

DS #: 4691

APN: 125-19-301-007 & -008

PROJECT: CONNOR HILLS

SUBMITTAL: 1ST

SCANNED BY/DATE:

CHECKED BY/DATE:





CITY OF LAS VEGAS			DATE:
INTER-OFFICE MEMORANDUM			August 7, 2014
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: Connor Hills		COPIES TO: Slater Hanifan Group
Cross Streets:	SWC Deer Springs Way & Grand Canyon Dr.		Richmond American Homes
File Number:	F:\Depot\DSMemos\DS4691A.doc		Bart Anderson, P.E., DevCo
Parcel Number:	125-19-301-007 & 125-19-301-008		CCPW
Zoning Action:	TMP-52119; GPA-52116; ZON-52117; VAR-52118 & WVR-52169		
FEMA Flood Zone	YES	NO X	
Proposed Storm Drain	YES X	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	7/24/2014	8/6/2014	See Comments Below	\$400.00	364839: \$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. Provide a copy of the zoning/planning conditions associated with this site (**TMP-52119; GPA-52116; ZON-52117; VAR-52118 & WVR-52169**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
2. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.
3. The site is adjacent to the jurisdiction of *Clark County* to the north and south. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and incorporate any concerns for boundary conditions along the north and south borders. CCPW concurrence is required prior to the final acceptance of the study.
4. The anticipated 100-year flow depth in *Deer Springs Way* is above the top of curb (0.62') and is erosive (6.29 ft/s). Provide erosion protective measures such as riprap or stamped concrete or equivalent behind the top of curb in *Deer Springs Way*. For riprap, the minimum d_{50} is 8" in public right-of-ways. Revise all pertinent plans, details and construction notes accordingly.

5. Extend a lateral at SDMH #1 beyond the center line of *Deer Springs Way* for future inlet connection on the north side of the street.
 6. Explain why a sidewalk is proposed within the proposed drainage easement. Is it a trail required by *Planning* or for maintenance access? Note that the effective drainage channel is only 4'-wide, the 100-year flow velocity is 7.19 ft/s which is high visually. Reduce the discharge velocity down to 5 ft/s as possible.
 7. 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.
 8. Label the slopes in the bulbs of the cul-de-sac of *Pinley Rise Street* and *Luck Summit Street* on the grading plan. The *Clark County Regional Flood Control District Manual* requires 1% minimum slope around the bulb of a cul-de-sac where storm water is drained through in Section 1602.
 9. Label the existing storm drain systems in *Deer Springs Way* and *Grand Canyon Drive* with *City of Las Vegas* recorded plan numbers on the grading plan.
 10. **Detail Sections 1/D-1** and **2/D-1**: Clearly label the proposed solid grouted wall as "8"-CMU min." or equivalent.
 11. **Detail Section 5/D-1** shows a wrought iron fence on top of a U-channel which doesn't appear to be structurally sound. The wrought iron fence must sit on a stem wall instead of the U-channel. Review and revise accordingly.
 12. The wrought iron fence proposed on the west boundary of the subject development must utilize *City of Las Vegas* standard. Contact Raul Cruz at 229-3224 for the AutoCAD details (421 series) to be included with the improvement plans.
 13. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).
- 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: T19S/R60E/19
AREA G-19

 *** FAX TX REPORT ***

TRANSMISSION OK

JOB NO. 4303
 DESTINATION ADDRESS 7022845399
 PSWD/SUBADDRESS
 DESTINATION ID
 ST. TIME 08/07 15:25
 USAGE T 00' 39
 PGS. 2
 RESULT OK

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: August 7, 2014
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
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Proposed Storm Drain	YES X NO	

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Rec'd: 7/24/17

DS 4691

G-19

\$400-

TMP-52119
WVR-52169
VAR-52118
ZON-52117
GPA-52116

S-I-G SLATER
HANIFAN
GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET, SUITE 216

LAS VEGAS, NEVADA 89118

PHONE: 702-284-5300 • FAX: 702-284-5399

Albert Sung

From: Stanley Amadi <samadi@shg-inc.com>
Sent: Monday, August 11, 2014 3:30 PM
To: Albert Sung
Cc: Todd Steadham; Christopher Zhang; Angela Pinley; Erick Mata
Subject: FW: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)
Attachments: 140617 RAH1310 Revised TM.pdf

Hi Albert,
Below is our email thread with Mark Rex at CLV Planning Department per our conversation.
Please let me know when you discuss with him so we can proceed with our resubmittal.
Thanks as always.

Stanley Okey Amadi, P.E.
Project Manager
Flood Control

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Any files contained within are to be used for information ONLY. Accuracy and/or design information to be verified from approved original plans. Use of electronic media is at the sole risk of the user.

From: Angela Pinley
Sent: Monday, August 11, 2014 3:23 PM
To: Stanley Amadi
Cc: Erick Mata; Christopher Zhang; Todd Steadham
Subject: FW: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Hi Stanley,

Below is my correspondence with Mark Rex regarding the pedestrian access/drainage easement along the west property line of Connor Hills. Let me know if you have any questions.

Thank you,

Angela Pinley, P.E.
Assistant Project Manager

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From: Mark Rex [<mailto:mrex@LasVegasNevada.GOV>]
Sent: Wednesday, June 18, 2014 8:52 AM
To: Angela Pinley
Cc: Todd Steadham
Subject: RE: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Good morning Angela,

Below are the revised conditions that will be added to the tentative map.
Please let me know if you questions.

All Plans shall be in conformance to the Tentative Map date stamped 06/18/14.

Any walls or fences erected along the western portion of this Tentative Map shall be solid for the first three feet and then any portion beyond three feet shall be open view fencing. All walls or fences shall be constructed per Title 19.06.040.H. A wall elevation shall be submitted to the Planning Department detailing any walls along the western portion of this Tentative Map prior to submission of civil permits.

From: Angela Pinley [<mailto:apinley@shg-inc.com>]
Sent: Wednesday, June 18, 2014 8:00 AM
To: Mark Rex
Cc: Todd Steadham
Subject: RE: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Hi Mark,

That condition sounds reasonable to me so yes we will agree.

