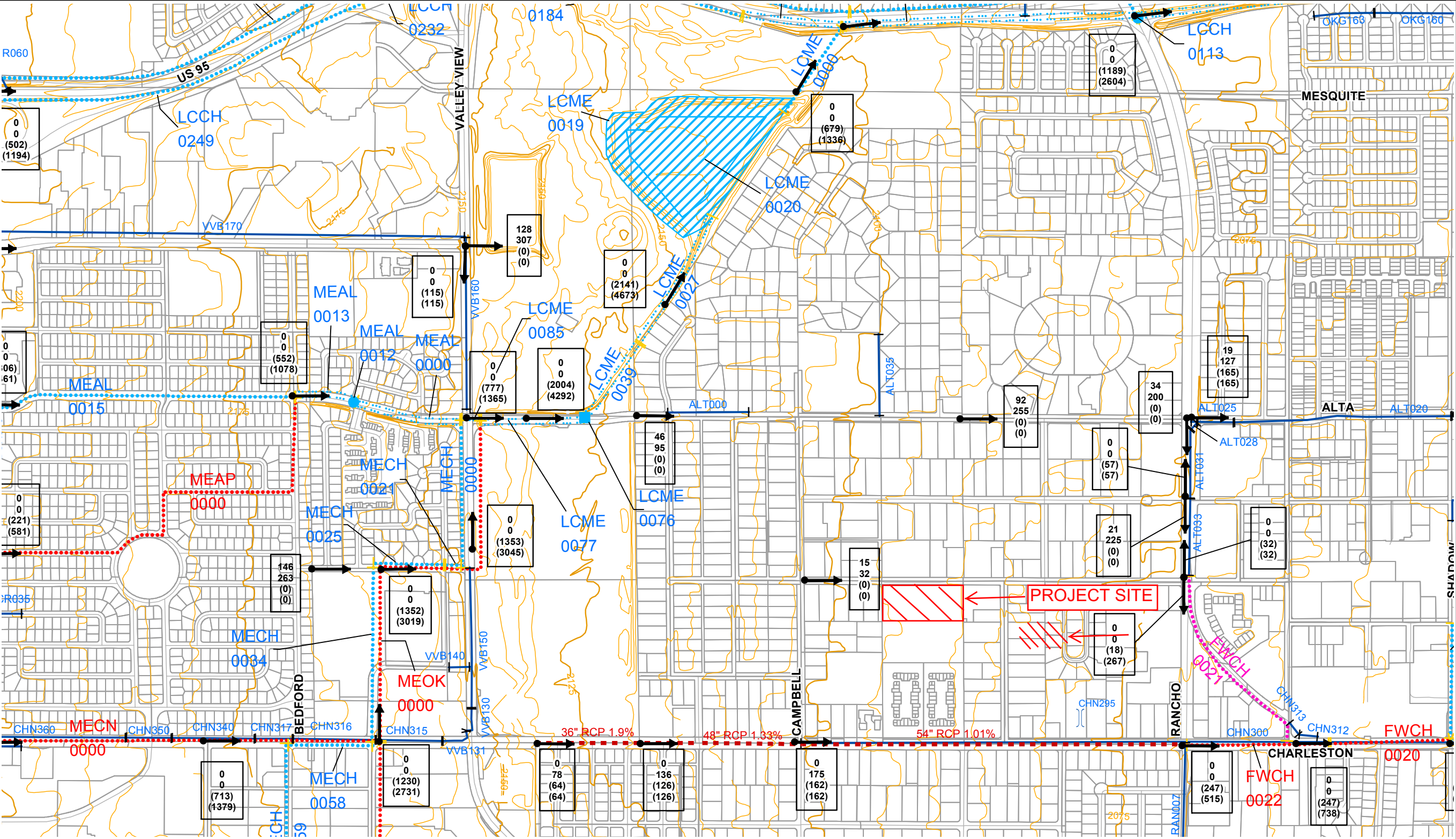
NOTE:
Existing conditions are based on future Curve Number values with only existing local and CCRFCD facilities in place.

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explanation.



SCALE: 1 inch = 800 feet

FIGURE 6





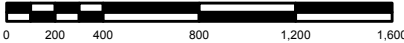
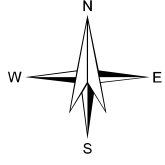
City of Las Vegas

CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

- Existing Regional Facility
- Category A Proposed Regional Facility (2002 MPU)
- Category B Proposed Regional Facility (2002 MPU)
- Category A Proposed Regional Facility (2004 CNFCMP)
- Existing Local Facility
- Proposed Local Facility
- Regional Culvert
- Regional Bridge
- Regional Pipeline
- Regional Channel
- Regional Levee
- Regional Detention Basin
- Local Storm Drain
- Local Culvert
- Proposed Local Storm Drain
- Regional ID-Mile Separator
- Local Facility Separator

FIGURE F-9



SCALE: 1 inch = 800 feet

Flow Arrow

250	10-Year Street Flow
500	100-Year Street Flow
(300)	10-Year Facility Flow
(800)	100-Year Facility Flow

(Flows in CFS)

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

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explanation.

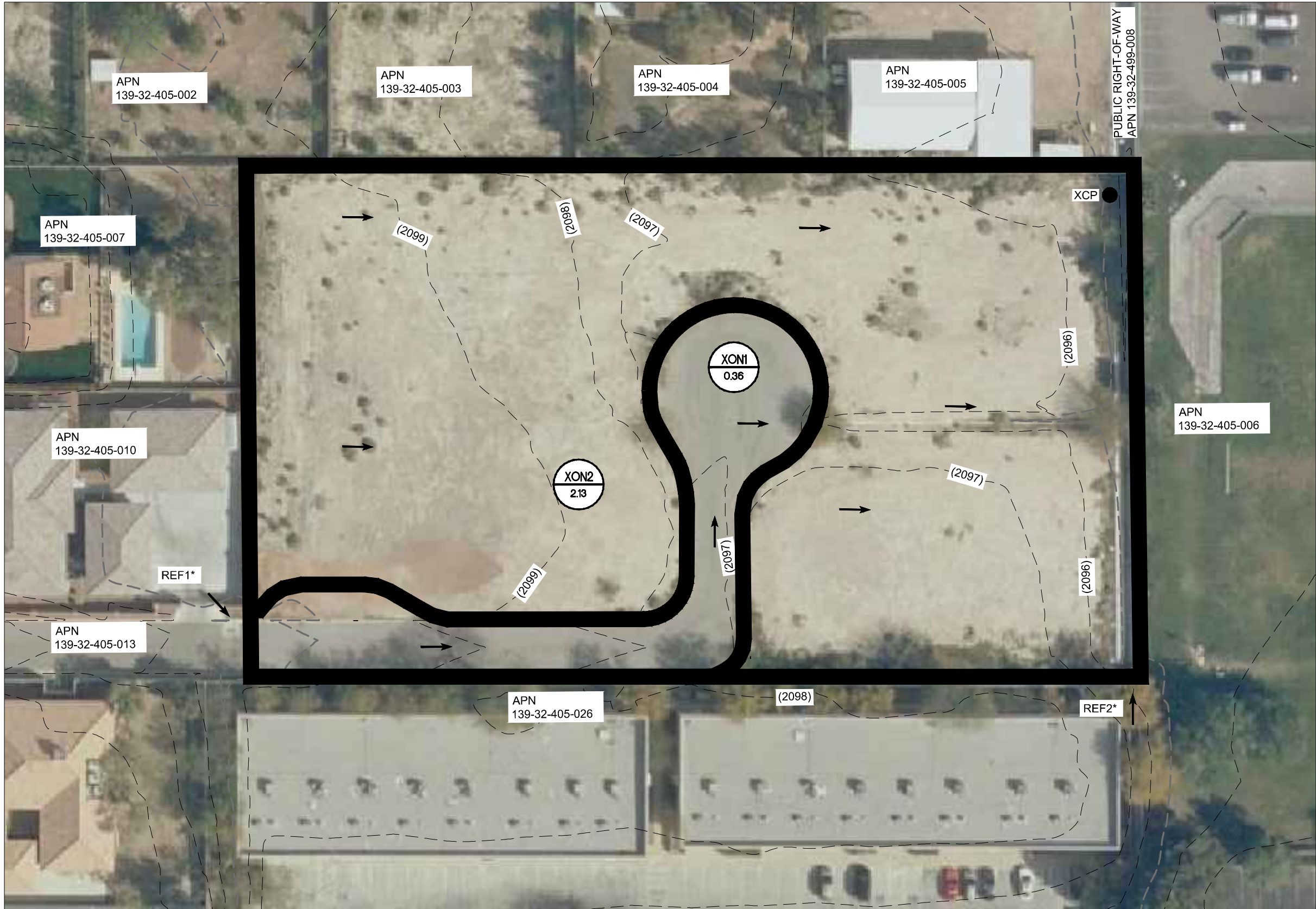
Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
Lake Mead			1	2		
Washington			3	4	5	6
Charleston	7	8	9	10	11	12
Sahara	13	14	15	16	17	
Desert Inn		18	19			

FUTURE DRAINAGE CONDITIONS

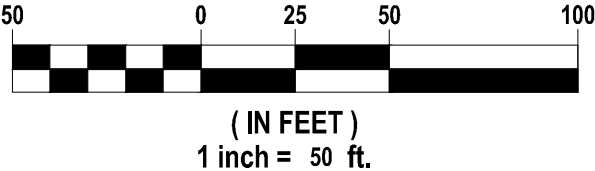


2270 Corporate Circle, Suite 100
Henderson, NV 89074
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Fax: (702) 263-7200

FIGURE 7

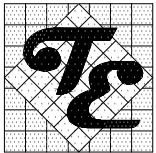


Existing Condition			
Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
XON1	0.36	1	1
XON2	2.13	3	6
REF1*	N/A	1	3
REF2*	N/A	10	20
XCP	N/A	15	30



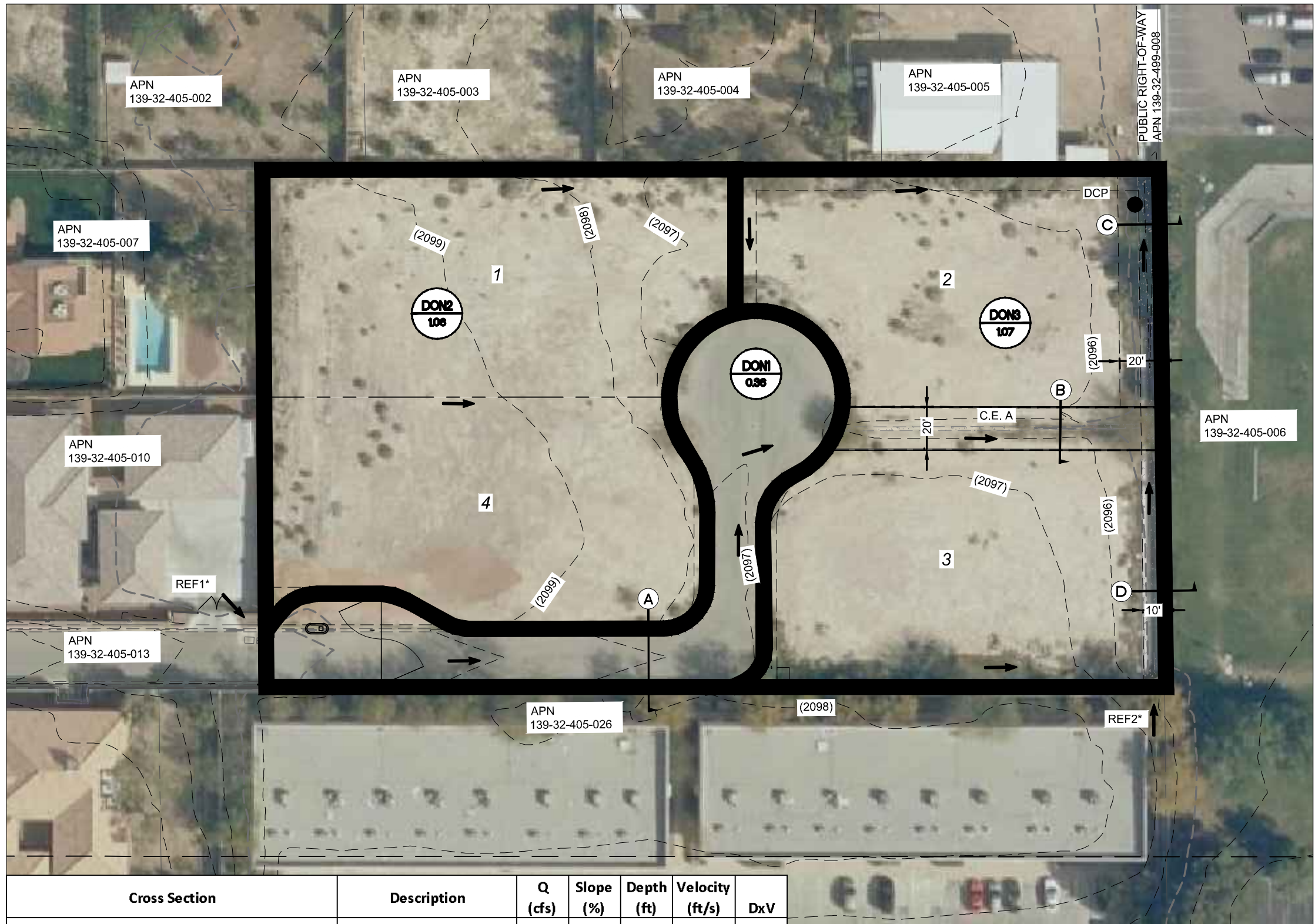
DRAINAGE LEGEND	
	BASIN IDENTIFICATION
	BASIN AREA (ACRES)
	BASIN BOUNDARY
	SUB-BASIN BOUNDARY
	CONCENTRATION POINT
	FLOW PATH
	CROSS SECTION
	10-YR/100-YR FLOW (CFS)
	REFERENCE FLOW (CFS)

REF1* AND REF2* ARE FLOWS REFERENCED FROM DRAINAGE STUDY DS 4430



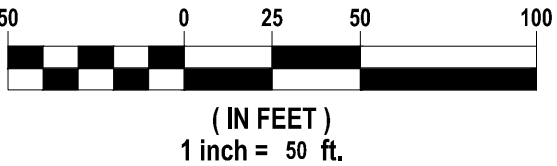
TANEY ENGINEERING
6030 S. JONES BLVD STE#100
LAS VEGAS, NV 89118
(702) 362-8844 FAX: (702) 362-5233

FIGURE 8
EXISTING CONDITION BASIN MAP
HASTINGS & CAMPBELL



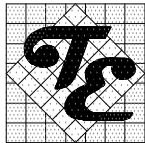
Ultimate Condition			
Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
DON1	0.36	1	1
DON2	1.06	1	3
DON3	1.07	1	2
REF1*	N/A	1	3
REF2*	N/A	10	20
DCP	N/A	14	29

REF1* AND REF2* ARE FLOWS REFERENCED FROM DRAINAGE STUDY DS 4430



DRAINAGE LEGEND	
	BASIN IDENTIFICATION
	BASIN AREA (ACRES)
	BASIN BOUNDARY
	SUB-BASIN BOUNDARY
	CONCENTRATION POINT
	FLOW PATH
	CROSS SECTION
XX/XXX	10-YR/100-YR FLOW (CFS)
(XX/XXX)	REFERENCE FLOW (CFS)

Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
A - 30 FT PRIVATE DR 100YR-DV	REF1 + DON1	4	1.29	0.32	2.30	0.74
A - 30 FT PRIVATE DR 10YR-DV	REF1 + DON2	2	1.29	0.27	1.99	0.54
B - 20 FT PRIVATE DRAINAGE EASEMENT 100YR-DV	REF1+DON1+DON2+DON3	9	0.87	0.25	3.00	0.75
C - 10 FT VALLEY GUTTER 100YR-DV	DCP	29	0.37	1.12	4.64	5.20
D - 10 FT VALLEY GUTTER 100YR-DV	REF2*	20	0.23	1.06	3.54	3.75



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 LAS VEGAS, NV 89118
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FIGURE 9
DEVELOPED CONDITION BASIN MAP
HASTINGS & CAMPBELL



APPENDIX B

Hydrologic Calculations



HYDROLOGIC METHODOLOGY AND CRITERIA

The U.S. Army Corps of Engineers *HEC-1 Flood Hydrograph Package* was used to determine the peak runoff values generated by the 100-year, 6-hour storm event. The HEC-1 computer model has the ability to simulate the surface runoff response of a drainage basin to precipitation. The HEC-1 Program represents the basin as an interconnected system of hydraulic components. Each component models an aspect of the rainfall runoff process within a portion of the entire basin. This basin portion is referred to as a sub-basin. The computed hydrographs of each sub-basin are then combined at the appropriate locations and a final discharge hydrograph is obtained.

Hydrologic Parameters

Basin Area

The offsite drainage basins were determined from available topographic maps, aerial photographs and field investigation. The proposed onsite areas were determined from the onsite improvement plans in AutoCAD format. The drainage basins are shown on Figures 8 and 9.

Precipitation

The project site is located inside of the limits for McCarran Airport Rainfall. Precipitation values have been referenced from Table 505 of the HCDDM.

The site encompasses less than 8 square miles, therefore the Storm Distribution Number Three (SDN No. 3) was used for the HEC-1 Model. Since the total watershed studied consists of approximately 100 acres, the rainfall depths were not adjusted for depth area.

Depth-Area Reduction Factor

A Depth-Area Reduction Factor or DARF is used to reduce the rainfall depth for a specified area to account for typical storm intensity distribution. DARFs were not used in this analysis as the drainage basins were too small.



Hydrologic Abstractions

Interception, infiltration, surface storage, evaporation, and evapotranspiration are regarded as hydrologic abstractions. The primary rainfall loss component in hydrologic models is infiltration.

The SCS curve number method was used to approximate the infiltration rates for the onsite watershed. Curve numbers are a function of the hydrologic soil group, vegetative cover and its hydrologic condition, land use, and the soil's antecedent soil moisture condition. Curve numbers are referenced from the CCRFCD's Hydrologic Criteria and Drainage Design Manual, Tables 602 and 602A.

Hydrologic soil group information was determined from the Web Soil Survey website (<http://websoilsurvey.nrcs.usda.gov>). The project site and offsite basins are located within Hydrologic Soil Group C and D which have a high runoff potential. Composite SCS curve number calculations were calculated using a spreadsheet.

Lag Time

Lag time (TLAG) is described as the time measured between the centroid of rainfall to the peak of the outflow hydrograph. It is a measure of the watershed's response time and is associated to basin length, slope, roughness characteristics, and land use.

Lag-times have been estimated by calculating the drainage basins' time of concentration, T_c . The time of concentration consists of two component times; the initial overland flow time, t_i , and the travel time for the flow within the gutter, swale, or channel, t_t . The equation for the time of concentration is as follows:

$$T_c = t_i + t_t$$

Where, $t_i = 1.8(1.1-K)L_o^{1/2}/S^{1/3}$

K = Flow Resistance Coefficient ($K = 0.0132CN - 0.39$)

CN = Curve Number

L_o = Length of the Overland Flow

S = Average Basin Slope

And, $t_t = L/(60V)$

L = Length of Gutter/Channel (ft)

V = Flow Velocity (ft/s) – Velocity is calculated from the

Manning's Equation with $Q = 0.6Q_T$, where Q_T = Total Discharge

Lag-times are estimated with the following equation: $TLAG = 0.6T_c$.