Thank you,
Angela Pinley

----- Original message -----

From: Mark Rex <mrex@LasVegasNevada.GOV>
Date: 06/18/2014 7:42 AM (GMT-08:00)
To: Angela Pinley <apinley@shg-inc.com>
Cc: Todd Steadham <tsteadham@shg-inc.com>
Subject: RE: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Morning Angela,

Thank you for the revisions.
Will the client agree to the Condition of Approval below?

If an additional wall/fence is constructed on top of the three-foot tall flood wall along the west property line it shall be a view fence only.

From: Angela Pinley [<mailto:apinley@shg-inc.com>]
Sent: Wednesday, June 18, 2014 2:06 AM
To: Mark Rex
Cc: Todd Steadham
Subject: RE: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Hi Mark,

Attached is the revised layout for Connor Hills including the pedestrian/drainage easement detail added to sheet TM-2.
Let me know if you have any questions.

Thank you,

Angela Pinley, P.E.
Project Engineer

SLATER HANIFAN GROUP

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From: Mark Rex [<mailto:mrex@LasVegasNevada.GOV>]

Sent: Tuesday, June 17, 2014 4:43 PM

To: Angela Pinley

Cc: Todd Steadham

Subject: RE: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Good afternoon Ms. Pinley,

Per our conversation this afternoon, the revised pedestrian/drainage channel along the west end of the property raises potential safety concerns.

1. Will the applicant agree to a Condition of Approval allowing view fence only solid floor wall along the western property line.
2. If a view fence is agreed upon how tall is the solid flood wall?

Please submit revised plans showing revised lot areas for lots 9, 18, 11, 30, and 32 and a wall/fence section of the western property line.

Please email me a revised plan with the changes by 8:00 am tomorrow.

Thank you

Sincerely,

Mark Rex, Planner I
The Department of Planning
city of Las Vegas
mrex@lasvegasnevada.gov

Tell us how we're doing! Please [click here](#) to take a short online survey to help us improve our service.

From: Angela Pinley [<mailto:apinley@shg-inc.com>]

Sent: Tuesday, June 17, 2014 9:01 AM

To: Mark Rex

Cc: Todd Steadham

Subject: FW: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Hi Mark,

I'm following up with the email I sent Thursday afternoon and just wondering if you have had a chance to review the attached site plan changes. Let me know if you have any questions.

Thank you,

Angela Pinley, P.E.
Project Engineer

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From: Angela Pinley
Sent: Thursday, June 12, 2014 4:57 PM
To: 'Mark Rex'
Cc: Todd Steadham
Subject: Connor Hills (GPA-52116, ZON-52117, WVR-52169 & TMP-52119)

Hi Mark,

We would like to move both of the 10' pedestrian paths to the west property line and make a 10' pedestrian path / drainage easement for the entire length of the property. Since the adjacent property is owned by BLM it is unlikely that we will be able to get permission to grade so we will need the drainage easement to capture flow from the west and make up any grade difference between existing condition and the pad grades. The pedestrian access easement will be connected at the ends of both cul-de-sacs, Deer Springs Way, and Echelon Point. Please let me know any concerns you may have with this site layout change.

Thank you,

Angela Pinley, P.E.
Project Engineer

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TECHNICAL DRAINAGE STUDY

Connor Hills

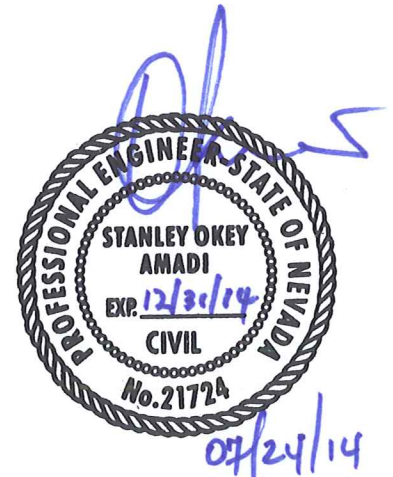
City of Las Vegas, Nevada
Job No.: RAH1310.000
Date: July 2014

Prepared By:

Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
Las Vegas, Nevada 89118
Phone: 702-284-5300 • Fax: 702-284-5399

Prepared For:

Richmond American Homes, Inc.
7770 South Dean Martin Drive, Suite 308
Las Vegas, NV 89139
Phone: 702-617-8400 • Fax: 702-617-8499



Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted By: Erick Mata, E.I.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Connor Hills Date: July 2014
 Location of Development: a) Descriptive (Cross Streets): North/South: Grand Canyon Drive
East/West: Deer Springs Way
 b) Section: 19 Township: 19 South Range: 60 East
 c) APN: 125-19-301-007, 125-19-301-008

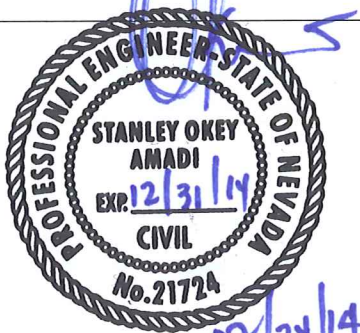
Name of Owner: G Spring LLC/ Richmond American Homes, Inc.
 Telephone No.: (702) 617-8400 Fax No.: (702) 617-8499 E-mail Address: Brian.Walsh@mdch.com
 Address: 7770 South Dean Martin Drive, Suite 308 Las Vegas, Nevada 89139

Contact Person – Name: Stanley Okey Amadi, P.E. Telephone No.: 702-284-5300
 *E-mail Address: samadi@shg-inc.com Fax No.: 702-284-5399
 Firm: Slater Hanifan Group, Inc.
 Address: 5740 S. Arville Street, Suite 216, 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	☐

- Total Owned Land Area: At Site: Approx. 10 ac Being Developed/Disturbed: Approx. 10 ac
- Is a portion or all of the subject property located in a FEMA Flood Hazard Area? ☐ Yes** ☒ No
- Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No
- Proposed type of development (Residential, Commercial, Etc.): Single Family Residential
- Approximate upstream land area which drains to the subject site: Approx. 60 acres
- Has the site drainage been evaluated in the past? ☒ Yes** ☐ No If yes, please identify documentation: Technical Drainage Study for Grand Canyon Estates (HTE# 05-891). The study addressed the west portion of the Site (APN# 125-19-301-007).
- If known, please briefly identify the proposed discharge point(s) of runoff from the site: The site discharges east onto Grand Canyon Drive through two site entries.
- 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.