TANEY ENGINEERING

6030 S. JONES BOULEVARD, SUITE #100

LAS VEGAS, NV 89118

TELEPHONE: 702-362-8844

FAX: 702-362-5233

Composite Curve Number Calculations

Proj. No: DXC-16-058

Project Name: Hastings & Campbell

Date: 4/22/2015

Designed By: NID

Basin	Basin Area (ac)	Sub-region Cover Type	Sub-region Soil Type	Sub-region CN	Sub-region Area (ac)	Percent of Basin	Cumulative Percent	Areal Weighted CN	Cumulative CN	Composite CN
EXISTING CONDITIONS										
XON1	0.36	Imperivious	D	98	0.36	100%	100%	98	98	98
XON2	2.13	Newly Graded Areas	D	94	1.99	93%	93%	88	88	
XON2	2.13	Newly Graded Areas	C	91	0.14	7%	100%	6	94	94
DEVELOPED CONDITIONS										
DON1	0.36	Imperivious	D	98	0.36	100%	100%	98	98	98
DON2	1.06	Residential, 20000sf, 25% Imp	D	85	1.06	100%	100%	85	85	85
DON3	1.07	Residential, 20000sf, 25% Imp	D	85	0.93	87%	87%	74	74	
DON3	1.07	Residential, 20000sf, 25% Imp	C	80	0.14	13%	100%	10	84	84

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL - STANDARD FORM 4



Taney Engineering
6030 S. Jones, Suite #100
Las Vegas, NV 89118

PROJECT NO. : DXC-16-058

PROJECT: Hastings & Campbell

FILE : STD_FRM4

CALCULATED BY: NID

DATE : 05/02/16

Sub-Basin Data					Initial/Overland Time (T _i)			Travel Time (T _t)					T _c	T _c Check (Urbanized Basins)		Final T _c	T _{lag}	Remarks
DESIG	CN	K	AREA (acres)	AREA (mi ²)	LENGTH (ft)	SLOPE (%)	T _i (min)	LENGTH (ft)	SLOPE (%)	V ₁ (fps)	V ₂ (fps)	T _t (min)	T _c =T _i +T _t (min)	TOTAL (ft)	T _c (min)	T _c (min)	T _{lag} (hrs)	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)

EXISTING CONDITION

XON1	94.0	0.851	0.36	0.0006	20	1.0	2.0	360	1.0	1.48	N/A	4.1	6.1	N/A	N/A	6.06	0.100	
XON2	94.0	0.851	2.13	0.0033	50	1.0	3.2	366	0.9	1.40	N/A	4.3	7.5	N/A	N/A	7.52	0.100	

DEVELOPED CONDITION

DON1	91.0	0.811	0.36	0.0006	20	1.0	2.3	360	1.0	2.02	N/A	3.0	5.3	380.0	12.1	5.3	0.053	
DON2	85.0	0.732	1.06	0.0017	20	1.0	3.0	240	1.1	2.15	N/A	1.9	4.8	260.0	11.4	4.8	0.050	
DON3	84.0	0.719	1.07	0.0017	20	1.0	3.0	290	0.4	1.23	N/A	3.9	7.0	310.0	11.7	7.0	0.070	

$T_i=(1.8(1.1-K)L^{(1/2)})/(S^{1/3})$ $T_c=T_i+T_t$ $K=0.0132(CN)-.39$ $T_{lag} = 0.6T_c$		For the travel time (T_i) calculations, V_1 applies to the first 500 feet of travel distance; V_2 applies to the remaining travel distance.		Travel Time Velocity Formulas		All basins over one square mile are calculated by the equation $T_{lag}=20Kn(L*L_c/S^{0.5})^{0.33}$ and denoted by shaded gray (See Worksheet).
				Existing	Developed	
				$V_1 = 14.8*(S/100)^{1/2}$ $V_2 = 29.4*(S/100)^{1/2}$	$V_1 = 20.2*(S/100)^{1/2}$ $V_2 = 30.6*(S/100)^{1/2}$	

REFERENCE:

CCRFCD HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

STANDARD FORM 4


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*   VERSION 4.1                     *
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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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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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19 IO 5
20 IN 5
21 JR PREC 0.57
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23 BA .0006
24 PB 2.77
25 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
26 PC .130 .130 .133 .140 .142 .148 .158 .172 .181
27 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
28 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
29 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
30 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
31 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
32 PC .998 .999 1.00 .989 .990 .993 .993 .994 .995 .998
33 LS 0 98
34 UD .050
*
35 KK REF1*
36 KM REFERENCED FLOW FROM DS-4430
37 BA .0001
38 BF 1
39 LS 0 63
40 UD .6
*
41 KK REF2*
42 KM REFERENCED FLOW FROM DS-4430
43 BA .0001
44 BF 10
45 LS 0 63
46 UD .6
*

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1 HEC-1 INPUT PAGE 2

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
47 KK XON2
48 BA .0033
49 BF 0
50 LS 0 94
51 UD .100
*
52 KK XCP
53 KM COMBINES XON2, REF1*, REF2*, XON1
54 HC 4
*
55 ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
22 XON1
.
.
35 REF1*
.
.
41 REF2*
.
.
47 XON2
.
.
52 XCP.....

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*   JUN 1998                        *
*                                     *
* U.S. ARMY CORPS OF ENGINEERS      *
* HYDROLOGIC ENGINEERING CENTER     *
*                                     *

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=====
HASTINGS & CAMPBELL
HYDROLOGIC MODEL
-----

10-YR AND 100-YR STORM EVENT
-----
TANEY ENGINEERING
EXISTING CONDITION
FILE: EX10.DAT
PROJECT No: DXC-106-058
DATE: APRIL 2016
=====

--> 6-HOUR / SDN 3 <--

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Page 2

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* VERSION 4.1 *
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* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.
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THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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6 ID
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8 ID
9 ID TANAY ENGINEERING
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17 ID
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19 IO 5
20 IN 5
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23 BA .0006
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26 PC .130 .130 .133 .140 .142 .148 .158 .172 .181
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28 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
29 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
30 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
31 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
32 PC .998 .999 1.00 .989 .990 .993 .993 .994 .995 .998
33 LS 0 98
34 UD .005
*
35 KK REF1*
36 KM REFERENCED FLOW FROM DS-4430
37 BA .0001
38 BF 3
39 LS 0 63
40 UD .6
*
41 KK REF2*
42 KM REFERENCED FLOW FROM DS-4430
43 BA .0001
44 BF 20
45 LS 0 63
46 UD .6
*
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1 HEC-1 INPUT PAGE 2

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
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48 BA .0033
49 BF 0
50 LS 0 94
51 UD .100
*
52 KK XCP
53 KM COMBINES XON2, REF1*, REF2*, XON1
54 HC 4
*
55 ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
22	XON1	
35	REF1*	
41	REF2*	
47	XON2	
52	XCP	

1 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION *****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *

Page 2

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*   VERSION 4.1                     *
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* HYDROLOGIC ENGINEERING CENTER     *
* 609 SECOND STREET                 *
* DAVIS, CALIFORNIA 95616          *
* (916) 756-1104                   *
*****

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      X  X  X        X      X
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      X  X  XXXXXXXX  XXXXX  XXX

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KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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3 ID
4 ID
5 ID
6 ID
7 ID
8 ID
9 ID
10 ID
11 ID
12 ID
13 ID
14 ID
15 ID
16 ID
17 ID
18 IT      5      0      0      300
19 IO      5
20 IN      5
21 JR      PREC      0.57
*
22 KK      DON1
23 BA      .0006
24 PB      2.77
25 PC      .000      .020      .057      .070      .087      .108      .124      .130      .130      .130
26 PC      .130      .130      .130      .133      .140      .142      .148      .158      .172      .181
27 PC      .190      .197      .199      .200      .201      .204      .214      .229      .241      .249
28 PC      .251      .256      .270      .278      .281      .283      .295      .322      .352      .409
29 PC      .499      .590      .710      .744      .781      .812      .819      .835      .851      .856
30 PC      .860      .868      .876      .888      .910      .926      .937      .950      .970      .976
31 PC      .982      .985      .987      .989      .990      .993      .993      .994      .995      .998
32 PC      .998      .999      1.00
33 LS      0      98
34 UD      .050
*
35 KK      REF1*
36 KM      REFERENCED FLOW FROM DS-4430
37 BA      .0001
38 BF      1
39 LS      0      63
40 UD      .6
*
41 KK      DON2
42 BA      .0017
43 BF      0
44 LS      0      85
45 UD      .050
*

```

1 HEC-1 INPUT PAGE 2

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
46 KK      REF2*
47 KM      REFERENCED FLOW FROM DS-4430
48 BA      .0001
49 BF      10
50 LS      0      63
51 UD      .6
*
52 KK      DON3
53 BA      .0017
54 BF      0
55 LS      0      84
56 UD      .070
*
57 KK      DCP
58 KM      COMBINES DON3, DON2, REF1*, REF2*, DON1
59 HC      5
*
60 ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

```

22 DON1
.
.
35 REF1*
.
.
41 DON2
.
.
.
46 REF2*
.
.
.

```



```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 27APR16 TIME 08:57:16
*****

DEV100.OUT

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

```

```

      X  X  XXXXXXX  XXXXX  X
      X  X  X      X      XX
      X  X  X      X      X
      XXXXXXX  XXXX  X      XXXXX
      X  X  X      X      X
      X  X  XXXXXXX  XXXXX  XXX

```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*DIAGRAM
1 ID
2 ID
3 ID
4 ID
5 ID
6 ID
7 ID
8 ID
9 ID
10 ID
11 ID
12 ID
13 ID
14 ID
15 ID
16 ID
17 ID
18 IT      5      0      0      300
19 IO      5
20 IN      5
21 JR      PREC      1.00
*
22 KK      DON1
23 BA      .0006
24 PB      2.77
25 PC      .000      .020      .057      .070      .087      .108      .124      .130      .130      .130
26 PC      .130      .130      .130      .133      .140      .142      .148      .158      .172      .181
27 PC      .190      .197      .199      .200      .201      .204      .214      .229      .241      .249
28 PC      .251      .256      .270      .278      .281      .283      .295      .322      .352      .409
29 PC      .499      .590      .710      .744      .781      .812      .819      .835      .851      .856
30 PC      .860      .868      .876      .888      .910      .926      .937      .950      .970      .976
31 PC      .982      .985      .987      .989      .990      .993      .993      .994      .995      .998
32 PC      .998      .999      1.00
33 LS      0      98
34 UD      .050
*
35 KK      REF1*
36 KM      REFERENCED FLOW FROM DS-4430
37 BA      .0001
38 BF      3
39 LS      0      63
40 UD      .6
*
41 KK      DON2
42 BA      .0017
43 BF      0
44 LS      0      85
45 UD      .050
*

```

1 HEC-1 INPUT PAGE 2

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
46 KK      REF2*
47 KM      REFERENCED FLOW FROM DS-4430
48 BA      .0001
49 BF      20
50 LS      0      63
51 UD      .6
*
52 KK      DON3
53 BA      .0017
54 BF      0
55 LS      0      84
56 UD      .070
*
57 KK      DCP
58 KM      COMBINES DON3, DON2, REF1*, REF2*, DON1
59 HC      5
*
60 ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

```

22 DON1
.
.
35 REF1*
.
.
41 DON2
.
.
.
46 REF2*
.
.
.

```

```

=====
HASTINGS & CAMPBELL
HYDROLOGIC MODEL
-----

10-YR AND 100-YR STORM EVENT
-----
TANEY ENGINEERING
DEVELOPED CONDITION
FILE: DEV100.DAT
PROJECT NO: DXC-16-058
DATE: APRIL 2016
=====
--> 6-HOUR / SDN 3 <--

```

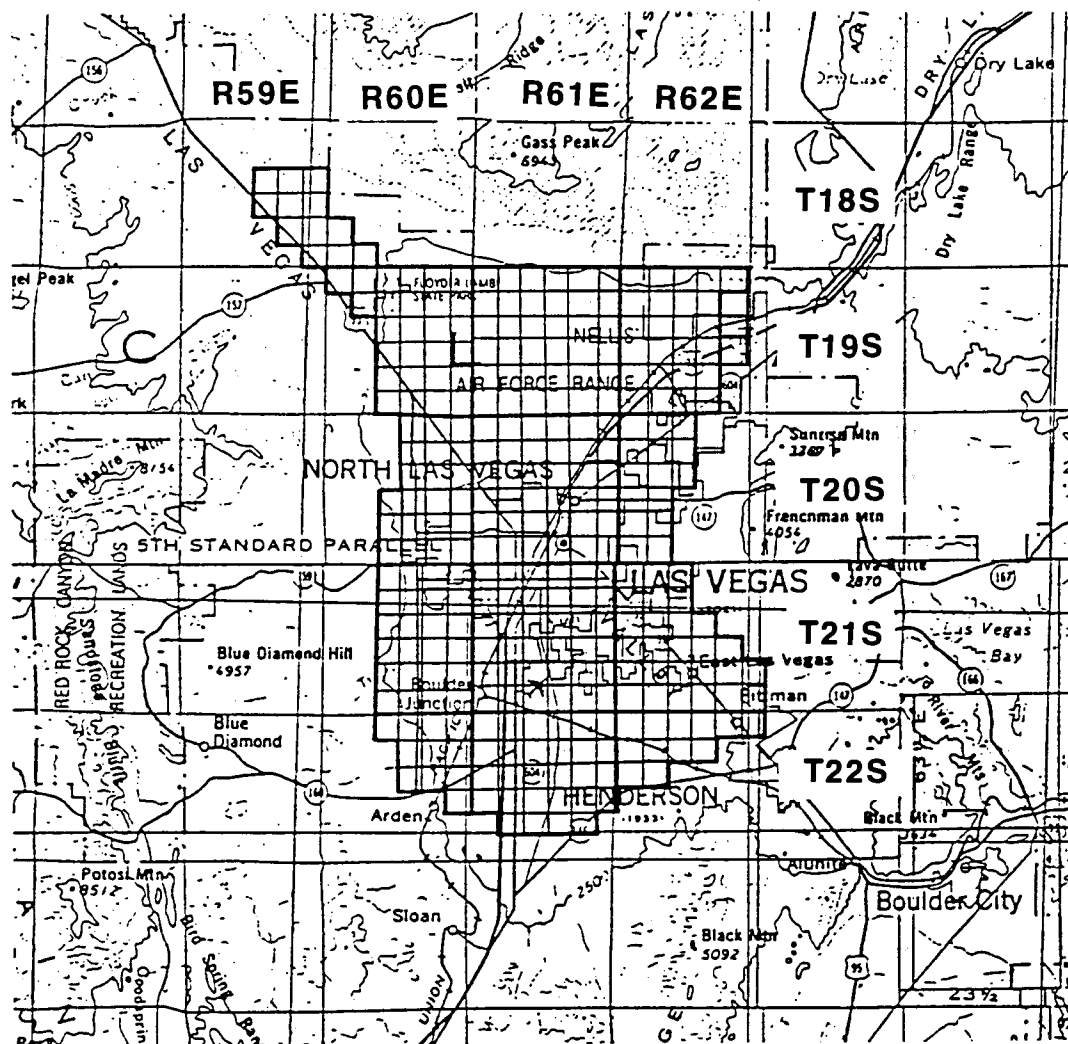
1

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

*** NORMAL END OF HEC-1 ***

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP	RANGE	SECTIONS	TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,36	20 South	62 East	4-9,16-20,29-32
18 South	60 East	30-32	21 South	60 East	1-4,9-16,21-28,33-36
19 South	60 East	1-6,8-16,21-28,33-36	21 South	61 East	ALL SECTIONS
19 South	61 East	ALL SECTIONS	21 South	62 East	4-9,15-23, 25-36
19 South	62 East	2-11,14-23,27-34	22 South	60 East	1-4,10-15,24
20 South	60 East	1-3,10-15,21-28,33-36	22 South	61 East	1-24,26-29
20 South	61 East	ALL SECTIONS	22 South	62 East	1-10,17-18

Notes:

1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
2. Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA (IN INCHES)

TIME	RECURRENCE INTERVAL					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

- NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.
2. The 24 hour values presented above are for use with TR-55 only.
3. Table 501 adjustments not required.

Revision	Date

SIX HOUR DEPTH-AREA REDUCTION FACTORS

<u>Drainage Area (Square Miles)</u>	<u>Six-Hour Depth-Area Reduction Factor</u>
0.0	1.00
0.5	0.98
1.0	0.97
2.0	0.93
4.0	0.91
6.0	0.90
8.0	0.88
10.0	0.86
20.0	0.79
30.0	0.74
50.0	0.68
100.0	0.60
150.0	0.55
200.0	0.51
300.0	0.46
400.0	0.42
500.0	0.39

- NOTES: 1. A graphical representation of these factors is presented in Figure 514.
2. Consult with the local entity and/or the CCRFCD for guidance in using the Depth-Area Reduction Factors for drainage areas greater than 200 square miles.

<i>Revision</i>	<i>Date</i>

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

Percent of Total Storm Depth				Percent of Total Storm Depth			
Storm Time (In Minutes)	SDN3	SDN4	SDN5	Storm Time (In Minutes)	SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

- Notes: 1. For drainage areas less than 8 square miles in size, use SDN 3.
 2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
 3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
 4. A graphical representation of these values is presented on **Figure 515**.

Revision	Date

REFERENCE:

TABLE 503

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.): ³					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ⁴ ...		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas

Newly graded areas (pervious areas only, no vegetation) ⁵	77	86	91	94
--	----	----	----	----

1 Average runoff condition, and $I_p = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage ¹	Percent Impervious ²	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less ³	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.

2 Actual percent impervious value should be compared to selected land use type.

3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

Custom Soil Resource Report Map—Hydrologic Soil Group



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
 Survey Area Data: Version 10, Aug 22, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 7, 2011—Feb 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Las Vegas Valley Area, Nevada, Part of Clark County (NV788)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
300	Las Vegas gravelly fine sandy loam, 0 to 2 percent slopes	D	41.2	63.5%
390	Spring clay loam	C	23.7	36.5%
Totals for Area of Interest			64.9	100.0%

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



APPENDIX C

Hydraulic Calculations

Worksheet for A - 30 FT PRIVATE DR 10YR-DV

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 1.29000 %
Discharge 2.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.50
0+00.5	0.50
0+00.5	0.00
0+02.0	0.17
0+13.5	0.41
0+25.5	0.17
0+26.5	0.00
0+27.0	0.50
0+27.5	0.50
0+27.5	2.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.50)	(0+02.0, 0.17)	0.013
(0+02.0, 0.17)	(0+25.5, 0.17)	0.016
(0+25.5, 0.17)	(0+27.5, 2.00)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth 0.27 ft

Worksheet for A - 30 FT PRIVATE DR 10YR-DV

Results

Elevation Range	0.00 to 2.00 ft	
Flow Area	1.01	ft ²
Wetted Perimeter	13.12	ft
Hydraulic Radius	0.08	ft
Top Width	12.71	ft
Normal Depth	0.27	ft
Critical Depth	0.29	ft
Critical Slope	0.00810	ft/ft
Velocity	1.99	ft/s
Velocity Head	0.06	ft
Specific Energy	0.33	ft
Froude Number	1.24	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.27	ft
Critical Depth	0.29	ft
Channel Slope	1.29000	%
Critical Slope	0.00810	ft/ft

Cross Section for A - 30 FT PRIVATE DR 10YR-DV

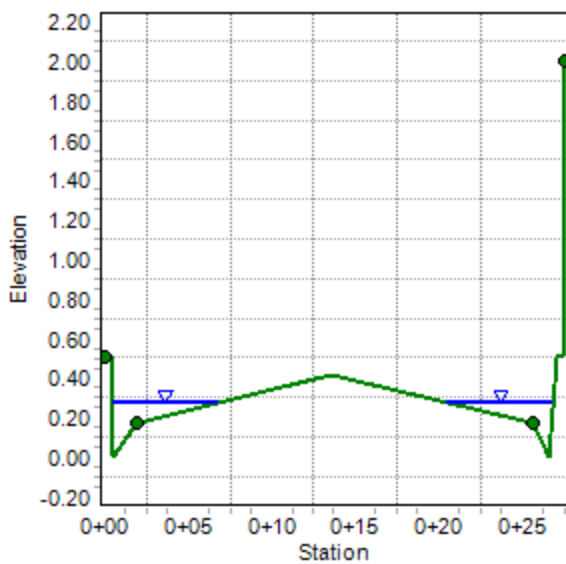
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.29000	%
Normal Depth	0.27	ft
Discharge	2.00	ft ³ /s

Cross Section Image



Project Description

Input Data

0+00.0	0.50
0+00.5	0.50
0+00.5	0.00
0+02.0	0.17
0+13.5	0.41
0+25.5	0.17
0+26.5	0.00
0+27.0	0.50
0+27.5	0.50
0+27.5	2.00

(0+00.0, 0.50)	(0+02.0, 0.17)	0.013
(0+02.0, 0.17)	(0+25.5, 0.17)	0.016
(0+25.5, 0.17)	(0+27.5, 2.00)	0.013

Current Roughness weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Normal Depth 0.32 ft

Worksheet for A - 30 FT PRIVATE DR 100YR-DV

Results

Elevation Range	0.00 to 2.00 ft	
Flow Area	1.74	ft ²
Wetted Perimeter	18.00	ft
Hydraulic Radius	0.10	ft
Top Width	17.52	ft
Normal Depth	0.32	ft
Critical Depth	0.34	ft
Critical Slope	0.00758	ft/ft
Velocity	2.30	ft/s
Velocity Head	0.08	ft
Specific Energy	0.40	ft
Froude Number	1.28	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.34	ft
Channel Slope	1.29000	%
Critical Slope	0.00758	ft/ft