***Newly 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

Updated 05/01/2008

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Connor Hills		Map ID:
Firm Name: Slater Hanifan Group		Engineer: Stanley Okey Amadi, P.E.
Address: 5740 S. Arville St., Suite 216		
City: Las Vegas	State: Nevada	Zip: 89118
Phone Number: 702-284-5300		Fax Number: 702-284-5399
Property Owner/Developer: G Spring LLC/ Richmond American Homes		
Address: 7770 S. Dean Martin Drive, Suite 308		
City: Las Vegas	State: NV	Zip: 89139
Reviewed By:	Date Received:	Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT:

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

Reference:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS

Yes	No	
☒	☐	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
☒	☐	A copy of the current CCRFCD Master Plan Update Figure, (F-14), for Flood Control Facilities and Environmental areas with the site delineated.
☒	☐	On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
☒	☐	Vicinity Map with local and major cross streets identified and a north arrow.
☒	☐	Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.

III. DRAINAGE PLAN

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

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

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

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
X		Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood Walls with 8-inch concrete masonry unit.
X		Building and/or lot numbers.
	N/A	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
	N/A	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.
	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 floor elevations must be a minimum of 18 inches above BFE.
	N/A	Appropriately elevated "humps" 6 inches above the 100-year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.
X		Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

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 storm water flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where acceptable.
X		Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
X		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 for 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.
	N/A	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 tee intersection losses, where appropriate.
X		Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, which ever is greater.
	N/A	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub- and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
X		Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
X		Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
X		The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.

REFERENCE:

STANDARD FORM 2



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

I. GENERAL REQUIREMENT		
Yes	No	
-	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
X	-	Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions. ZON-52118, TMP-52119 & GPA-52116, WWR-52169 Approved 05/15/14.
X	-	An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. _____ by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

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

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II. GRADING PLAN INFORMATION		
Yes	No	
X	-	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.
X	-	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. (IN PROCESS OF OBTAINING)
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	
-	N/A	Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options.
-	N/A	Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

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

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

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- Drop Inlet Analysis
- WSPG Model

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Technical Drainage Study for Deer Springs and Grand Canyon

- Approval Letter(s)
- Drainage Exhibits

Appendix H Reference Material

Technical Drainage Study for Town Center L-TC 60/75 No.5

- Approval Letter(s)
- HEC-1 Model
- Drainage Exhibits
- Approved Grading Plans

Appendix I Reference Material

Conceptual Drainage Study for Hualapai and 215

- Approval Letter(s)
- Ultimate Condition Drainage Map

- Appendix J** Reference Material
Technical Drainage Study for Rome/Grand Canyon
- Approval Letter(s)
 - Flowmaster Calculations
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- Appendix K** Reference Material
City of Las Vegas Northwest Neighborhood Study
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1 INTRODUCTION

1.1 Project Overview & Study Purpose

Richmond American Homes is proposing to construct a single-family residential development on approximately ten (10) acres of undeveloped land. The development is located at the southwest corner of the intersection of Grand Canyon Drive and Deer Springs Way, within the City of Las Vegas, Nevada. The project is comprised of 40 single family residential lots and is identified as *Connor Hills*.

The purpose of this study is to provide a detailed hydrologic and hydraulic analysis for the project site and to substantiate the hydraulic design in order to protect the property from onsite and offsite runoff in accordance with local storm water management criteria. This study also offers an inventory of the existing drainage facilities in the vicinity of the site and provides recommendations for site specific facilities necessary to control runoff impacting the project site. This report presents a summary of the hydrologic and hydraulic analyses, methodology and results of the study.

1.2 Site Description and Improvements

The project site is bordered to the north by Deer Springs Way and to the south by Echelon Point Drive alignment. Grand Canyon Drive is directly east of the site while the adjacent parcel to the west is owned by the Bureau of Land Management (BLM) and is currently undeveloped. Both Grand Canyon Drive and Deer Springs Way adjacent to the site currently consist of typical access road. An existing single family residence is located directly north of the site across Deer Springs Way.

The site is located within a portion of the Northern Half (N1/2) of Southwest Quarter (SW1/4) of Section 19, Township 19 South, and Range 60 East of the MDM in the City of Las Vegas, Nevada. The project site consists of two parcels identified by Assessor's Parcel Numbers (APN) 125-19-301-007 and 125-19-301-008. The location of the project site in relation to the surrounding streets has been identified on the Exhibit A-Location Map included in Appendix A, for reference.

The typical lot size proposed on the project site is approximately 60-ft by 120-ft (approximately 7,000 square feet). It is anticipated that the project will be constructed in one (1) phase. The onsite improvements will include private interior roadways with curb and gutter for the conveyance of surface runoff. In addition, the project will construct half street improvements in the adjacent streets including Deer Springs Way, Grand canyon Drive and Echelon Point Drive.

1.3 FEMA Flood Zone Designation

The project site is located within a portion of the current Flood Insurance Rate Map (FIRM) Panel 32003C1745E, effective date September 27, 2002. Review of Panel 32003C1745E indicates that the site is located within an area designated by FEMA as Zone "X" (unshaded). Zone "X" (unshaded) is described by FEMA as *areas determined to be outside the 0.2% annual chance floodplain*. Exhibit B-FEMA FIRM Map, identifying the

project site on a portion of FIRM Panel 32003C1745E, has been included in Appendix A for reference.

1.4 CCRFCD MPU Facility & CLV Neighborhood Study Information

The 2013 Las Vegas Valley Flood Control Master Plan Update (MPU, Reference 2) illustrates the existing and proposed regional master planned facilities in the vicinity of the site as shown on Figure F-13.