Cross Section for A - 30 FT PRIVATE DR 100YR-DV

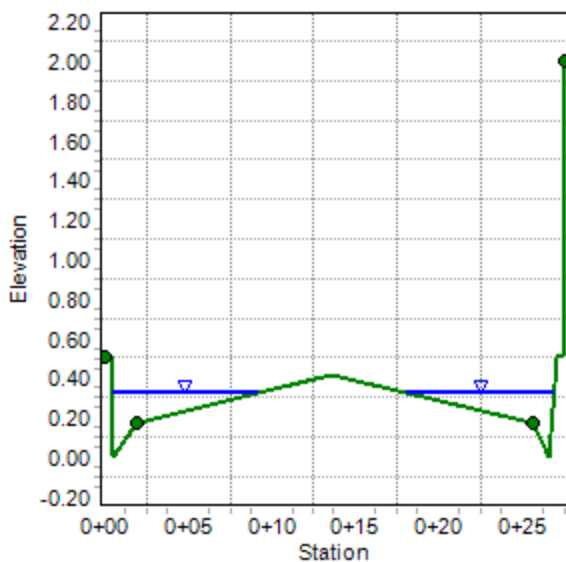
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.29000	%
Normal Depth	0.32	ft
Discharge	4.00	ft ³ /s

Cross Section Image



Project Description

Input Data

Station (ft)	Elevation (ft)
--------------	----------------

Roughness Segment Definitions

(0+00.0, 2.00)	(0+20.0, 2.00)	0.013
----------------	----------------	-------

Options

Results

Bentley Systems, Inc. Haestad Methods Software Bentley CenterMaster V8i (SELECTseries 1) [08.11.01.03]

Worksheet for B - 20 FT PRIVATE DRAINAGE EASEMENT 100YR-DV

Results

Critical Slope	0.00438	ft/ft
Velocity	3.00	ft/s
Velocity Head	0.14	ft
Specific Energy	0.39	ft
Froude Number	1.37	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Channel Slope	0.87000	%
Critical Slope	0.00438	ft/ft

Cross Section for B - 20 FT PRIVATE DRAINAGE EASEMENT 100YR-DV

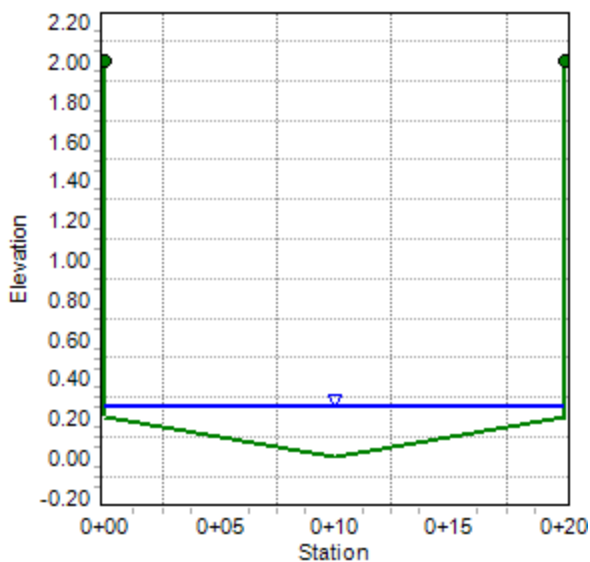
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.87000	%
Normal Depth	0.25	ft
Discharge	9.00	ft ³ /s

Cross Section Image



Worksheet for C - 10 FT VALLEY GUTTER 100YR-DV

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.37000 %
Discharge 29.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	4.33
0+10.0	1.00
0+15.0	0.00
0+20.0	1.00
0+20.0	3.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 4.33)	(0+10.0, 1.00)	0.025
(0+10.0, 1.00)	(0+20.0, 3.00)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth 1.12 ft
Elevation Range 0.00 to 4.33 ft
Flow Area 6.26 ft²
Wetted Perimeter 10.71 ft
Hydraulic Radius 0.58 ft
Top Width 10.37 ft
Normal Depth 1.12 ft

Worksheet for C - 10 FT VALLEY GUTTER 100YR-DV

Results

Critical Depth	1.15	ft
Critical Slope	0.00332	ft/ft
Velocity	4.64	ft/s
Velocity Head	0.33	ft
Specific Energy	1.46	ft
Froude Number	1.05	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.12	ft
Critical Depth	1.15	ft
Channel Slope	0.37000	%
Critical Slope	0.00332	ft/ft

Cross Section for C - 10 FT VALLEY GUTTER 100YR-DV

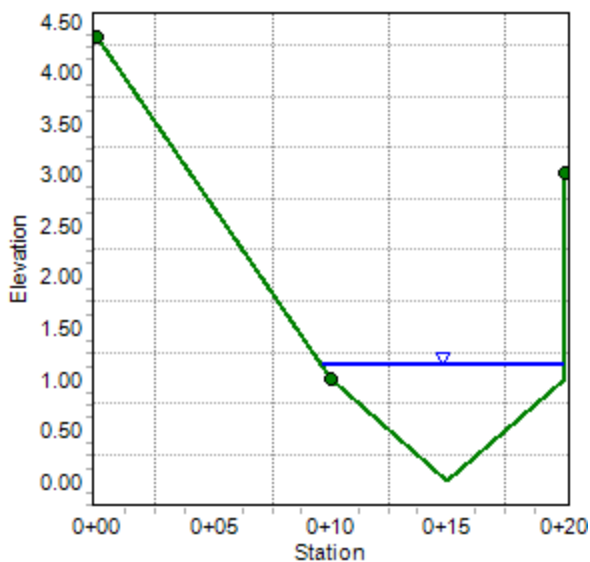
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.37000	%
Normal Depth	1.12	ft
Discharge	29.00	ft ³ /s

Cross Section Image



Project Description

Input Data

Station (ft)

Elevation (ft)

Roughness Segment Definitions

Start Station

Ending Station

Roughness Coefficient

Options

Results

Bentley Systems, Inc. Haestad Methods Software Bentley CenterMaster V8i (SELECTseries 1) [08.11.01.03]

Worksheet for D - 10 FT VALLEY GUTTER 100YR-DV

Results

Critical Depth	1.00	ft
Critical Slope	0.00335	ft/ft
Velocity	3.54	ft/s
Velocity Head	0.19	ft
Specific Energy	1.26	ft
Froude Number	0.84	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.06	ft
Critical Depth	1.00	ft
Channel Slope	0.23000	%
Critical Slope	0.00335	ft/ft

Cross Section for D - 10 FT VALLEY GUTTER 100YR-DV

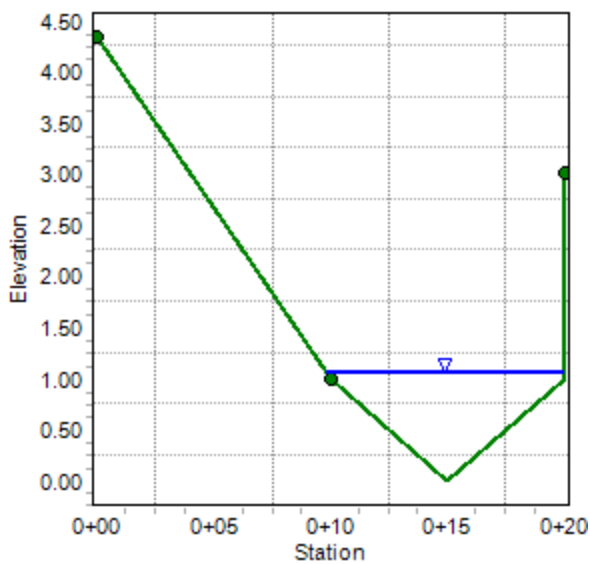
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.23000	%
Normal Depth	1.06	ft
Discharge	20.00	ft ³ /s

Cross Section Image



Worksheet for 2' X 10' BLOCK WALL OPENING (MID EAST)

Project Description

Solve For Headwater Elevation

Input Data

Discharge	20.00	ft ³ /s
Crest Elevation	1.00	ft
Tailwater Elevation	1.10	ft
Weir Coefficient	3.00	US
Crest Length	10.00	ft
Number Of Contractions	0	

Results

Headwater Elevation	1.77	ft
Headwater Height Above Crest	0.77	ft
Tailwater Height Above Crest	0.10	ft
Flow Area	7.73	ft ²
Velocity	2.59	ft/s
Wetted Perimeter	11.55	ft
Top Width	10.00	ft

Cross Section for 2' X 10' BLOCK WALL OPENING (MID EAST)

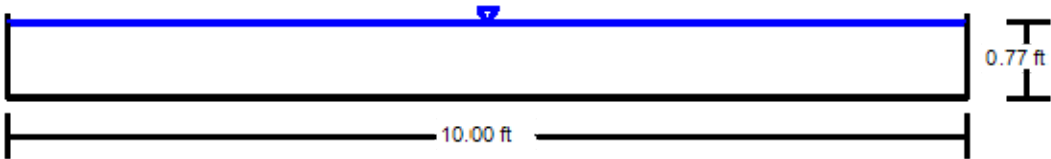
Project Description

Solve For Headwater Elevation

Input Data

Discharge	20.00	ft ³ /s
Headwater Elevation	1.77	ft
Crest Elevation	1.00	ft
Tailwater Elevation	1.10	ft
Weir Coefficient	3.00	US
Crest Length	10.00	ft
Number Of Contractions	0	

Cross Section Image



V: 1
H: 1

Worksheet for 2' X 10' BLOCK WALL OPENING (NORTH EAST)

Project Description

Solve For Headwater Elevation

Input Data

Discharge		29.00	ft ³ /s
Crest Elevation		1.00	ft
Tailwater Elevation		1.10	ft
Weir Coefficient		3.00	US
Crest Length		10.00	ft
Number Of Contractions	0		

Results

Headwater Elevation	1.99	ft
Headwater Height Above Crest	0.99	ft
Tailwater Height Above Crest	0.10	ft
Flow Area	9.86	ft ²
Velocity	2.94	ft/s
Wetted Perimeter	11.97	ft
Top Width	10.00	ft

Cross Section for 2' X 10' BLOCK WALL OPENING (NORTH EAST)

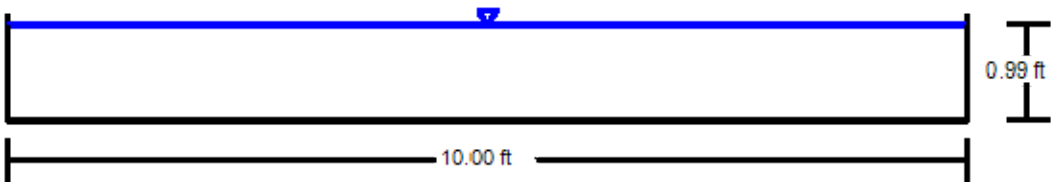
Project Description

Solve For Headwater Elevation

Input Data

Discharge	29.00	ft ³ /s
Headwater Elevation	1.99	ft
Crest Elevation	1.00	ft
Tailwater Elevation	1.10	ft
Weir Coefficient	3.00	US
Crest Length	10.00	ft
Number Of Contractions	0	

Cross Section Image



V: 1
H: 1



APPENDIX D

Reference Material

Technical Drainage Study for Busch Residence

JOB# 101056

July 2010

Prepared for:

Ned & Ann Busch
208 Campbell Drive
Las Vegas, Nevada 89107
(702) 365-9312

Prepared By:
LOCHSA ENGINEERING
6345 South Jones Boulevard
Suite 100
Las Vegas, Nevada 89118
(702) 365-9312

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Busch Residence Date: July 13, 2010
Location of Development: a) Descriptive (Cross Streets) North/South: Campbell Drive
East/West: Triple Crown Circle
b) Section: 32 Township: 20 South Range: 61 East
c) APN : 139-32-405-008, 139-32-405-009, 139-32-405-011 and 139-32-405-012
Name of Owner: Ned and Ann Busch
Telephone No.: 702-365-9312 Fax No.: 702-365-9317 E-Mail Address: N/A
Address: 208 Campbell Drive, Las Vegas, Nevada 89107

Contact Person-Name: Stanley Okey Amadi Telephone No.: 702-365-9312
* E-Mail Address: stanley@lochsa.com Fax No.: 702-365-9317
Firm: Lochsa Engineering
Address: 6345 South Jones Boulevard, Suite 100, Las Vegas, Nevada 89118

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	

1. Total Owned Land Area: At Site: 2.48 +/- Acres Being Developed/Disturbed: 2.48 +/- Acres
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.): Residential
5. Approximate upstream land area which drains to the subject site: 7.55 +/- Acres
6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Storm Drainage Report for Westbay at Charleston (DS #1615)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: To the northeast corner of the site through the existing 20-foot wide Drainage Easement.
8. Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal

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

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

September 27, 2010

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:

Busch Residence (PMP-38735)

COPIES TO:

Lochsa Engineering

Ned and Ann Busch

Bart Anderson, P.E., DevCo

Cross Streets:

SEQ of Campbell Drive & Palomino Lane

File Number:

F:\Depot\DSMemos\DS4430C.doc

Parcel Number:

139-32-405-008; -009; -011 & -012

Zoning Action:

SUP-38573; VAR-38582 & PMP-38735

FEMA Flood Zone

YES

NO

X

Proposed Storm Drain

YES

NO

X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal	7/14/2010	7/26/2010	Not Approved	\$400.00	148806: \$400
2 nd Submittal	9/8/2010	9/21/2010	Not Approved	\$400.00	153052: \$400
Supplement	9/23/2010	9/27/2010	See Comments Below	N/C	N/C
TOTAL FEES (LDDRS):				\$800.00	---

REMARKS:

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

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

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 of a project.

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
ays

Post-It® Fax Note	7671	Date	9/27/10	# of pages	1
To	Stanley Amadi	From	Albert Sung		
Co./Dept.	Lochsa	Co.	CLU		
Phone #		Phone #	229-2001		
Fax #		Fax #			

T/R/S: T20S/R61E/32
AREA M-32

2. DRAINAGE DESCRIPTION

2.1 Existing Drainage Conditions

In the 2008 Flood Control Master Plan Update for the Las Vegas Valley, the entire valley was hydrologically divided into ten watersheds and each watershed was further subdivided into subareas. The subject site falls within subbasin CH18-C in the Central Watershed as analyzed in the CCRFCD Master Plan Update (Reference 2). The site is also located within a portion of subbasin CH18 as analyzed in the “*City of Las Vegas Central Neighborhood Flood Control Master Plan*” prepared by Post Buckley Schuh & Jernigan (Reference 5). Review of the Existing Drainage Conditions Map (Figure E-9) from Reference 5 indicates that approximately 95 cfs and 218 cfs is conveyed east along Charleston Boulevard from basin CH18. However, the existing improvements and drainage patterns around the site indicate that flows from CH18 are partially conveyed north towards Palomino Lane and eventually east to Rancho Drive. These flows are then picked up by the existing CCRFCD storm drain facilities and routed east along Charleston Boulevard.

A. Offsite Drainage

The location of the project site provides complete flood protection from major offsite flows conveyed within the corridor streets as the site is sandwiched by the adjacent parcels. However, a portion of the existing Westbay Office Park discharges localized flows directly into the site through the existing 20' wide Drainage Easement along the western boundary of the site. A review of the “*Storm Drainage Report for Westbay at Charleston*” (DS #1615; Reference 6) prepared by Stan Hansen and Associates, indicates that the combined developed condition 100-year flows discharging

into the site through the aforementioned drainage easement is approximately 19 cfs. This combined runoff resulted from basins DEV3 (13 cfs) and DEV4 (6 cfs). Reference 6 also analyzed the subject site as basin DEV2 (4 cfs) and the adjacent residential parcels directly west of the site including the private drive (Triple Crown Circle) as basin OFF2 (3 cfs). Flows from both OFF2 and DEV2 are conveyed east and eventually north in the existing Drainage Easement along the eastern boundary of the site. The hydrologic parameters of the pertinent offsite basins (OFF2, DEV3 and DEV4) as analyzed in Reference 6 have been adopted and incorporated into the hydrologic (HEC-1) analysis provided for the subject site. The combined flows exiting the site in the easement were estimated by Reference 6 to be approximately 23 cfs during the 100-year, 6-hour storm event. However, the analysis provided in the subject study which incorporated the parameters for the referenced offsite basins indicates the combined flows exiting the northeast corner of the site through the easement at concentration point CM3 (15/29 cfs). Excerpts of the HEC-1 output files and drainage basin map from Reference 6 have been included in the appendix.

B. Onsite Drainage

The site in its existing condition has been previously rough graded and generally slopes east towards the existing drainage easement along the eastern boundary. The site is analyzed as one drainage basin labeled NX1 (3/7 cfs). Runoff from basin NX1 combines with offsite flows from basin OFF2 at concentration point CM1 (4/10 cfs), and the combined runoff sheet flows east to the exiting drainage easement along the eastern boundary of the site. The flows will then continue north within the easement to combine with other offsite flows conveyed through the site from the adjacent

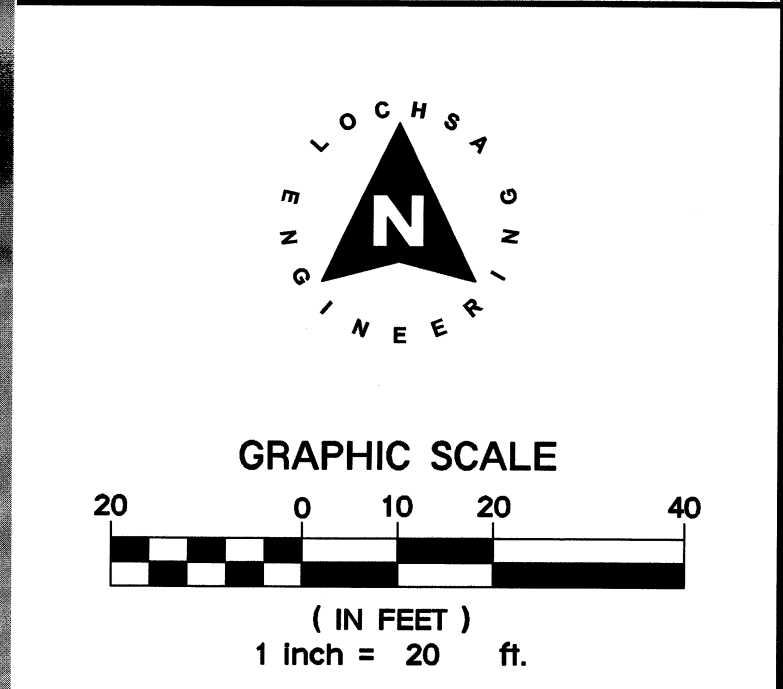
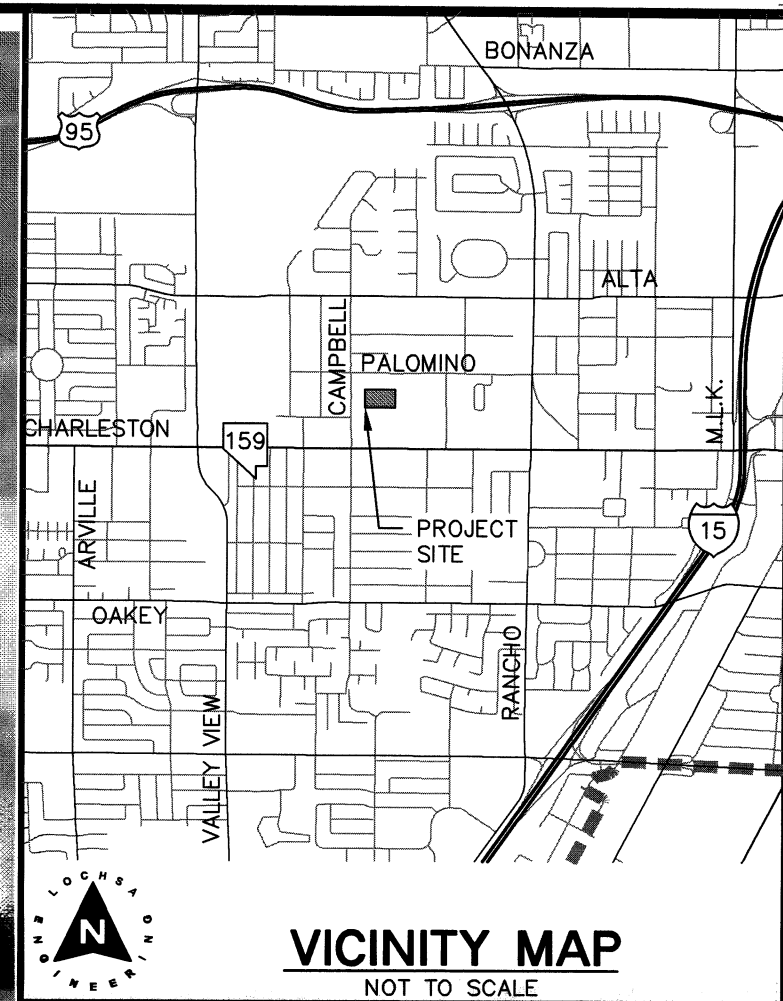
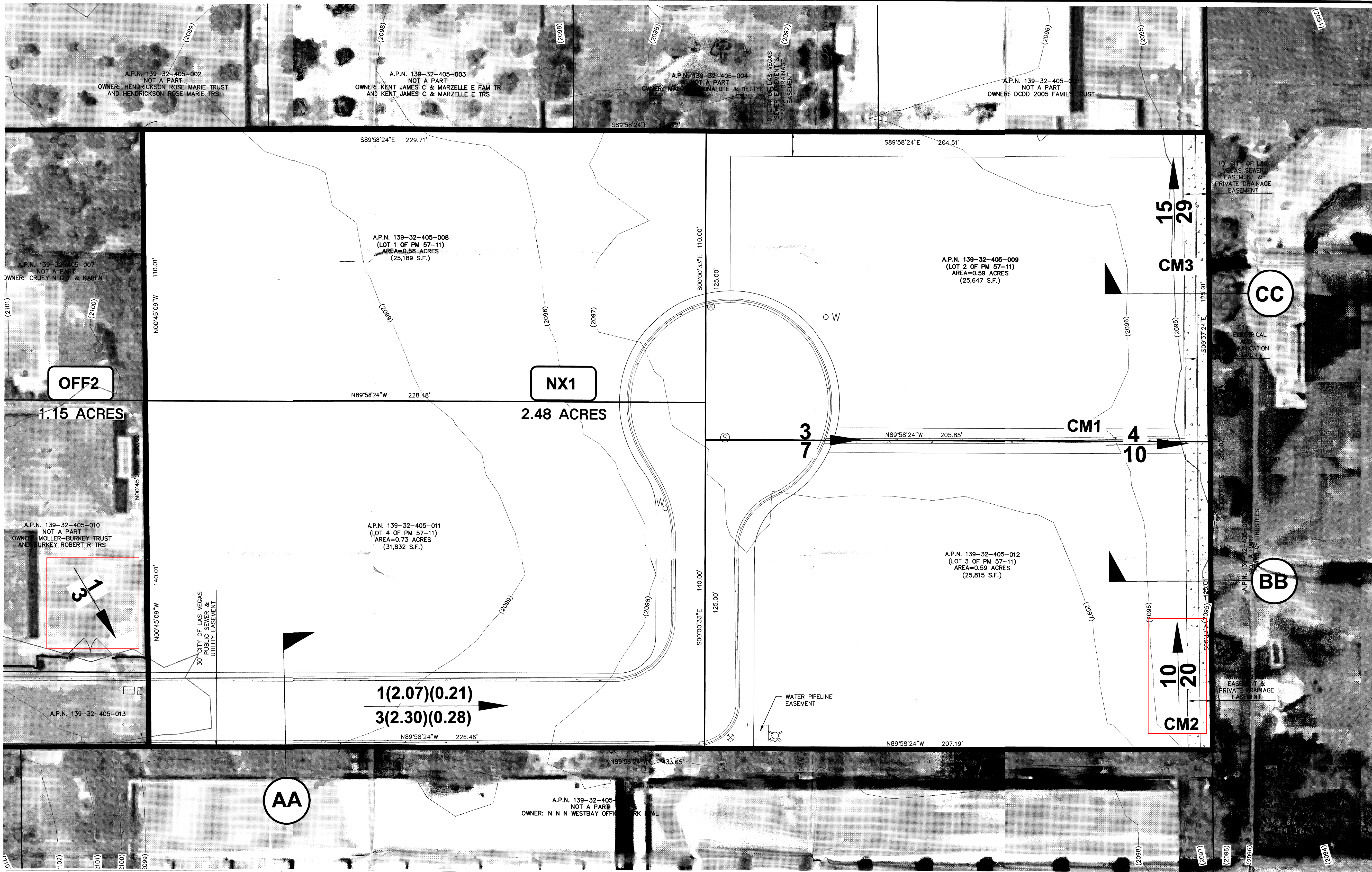
Westbay Office Park estimated at concentration point CM2 (10/20 cfs). The combined flows within the easement exiting through the northeast corner of the site are estimated at concentration point CM3 (15/29 cfs).