Review of Figure F-13, from the Master Plan Update (MPU, Reference 2), indicates no existing or future CCRFCD Master Plan facilities adjacent to or crossing through the site. Exhibit C1, which identifies the location of the project site on a portion of Figure F-13 of the 2013 MPU Flood Control Facilities Map, has been included in Appendix A for reference.

The project site is also covered by the CLV Northwest Neighborhood Study (Phase 2) prepared by PBS&J. The CLV Northwest Neighborhood Study indicates a proposed local facility in Deer Springs Way adjacent to the site, consisting of a 24" Reinforced Concrete Pipe (RCP). This facility will convey localized offsite flows in Deer Springs Way and will continue east across Grand Canyon Drive. The CLV Northwest Neighborhood Study exhibits which identify the existing and ultimate condition CLV local facilities are also included in Appendix K for reference.

1.5 Reference Studies

The following documents have been utilized as reference materials in preparation of this drainage study. The referenced documents have been reviewed and portions determined acceptable for reference have been included in the appropriate appendix. Slater Hanifan Group generally concurs with all referenced and adopted hydrologic and hydraulic analysis from the studies and the results established therein.

- The study entitled, *Technical Drainage Study for Deer Springs and Grand Canyon* (HTE #13-31940; Reference 4; hereafter referred to as the Deer Springs and Grand Canyon Study), as prepared by Thomason Consulting Engineers. The study was utilized to establish offsite drainage patterns within the adjacent northern parcels, and to determine the combined offsite flows conveyed within Deer Springs Way. Relevant reference materials from this study have been included in Appendix G.
- The study entitled, *Technical Drainage Study for Town Center L-TC 60/75 No.5* (HTE #05-55610; Reference 5; hereafter referred to as Town Center Study) as prepared by Slater Hanifan Group. The study was used to review the drop inlets located on Grand Canyon Drive north of the project site. Also note that ultimate condition drainage patterns have been revised by the Deer Springs and Grand Canyon Study to drain parcels south to Deer Springs and not east to Grand Canyon Drive as previously established by the Town Center Study. Revised flows to the intersection of Grand Canyon and Deer Springs have been illustrated and provided as reference material for this study. The Town Center Study also provides a storm drain stub at the intersection of Grand Canyon Drive and Deer Springs Way. The approved plans were utilized to establish starting Hydraulic Grade Line (HGL) for the proposed connection to the storm drain stub. Please find relevant material included in Appendix H.

- The study entitled, *Conceptual Drainage Study for Hualapai and 215* (HTE #07-43671; Reference 6; hereafter referred to as Hualapai and 215 Study) as prepared by Slater Hanifan Group. The plans were used to establish drainage patterns and basin delineation west of the project site and south of Deer Springs Way. Relevant reference material has been included in Appendix I.
- The study entitled, *Technical Drainage Study for Rome/Grand Canyon* (HTE #06-14152; Reference 7; hereafter referred to as the Middle School Study) as prepared by Nevada by Design. The study provided the storm drain system that extends along Grand Canyon Drive to the intersection of Echelon Point Drive. The storm drain has been extended north in Grand Canyon Drive by Connor Hills as necessary to meet street design criteria. The proposed storm drain extension will tie into the existing manhole provided by the Middle School Study at the intersection of Echelon Point Drive and Grand Canyon Drive. Relevant reference material has been included in Appendix J.
- The document entitled *City of Las Vegas Northwest Neighborhood Flood Control Master Plan – Phase 2* (hereafter referred to as the CLV NWNS, Reference 8), prepared by PBS&J, established historic existing condition and anticipated future condition flow rates conveyed in the adjacent perimeter streets and infrastructures. CLV NWNS has been utilized for comparative and reference purposes in establishing the Project Site's design flows. Relevant exhibits from the CLV NWNS have been included in Appendix K.

2 METHODOLOGY

2.1 Compliance

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 (HCDDM, Reference 1).

2.2 Hydrologic Modeling

Modeling: The SCS Unit Hydrograph Method (SCS Method) was utilized to determine peak flow rates. The SCS Method utilizes precipitation, drainage area, curve number and lag time parameters to determine peak flow rates. The SCS Method routine within the U.S. Army Corp of Engineers HEC-1 Flood Hydrograph Package program was utilized to model the drainage subbasins analyzed by this study.

Precipitation: The site is located outside of the McCarran Airport Rainfall Area. The adjusted precipitation values utilized in the HEC-1 models, per CCRFCD HCDDM Figures 503 and 506 and Table 501, are 1.61 and 3.00 inches for the 10-year and 100-year 6-hour storm events, respectively. Furthermore, since the drainage area of the contributing watershed is less than 8 square miles, the SDN 3 design storm distribution as shown on Table 503 of the CCRFCD HCDDM was used. Reference tables and figures from the CCRFCD HCDDM are included in Appendix B.

Soil Data & Curve Number: The SCS curve number loss rate methodology was utilized to approximate infiltration for the drainage subbasins. The soils information within the watershed was obtained from the National Resources Conservation Service (NRCS) Web Soil Survey of the Las Vegas Valley Area (Soil Survey, Reference 3). Exhibit D depicts this study's project boundary on the soils map and has been included in Appendix A. Per the Soil Survey, the project site lies within Soil Type 191, which is comprised of 100% Hydrologic Soil Group (HSG) 'A'.

The undeveloped land within the basin boundaries is typical of southern Nevada desert, undeveloped with sparse desert shrub. Therefore, a curve number associated with a "desert shrub (poor condition)" has been utilized for the undeveloped areas.

The average lot size proposed by this project is approximately 7,000 square foot in area. Therefore, curve number associated with a land use corresponding to "7,000 square feet" development has been utilized for the onsite drainage areas in the proposed condition.

For the perimeter offsite street improvements adjacent to the project site, a curve number of 98 associated with roadway has been utilized to analyze the street basins. All soil and curve number data and computations have been included in Appendix B.

Lag Time: The lag time is defined as the time measured from the center of mass of excess rainfall to the time to peak of the outflow hydrograph. The lag time is related to the time of concentration as 0.6 times the time of concentration. The time of concentration is defined as the time required for runoff to flow from the hydraulically most distant point of a subbasin to the outlet point of the subbasin. Standard Form 4, as outlined in the CCRFCD HCDDM, was utilized to determine the lag times for subbasins modeled. The lag time computations have been included in Appendix B.

2.3 Hydraulic Modeling

Street Flow: Street flows have been analyzed utilizing the FlowMaster Version 7.0 software by Haestad Methods. In accordance with the CCRFCD HCDDM, the depth times velocity factor ($D \cdot V$) for street flow during the 10-year storm event must be less than or equal to 6, with a maximum depth of 1.0-ft. Likewise, the depth times velocity factor ($D \cdot V$) for street flow during the 100-year storm event must be less than or equal to 8, with a maximum depth of 2.0-foot. Furthermore, the CCRFCD HCDDM criteria requires a 12-foot wide dry lane (excluding use of a 7.0-foot dry center turning lanes in each direction) for streets with a ROW width of 80-feet and greater during a 10-year storm event.

Flow Split Analyses: Flowsplits generated by this project have been analyzed utilizing Flowmaster Version 7.0 software by Haestad Methods. Equal depths at the intersection for each street were obtained to divert flow.

Drop Inlets: Drop inlets are designed using a spreadsheet that incorporates orifice and weir equations as outlined in Section 805 of the CCRFCD HCDDM, which also includes the required 50% clogging factor in determining sizes.

Storm Drains: The hydraulic gradient line (HGL) for the proposed storm drain systems has been determined utilizing the Water Surface and Pressure Gradient (WSPG) Hydraulic Analysis System software by the Los Angeles County Department of Public Works. As outlined in the CCRFCD HCDDM, storm drain facilities are designed to

maintain a hydraulic gradient line (HGL) at a minimum of 1.0-ft below above finished grade elevations and limit the flow velocities in the facilities to range between 3 ft/s and 25 ft/s.

3 EXISTING DRAINAGE CONDITION

3.1 Definition of Existing Drainage Condition

The existing drainage condition considers the site in its current undeveloped state with sparse desert shrub. The existing topography of the site and its tributaries drain from northwest to a southeast direction. Deer Springs Way north of the site and Grand Canyon Drive east of the site currently consists of full pavement without sidewalk, curb and gutter. The south boundary is bordered by Echelon Point Drive and has been partially rough graded. The west boundary consists of existing desert shrub.

3.2 Discussion of Existing Drainage Condition

Offsite: The offsite watershed directly impacting the project site consists of three basins (OFF1, OFF2 and *EXOF3). Basin *EXOF3 has been adopted from the Deer Springs and Grand Canyon Study. Basin *EXOF3 generates $6/ < 1$ cfs (Q_{100}/Q_{10}) and combines with basin OFF1. Basin OFF1 generates $15/1$ cfs and drains in a southeasterly direction discharging onto Deer Springs Road. Basin OFF2 generates $12/1$ cfs and also drains in a southeasterly direction to impact the west boundary of the project site.

Additionally, basins OFFW and OFFD have been delineated based on the existing topography and in conformance with the CLV NWNS drainage patterns to quantify the flows at the Grand Canyon Drive and Deer Spring Way intersection. The flows have been conservatively assumed to be contained by the existing swale located on the west half of Grand Canyon Drive. As a result the flows generated by basins OFFW and OFFD reach the intersection of Grand Canyon Drive and Deer Springs Way to combine with the basins EXOF3 and OFF1.

Onsite: The project site in its existing condition has been analyzed as one drainage basin identified as ON1 ($6/ < 1$ cfs). Runoff from basin ON1 combines with offsite flows and discharges in a southeasterly direction. The combined flows continue southeast beyond the intersection of Echelon Point Drive and Grand Canyon Drive.

Please refer to Exhibit E, included in Appendix A, for an illustration of the existing condition onsite and offsite drainage patterns.

3.3 Summary of Existing Condition Flows

A summary of the onsite and offsite flow rates, as determined in the existing condition hydrologic (HEC-1) analysis, has been presented below in Table 1. Please refer to Appendix C for the output file of the applicable HEC-1 analysis. Relevant reference materials supporting the referenced flows identified in Table 1 have also been included in the Appendix C.

Table 1: Summary of Existing Condition Flow Rates			
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)
ON1	10.2	6	<1
OFF1	34.1	15	1
OFF2	28.4	12	1
OFFW	29.4	7	<1
OFFD	26.4	9	<1
*EXOF3	11.5	6	<1
*REFERENCED FROM THE DEER SPRINGS AND GRAND CANYON STUDY.			

4 INTERIM DRAINAGE CONDITION

4.1 Definition of Interim Condition

The interim condition considers the project site being fully developed with the proposed residential homes and interior streets as depicted on the grading plan for the site, while the offsite tributary areas remains as analyzed in the existing condition. Offsite roadway improvements in Deer Springs Way, Echelon Point Drive and Grand Canyon Drive adjacent to the site will be constructed within the corresponding half of street right-of-way improvements.

4.2 Discussion of Interim Condition

Offsite: The upstream offsite tributary to the site will remain the same as analyzed and described in the existing condition. Consequently, flows from basin OFF2 will impact the west boundary of the site. The project site has provided drainage easements to convey the offsite flows through the site and discharge onto Grand Canyon Drive. Furthermore, flows will be collected by proposed drop inlets and bypass flow will discharge onto the intersection of Grand Canyon Drive and Echelon Point Drive and maintain historic drainage patterns.

Onsite: The project site in its interim condition has been analyzed as one drainage basin identified as ON1D (15/3 cfs). Runoff from the site is conveyed via curb and gutter and discharges onto Grand Canyon, as mentioned above. It is worthy to note that the interim condition drainage patterns are similar to that of the existing condition.