It will be noted that Reference 6 analyzed the area for the subject site as basin DEV2 which generated a 100-year flow of 4 cfs. It should further be noted that the analysis in Reference 6 computed a basin area of 1.85 acres for DEV2 with a curve number of 85 that corresponds to residences with 20,000 square foot lots, while the subject study analyzed the entire site area to be approximately 2.48 acres with a 93.9 curve number value that corresponds to newly graded land. Additionally, the flow contribution of approximately 3 cfs from basin OFF2 was not computed at the concentration point for all the flows exiting the northeast corner of the site through the drainage easement. All of the above discrepancies has resulted in a slight difference in the estimated combined flows exiting the site at the northeast corner resulting from the analysis between the two studies (i.e. 23 cfs from Reference 6 as opposed to 29 cfs at CM3). However, the analysis in the subject study appears to be more consistent and accurate and therefore better represents the existing condition of the site. Please refer to the appendix for the Existing Condition Onsite Drainage Map (Sheet DR1) provided.

2.2 Interim Drainage Condition

A. Offsite Drainage

For the interim condition, the offsite drainage patterns will remain as already described in the existing condition. Upstream flows are routed through the existing drainage easement along the



DRAINAGE LEGEND	
ND1	DRAINAGE BASIN LABEL
CMD1	CONCENTRATION POINT
SUMP-1	COMBINATION POINT
1 (1.0)(1.2)	BASIN BOUNDARY LINE
1 (1.0)(1.2)	STORAGE POINT
2	Q10 (V10)(D10)
3	Q100 (V100)(D100)
1D	Q10 FLOW IN CFS (10 YR.)
	Q100 FLOW IN CFS (100 YR.)
	FLOW DIRECTION
	HYDRAULIC CROSS-SECTION

HEC-RAS	
---	HEC-RAS CONTROL LINE
---	LIMITS OF FEMA ZONE "A"
100	HEC-RAS CROSS-SECTION AND STATION NUMBER
---	100 YR. WATER SURFACE ELEV.

Street Flow Summary (Existing and Developed Condition)							
10-year, 6-hour Storm	Right of Way Width (ft)	Roadway Carriage Width (ft)	Hydraulic Cross-Section Identifier	10-Year Flow (cfs)	10-year Velocity (fps)	10-year Flow Depth (ft)	Dry Lane Width (ft) (Within 1/2 ROW)
Triple Crown Circle	30	30	AA	1	2.07	0.21	N/A

Street Flow Summary (Existing and Developed Condition)							
100-year, 6-hour Storm	Right of Way Width (ft)	Street Carriage Width (ft)	Hydraulic Cross-Section Identifier	100-Year Flow (cfs)	100-year Velocity (fps)	100-year Flow Depth (ft)	100-year Velocity x Depth Product (v x d)
Triple Crown Circle	30	30	AA	3	2.30	0.28	0.64

Easement Flow Summary (Existing Condition)							
10-year, 6-hour Storm	Street	Right of Way Width (ft)	Roadway Carriage Width (ft)	Hydraulic Cross-Section Identifier	10-Year Flow (cfs)	10-year Velocity (fps)	10-year Flow Depth (ft)
10' Drainage Easement	10	10	BB	10	2.78	0.82	2.28
10' Drainage Easement	10	10	CC	15	3.47	0.93	3.23

Easement Flow Summary (Existing Condition)							
100-year, 6-hour Storm	Street	Right of Way Width (ft)	Street Carriage Width (ft)	Hydraulic Cross-Section Identifier	100-Year Flow (cfs)	100-year Velocity (fps)	100-year Flow Depth (ft)
10' Drainage Easement	10	10	BB	20	2.40	1.22	2.93
10' Drainage Easement	10	10	CC	29	3.68	1.22	4.49

Peak Flow Summary Existing Condition			
HEC-1 I.D.	Area (acres)	10-year Flow (cfs)	100-year Flow (cfs)
OFF2	1.15	1	3
NX1	2.48	3	7
CM1	-	4	10
DEV3	4.45	7	14
DEV4	1.95	3	6
CM2	-	10	20
CM3	-	15	29

NOTE:
LOCHSA ENGINEERING ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS PLAN ARE FROM THE BEST AVAILABLE INFORMATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES, INCLUDING BUT NOT LIMITED TO, THE WATER, FIRE, SANITARY SEWER, STORM SEWER, TELEPHONE, POWER, GAS, AND IRRIGATION LINES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. IF CONFLICT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE PROJECT ARCHITECT, OWNER'S REPRESENTATIVE AND THE PROJECT ENGINEER IMMEDIATELY.

SAFETY ALERT
Call before you dig
Avoid cutting underground utility lines. It's costly.

BENCHMARK:
CITY OF LAS VEGAS BENCHMARK 8LV01 325W RIVET AND PLATE IN THE TOP OF CURB AT THE SOUTHWEST CORNER OF CAMPBELL DRIVE AND PALOMINO LANE. ELEVATION = 640.727 METERS (2102.1185 FEET)

1-702-227-2929 **1-702-432-5300** **1-800-227-2800**

CL OR SURVEY LINE	EASEMENT LINE	DESCRIPTION:	CONTOUR LINES	EDGE OF PAVEMENT	"A" TYPE CURBS	"L" TYPE CURBS	WALLS	FENCES	AC PAVEMENT	CONCRETE	SPOT ELEVATIONS	SIGNS	MANHOLE W/ DESCRIPTION	MANHOLE DESCRIPTIONS	FIRE HYDRANTS	GATE VALVES	REDUCERS	CLEAN OUTS	UTILITY BOX OR VAULT	BACKWATER VALVES	100W HPS STREETLIGHTS	150W HPS STREETLIGHTS	200W HPS STREETLIGHTS	250W HPS STREETLIGHTS
---	---	EXISTING: --- PROPOSED: ---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Lochsa Engineering

6345 South Jones Blvd.
Suite 100
Las Vegas, NV 89118
Phone (702) 365-5312
Fax (702) 365-5317
www.lochsa.com

Onsite Drainage Map (Existing Condition)

Busch Residence

SHEET No. DR1

SHEET 1 of 2

HT No.



February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127 -

LAS VEGAS
CITY COUNCIL

CAROLYN G. GOODMAN
MAYOR

STAVROS S. ANTHONY
MAYOR PRO TEM

LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

**RE: VAR-62407 [PRJ-62201] - VARIANCE RELATED TO WVR-62353, VAC-62357 AND TMP-62358
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for Variance TO ALLOW A 27-FOOT PRIVATE STREET WHERE 47 FEET IS REQUIRED AND TO ALLOW NO AMENITY ZONES AND SIDEWALKS WHERE SUCH ARE REQUIRED FOR A PROPOSED RESIDENTIAL SUBDIVISION on 2.49 acres located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard (APN 139-32-405-027), R-E (Residence Estates) Zone, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
2. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
3. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
4. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

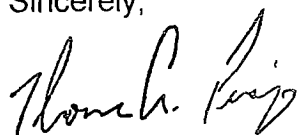
CITY OF LAS VEGAS
495 S. MAIN STREET
LAS VEGAS, NEVADA 89101

VOICE 702.229.6011
TTY 702.386.9108
www.lasvegasnevada.gov

Mr. Rick Firmine
805 Land, LLC
VAR-62407 [PRJ-62201] - Page Two
February 18, 2016

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas A. Perrigo". The signature is fluid and cursive, with the first name "Thomas" being more prominent.

Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Mr. Scott Harwood
DR Horton, Inc.
1081 Whitney Ranch
Henderson, Nevada 89104

Mr. Eric Rietz
Quantum Surveying
6018 S. Durango Drive, Suite #110
Las Vegas, Nevada 89113



LAS VEGAS
CITY COUNCIL

CAROLYN G. GOODMAN
MAYOR

STAVROS S. ANTHONY
MAYOR PRO TEM

LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127

**RE: WVR-62353 [PRJ-62201] - WAIVER RELATED TO VAR-62407, VAC-62357 AND TMP-62358
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for a Waiver TO ALLOW NO STREETLIGHTS WHERE SUCH ARE REQUIRED FOR A PROPOSED RESIDENTIAL SUBDIVISION on 2.49 acres located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard (APN 139-32-405-027), R-E (Residence Estates) Zone, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. This approval shall be void two (2) years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
2. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
3. A Waiver from of Title 19.02.240 to allow no street lighting where such is required is approved.
4. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
5. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

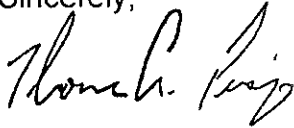
CITY OF LAS VEGAS
495 S. MAIN STREET
LAS VEGAS, NEVADA 89101

VOICE 702.229.6011
TTY 702.386.9108
www.lasvegasnevada.gov

Mr. Rick Firmine
805 Land, LLC
WVR-62353 [PRJ-62201] - Page Two
February 18, 2016

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas A. Perrigo".

Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Mr. Scott Harwood
DR Horton, Inc.
1081 Whitney Ranch
Henderson, Nevada 89104

Mr. Eric Rietz
Quantum Surveying
6018 South Durango Drive, Suite #110
Las Vegas, Nevada 89113



February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127

**RE: VAC-62357 [PRJ-62201] - VACATION RELATED TO VAR-62407, WVR-62353 AND TMP-62358
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for Petition to Vacate a PUBLIC SEWER EASEMENT generally located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. The limits of this Petition of Vacation shall be a 10-foot wide portion of the public sewer easement granted by the map recorded on Book 57, Page 11 of Parcel Maps generally located east of Campbell Road, north of Charleston Boulevard.
2. All public improvements, if any, adjacent to and in conflict with this vacation application are to be modified, as necessary, at the applicant's expense prior to the recordation of an Order of Vacation.
3. The Order of Vacation shall not be recorded until all of the conditions of approval have been met provided, however, that conditions requiring modification of public improvements may be fulfilled for purposes of recordation by providing sufficient security for the performance thereof in accordance with the Subdivision Ordinance of the City of Las Vegas. City Staff is empowered to modify this application if necessary because of technical concerns or because of other related review actions as long as current City right-of-way requirements are still complied with and the intent of the vacation application is not changed. If applicable, a five foot wide easement for public streetlight and fire hydrant purposes shall be retained on all vacation actions abutting public street corridors that will remain dedicated and available for public use. Also, if applicable and where needed, public easement corridors and sight visibility or other easements that would/should cross any right-of-way or easement being vacated must be retained.

LAS VEGAS
CITY COUNCIL
CAROLYN G. GOODMAN
MAYOR

STAVROS S. ANTHONY
MAYOR PRO TEM

LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

CITY OF LAS VEGAS
495 S. MAIN STREET
LAS VEGAS, NEVADA 89101

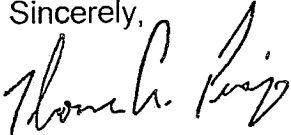
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TTY 702.386.9108
www.lasvegasnevada.gov

Mr. Rick Firmine
805 Land, LLC
VAC-62357 [PRJ-62201] - Page Two
February 18, 2016

4. All development shall be in conformance with code requirements and design standards of all City Departments.
5. If the Order of Vacation (or Order of Relinquishment of Interest if a Patent Reservation) is not recorded within one (1) year after approval by the City of Las Vegas or an Extension of Time is not granted by the Planning Director, then approval will terminate and a new petition must be submitted.

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,



Thomas A. Perrigo
Director
Department of Planning

TAP:clb

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DR Horton, Inc.
1081 Whitney Ranch
Henderson, Nevada 89104

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CITY MANAGER

February 18, 2016

Mr. Rick Firmine
805 Land, LLC
3 Snowy Owl Lane
Littleton, Colorado 80127

**RE: TMP-62358 [PRJ-62201] - TENTATIVE MAP RELATED TO VAR-62407,
WVR-62353 AND VAC-62357
CITY COUNCIL MEETING OF FEBRUARY 17, 2016**

Dear Mr. Firmine:

The City Council at a regular meeting held on February 17, 2016 **APPROVED** a request for a Tentative Map FOR A FOUR-LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION on 2.49 acres located approximately 200 feet east of Campbell Drive and approximately 700 feet north of Charleston Boulevard (APN 139-32-405-027), R-E (Residence Estates) Zone, Ward 1 (Tarkanian) [PRJ-62201].

This approval is subject to the following conditions:

Planning

1. The applicant is to provide street lighting adjacent to the front of the four residential lots in an acceptable manner to the Department of Planning prior to the issuance of civil improvement plans.
2. Approval of and conformance to the Conditions of Approval for Variance (VAR-62407), Waiver (WVR-62353) and Vacation (VAC-62357) shall be required, if approved.
3. Approval of the Tentative Map shall be for no more than four (4) years. If a Final Map is not recorded on all or a portion of the area embraced by the Tentative Map with four (4) years of the approval of the Tentative Map, this action is void.
4. Street names must be provided in accordance with the City of Las Vegas Street Naming and Address Assignment Regulations, 2009 Edition.
5. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.

CITY OF LAS VEGAS
495 S. MAIN STREET
LAS VEGAS, NEVADA 89101

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6. In conjunction with creation, declaration and recordation of the subject common-interest community, and prior to recordation of the Covenants, Codes and Restrictions ("CC&R"), or conveyance of any unit within the community, the Developer is required to record a Declaration of Private Maintenance Requirements ("DPMR") as a covenant on all associated properties, and on behalf of all current and future property owners. The DPMR is to include a listing of all privately owned and/or maintained infrastructure improvements, along with assignment of maintenance responsibility for each to the common interest community or the respective individual property owners, and is to provide a brief description of the required level of maintenance for privately maintained components. The DPMR must be reviewed and approved by the City of Las Vegas Department of Field Operations prior to recordation, and must include a statement that all properties within the community are subject to assessment for all associated costs should private maintenance obligations not be met, and the City of Las Vegas be required to provide for said maintenance. Also, the CC&R are to include a statement of obligation of compliance with the DPMR. Following recordation, the Developer is to submit copies of the recorded DPMR and CC&R documents to the City of Las Vegas Department of Field Operations.
7. All development is subject to the conditions of City Departments and State Subdivision Statutes.

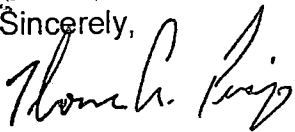
Public Works

8. A Petition of Vacation such as VAC-62357 shall be recorded prior to the recordation of a Final Map for this site.
9. Prior to the recordation of a Final Map for this site, provide proof of legal access to this site from Campbell Drive.
10. Label the private street as a "Public Sewer Easement to be Privately Maintained" on the Final Map.
11. Revise the statement "E 10' PUBLIC DRAINAGE & SEWER EASEMENT PER P.M. #53-87 TO BE VACATED" to eliminate the reference to drainage, as the existing drainage easement is private, not public.
12. The existing Public Drainage Easement per document number #20100913:03565 shall be within a common lot and labeled as privately maintained on the Final for this site.
13. All existing 8-inch private sewer that is proposed to be Public Sewer shall be bonded for and pass all City inspections for typical public sewer installations. The developer is responsible to repair any existing sewer that does not pass all inspections before the City will release the bond and accept maintenance of the sewer.

14. Grant a 20-foot wide "Public Sewer Easement, Surface to be Privately Maintained" over the existing sewer along the east edge of proposed lot 3. This easement can remain in the backyard, as long as the existing 10-foot wide concrete surface drainage easement remains. Remove the existing manhole from the northeast corner of lot 3.
15. Create a common area and grant a 20-foot wide "Public Sewer Easement, Surface To Be Privately Maintained" between lots 3 and 4. This easement shall be paved to provide drivable access to the existing manhole along the east edge of the development.
16. Grant a 10-foot wide "Private Sewer Easement for the sole benefit of APN 139-32-405-026" along the east edge of the lot 4. This easement shall be within the 10-foot common lot created on the east side of lot 4.
17. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or submittal of any construction drawings, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.

The Notice of Final Action was filed with the Las Vegas City Clerk on February 18, 2016.

Sincerely,



Thomas A. Perrigo
Director
Department of Planning

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DR Horton, Inc.
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Henderson, Nevada 89104

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APPENDIX E

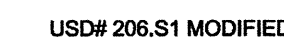
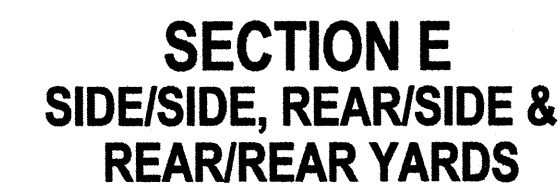
Improvement Plans



USD# 206.S1 MODIFIED



USD# 206.S1 MODIFIED



		HASTINGS AND CAMPBELL A RESIDENTIAL SUBDIVISION				BLUE HERON 4011 W. HARRIS AVE. LAS VEGAS, NV 89118 (702) 255-8866 FAX: (702) 255-8862		J&E ENGINEERING 6000 S. JONES BOULEVARD LAS VEGAS, NV 89118 (702) 392-8844 FAX: (702) 392-2333		REVISIONS	
DATE: 5/4/2016		SCALE: NTS		JOB NO: DXC-16-058		DESIGNED BY: MPB		CHECKED BY: SJT		SHEET NAME: GD1	
SHEET NUMBER: 4 OF 4											