Note the interim condition flows generate less flow than the ultimate condition flows. Therefore, the ultimate condition flows have been utilized for sizing and design of drainage facilities as well as street capacity calculations.

Please refer to Exhibit F, included in Appendix A, for a detailed illustration of the interim condition onsite and offsite drainage patterns.

4.3 Summary of Interim Condition Flows

A summary of the onsite and offsite flow rates, as determined in the interim condition hydrologic (HEC-1) analysis, has been presented below in Table 2. Please refer to Appendix C for the output file of the applicable HEC-1 analysis.

Table 2: Summary of Interim Condition Flow Rates			
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)
ON1D	10.2	15	3
OFF1	34.1	15	1
OFF2	28.4	12	1
OFFW	29.4	7	<1
OFFD	26.4	9	<1
*EXOF3	11.5	6	<1
CP1	N/A	37	2
*REFERENCED FROM THE DEER SPRINGS AND GRAND CANYON STUDY.			

As discussed above, the interim condition patterns stay the same as the existing condition therefore similar flow rates have been generated by the interim condition with the exception of basin ON1D. As a result of development, basin ON1D generated 9/2 cfs more than the existing condition flows.

4.4 Summary of Interim Condition Street Flows

Proposed street improvements have been hydraulically analyzed by the conservative ultimate condition flows. Please refer to Section 5.4 below for the summary of the ultimate condition street flow analyses.

4.5 Summary of Recommended Facilities

Refer to Exhibit H, included in Appendix A, for a detailed illustration of the storm drain and drop inlet schematic proposed by this project. As discussed above, all proposed drainage facilities were designed for the conservative Ultimate Condition flows and have been summarized under Section 5.5.

4.6 Summary of Finished Floor

The finished floors have been analyzed utilizing ultimate condition flows which provided the most conservative depths for design. The finished floor elevation assessment has been included in Appendix E.

5 ULTIMATE DRAINAGE CONDITION

5.1 Definition of Ultimate Condition

The ultimate condition considers full build-out of the offsite watershed, inclusive of the Project Site. The onsite drainage patterns do not change as a result of considering the ultimate condition compared to the previously described interim condition. However, offsite improvements are considered to increase flow rates and change drainage patterns when perimeter streets have been fully built out.

5.2 Discussion of Ultimate Condition

Refer to Exhibit G, included in Appendix A, for a detailed illustration of the ultimate condition drainage patterns.

Onsite & Offsite:

The ultimate condition onsite drainage patterns remain the same as presented in the interim condition. The offsite drainage patterns are similar to the interim condition but have been revised to incorporate the drainage patterns from the previously approved studies referenced in the area. The referenced Town Center Study had established flows to be routed from west to east in the ultimate condition per the CLV NWNS. Ultimately these flows would be conveyed south by Grand Canyon Drive. The flows generated are now assumed to be rerouted to Deer Springs Way per the referenced Deer Springs and Grand Canyon Study. As a result, less flow is now conveyed south by Grand Canyon Drive north of Deer Springs Way and additional flow is conveyed by Deer Springs Way from the west towards Grand Canyon Drive. All flows are routed to the intersection of Grand Canyon Drive and Deer Springs Way where a flowsplit is analyzed at concentration point CP1. Majority of the flows after the split conveys north in Deer Springs Way downstream and away from the project site. The portion of flows that split into Grand Canyon Drive are routed south to combine with the additional onsite and offsite flows from the Project Site. The flows are then routed south to the intersection with Echelon Point Drive at concentration point CP2.

Note basin OFF3D maintains the drainage pattern established in the interim condition and conveys through the site towards Grand Canyon Drive, while basin OFF4D routes all flow to be conveyed east on Echelon Point Drive.

5.3 Summary of Ultimate Condition Flows

A summary of ultimate condition flow rates determined by this study have been provided in Table 3 below. The HEC-1 analysis, included in Appendix B, has been prepared to determine onsite flow rates.

Table 3: Summary of Ultimate Condition Flow Rates			
Basin/Concentration Point ID	Area (acres)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)
ON1U	8.6	12.0	3.0
OFF2D	14.3	21.0	4.0

Table 3: Summary of Ultimate Condition Flow Rates			
Basin/Concentration Point ID	Area (acres)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)
OFF3D	5.9	17.0	7.0
OFF4D	3.9	12.0	5.0
OFF5D	2.0	<1.0	<1.0
GCD	1.2	5.0	2.0
DSW	4.9	17.0	9.0
ECH	0.9	4.0	2.0
**CP2D	N/A	68.0	<1.0
CP1 OFF2D + DSW + *13/10CFS + *32/8CFS + OFF5D + **47.5/<1CFS – 8CFS PROPOSED DI	N/A	121.0	22.0
CP2 41.5/7.5CFS FLOWSPLIT + OFF3D + OFF4D + ON1U + GCD + ECH – 16CFS PROPOSED DI'S	N/A	75.5	10.5
* REFERENCED FROM THE DEER SPRINGS AND GRAND CANYON STUDY			
** REFERENCED FROM THE TOWN CENTER STUDY			

Note that basin OFF3D and basin OFF4D have been prorated in order to quantify and flood protect against the flow impacting the west boundary of the site. The Project Site proposes easements that convey offsite flow on and through the site. A rating table for Section 1 has been provided in Appendix D to obtain flow depths on the west perimeter wall for the site. Table 4 below has been provided to summarize the prorated flow quantities.

Table 4: Prorated Flow Summary			
Basin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
OFF3D	17	5.9	2.9
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
A	7	2.4	2.9
B	10	3.5	2.9
TOTAL	17	5.9	
Basin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
OFF4D	12	3.9	3.1
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
C	4	1.4	3.1
D	8	2.5	3.1
TOTAL	12	3.9	

Below is a summary table of the ultimate condition flowsplit utilized at concentration CP1 for design of the project.

Table 5: Developed Condition Onsite Flowsplit Summary Table				
Street Section ID	Total Flow at Intersection (cfs) Q_{100}/Q_{10}	Split Section	Flowsplit (cfs) Q_{100}/Q_{10}	Notes
CP1	121/22	FS1	41.5/7.5	Flowsplit analyzed through FlowMaster calculations in the 10-yr and 100-yr events.
		FS2	79.5/14.5	

5.4 Summary of Ultimate Condition Street Flows

The ultimate onsite and perimeter street improvements have been hydraulically analyzed to show that the street flow criteria, outlined in Section 2.3 of this report, is satisfied. The 100-year flows conveyed within the onsite streets also satisfy the 10-year street flow criteria; therefore, only 100-year hydraulic sections have been provided for the onsite roadways. Tables 6 and 7 have been provided below to summarize the 100-year and 10-year onsite and perimeter hydraulics pertinent to the project. Refer to Exhibit G for the location of street sections.

Table 6: Summary of Ultimate 100-Year Hydraulic Characteristics						
Street Section ID	Contributing Source	Q_{100} (cfs)	Slope (%)	Depth, D_{100} (ft)	Velocity, V_{100} (ft/s)	$D_{100} \times V_{100}$
ON1	(Q = OFF3D-A + ON1U/2)	13.0	3.64	0.35	5.10	1.79
ON2	(Q = OFF3D-B + ON1U/2)	16.0	3.43	0.38	5.17	1.96
1	Rating Table Provided in Appendix D					
2	(Q = OFF4D + ECH)	16.0	3.55	0.38	5.23	1.99
3A	Half Street Capacity Section					
3B	(Q = OFF2D + DSW + *13CFS + *32CFS + OFF5D)	81.0	2.98	0.62	6.29	3.9
4A	(Q = 41.5CFS FLOWSPLIT + OFF3D-A + ON1U/2)	54.5	0.86	0.66	3.51	2.32
4B	(Q = OFF3D-B + ON1U/2 + GCD + 46.5CFS SECTION 4A BYPASS)	67.5	0.86	0.70	3.67	2.57

Table 7: Summary of Ultimate 10-Year Street Flow Hydraulic Characteristics						
Street Section ID	Contributing Source	Q_{100} (cfs)	Slope (%)	Depth, D_{100} (ft)	Velocity, V_{100} (ft/s)	Dry Lane (ft)
3B	(Q = CP1 + 8CFS COLLECTED FROM PROPOSED DI)	30.0	2.98	0.46	5.4	15.5
4A	(Q = 7.5CFS FLOWSPLIT + OFF3D-A + ON1U/2)	12.0	0.86	0.43	2.8	17.0
4B	(Q = OFF3D-B + ON1U/2 + GCD + 4CFS SECTION 4A BYPASS)	11.5	0.86	0.42	2.7	17.5

Review of Tables 6 and 7 shows that with the proposed drop inlets located at Sections 3B, 4A and 4B, the developed 100-year and 10-year flow rates meet street flow criteria. Note that Section 3B generates erosive velocities above the curb in the 100-Yr storm event. Through further inspection it has been determined the majority of the flows impacting this location are contained in the north side of Deer Springs Way as illustrated by Section 3A. Therefore, the proposed landscape within Connor Hills will not experience the erosive velocities. Refer to Appendix D for relevant calculations.

5.5 Summary of Ultimate Condition Drainage Facilities

Note that the design flow rates utilized for all easements were those of the ultimate condition to establish a more conservative analysis.

The project site proposes the following drainage facilities:

Drainage Easements:

A total of two (2) drainage easements have been provided to convey offsite flow through the site and conform to historic drainage patterns. Facility P1 and Facility P2 are both 10-ft in width with a 4-ft u-channel to convey flow onsite. The most conservative flow of 10cfs has been utilized for both easements and analyzed to adequately flood protect the adjacent finished floors at 18-inches above the highest water surface elevation generated.

Storm Drain:

Two (2) storm drain systems have been proposed by the project site. WSPG Model "DSU.WSP" is a representation of the storm drain system proposed in Deer Springs Way. The design includes a 12.5-ft drop inlet on the south side of the Deer Springs Way proposed to collect 8cfs. The flow is conveyed through an 18-inch lateral that ties into a proposed 36-inch RCP. The 36-inch RCP connects to an existing 36" RCP stub provided by the Town Center Study at the intersection of Grand Canyon Drive and Deer Springs Way. The starting HGL utilized in the DSU.WSP model has been referenced from the Town Center Study.

The second storm drain system (GCU.WSP) has been proposed along Grand Canyon Drive. It is composed of two (2) drop inlets with pertinent stubs provided for the ultimate condition connection on the east side of Grand Canyon Drive. The first 10-ft drop inlet is located right after onsite flow is introduced by Pinley Rise Street. The inlet collects 4cfs and conveys flow south through an 18-inch RCP. The second 10-ft drop inlet is located after the introduction of onsite flow by Luck Summit Street. Similarly, the second inlet collects 4cfs and continues routing flow south through a proposed 24-inch RCP in Grand Canyon Drive. The 24-inch RCP connects to an existing stub at the intersection of Echelon Point Drive and Grand Canyon Drive provided by the Middle School Study. Note that the starting HGL utilized for the GCU.WSP model has been assumed to be at top of pipe. Flowmaster computations were utilized to assess a worst case flow scenario by introducing the flow generated by the project site and the maximum flow collected by the first upstream inlet from the Middle School Study. The FlowMaster computation shows that the downstream pipe segment will partially full, thus, assuming the starting HGL at the top of pipe is very conservative.

Please find all storm drain computations in Appendix E for your reference.

6 SUMMARY OF FINISHED FLOOR ELEVATIONS

The proposed finished floor elevations satisfy local City of Las Vegas policy and are elevated minimum 6-inches above the adjacent top of curb elevation at the high side of the lot. In addition, all finished floors are adequately flood protected and elevated above twice the depth of flow in the adjacent street. The hydraulic evaluation of proposed finished floors, utilizing the flow depths summarized in Table 6 of this study, has been included in Appendix F.

7 CONCLUSIONS & RECOMMENDATIONS

1. This project is in compliance with the applicable drainage laws as recognized by the state of Nevada.
2. This project is in compliance with the CCRFCD *"Hydrologic Criteria and Drainage Design Manual"* (Reference 1).
3. The project site is not located within a FEMA designated Special Flood Hazard Area (SFHA). The site and surrounding improvements are located within a FEMA unshaded Zone "X" (unshaded).
4. The drainage facilities for this project have been designed to control and convey the onsite and offsite runoff from the 100-year storm safely around the site and perpetuate existing drainage conditions. In addition, they have been designed based on generally accepted engineering practices.
5. All the proposed finished floor elevations have been designed to meet the City of Las Vegas minimum flood protection criteria as well as those stipulated in the CCRFCD HCDDM.
6. The Notice of Final Action (NOFA) for the project site has been included in Appendix L.
7. The project's grading plan and detail sheet have been included in Appendix M of this study to support the analysis, drainage patterns, conclusions and recommendations provided.

8 REFERENCES

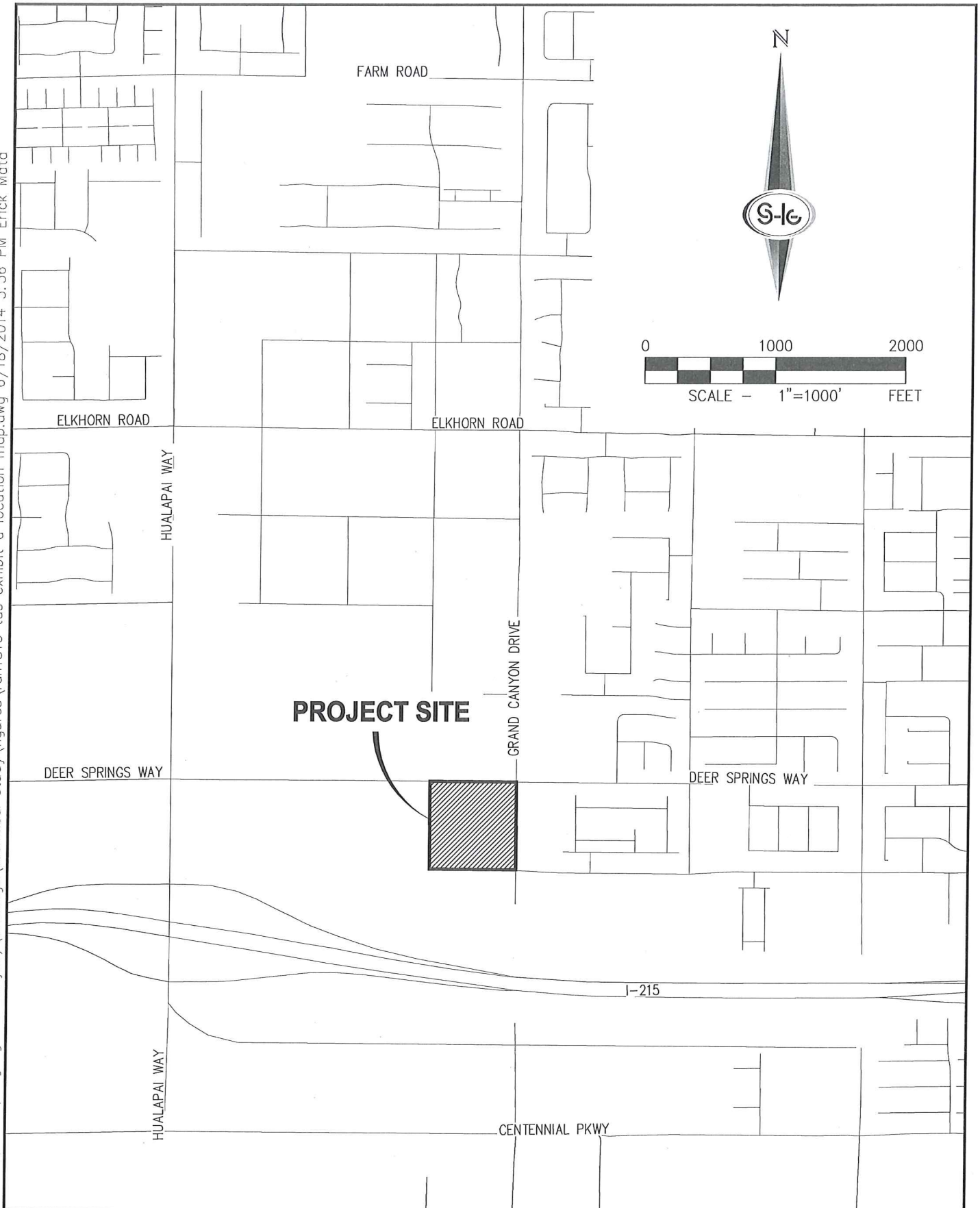
1. *Hydrologic Criteria and Drainage Design Manual (HCDDM)*. Clark County Regional Flood Control District, August 1999.
2. *Las Vegas Valley Flood Control Master Plan Update*. PBS&J, Inc., Louis Berger and Parsons-Brinckerhoff, October 2013.
3. *Custom Soil Resource Report for Las Vegas Valley Area, Nevada*. U.S. Department of Agriculture, Natural Resource Conservation Service, June 17, 2014.
4. *Technical Drainage Study for Deer Springs and Grand Canyon* by Thomas Consulting Engineers, approved on January 13, 2014.

5. *Technical Drainage Study for Town Center L-TC 60/75 No.5* by Slater Hanifan Group, approved on December 7, 2006.
6. *Conceptual Drainage Study for Hualapai and 215* by Slater Hanifan Group, approved on November 6, 2007.
7. *Technical Drainage Study for Rome/ Grand Canyon* by Nevada by Design, approved on April 13, 2006.
8. *City of Las Vegas Northwest Neighborhood Study*, PBS&J, September 1999.

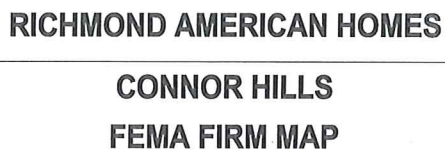
APPENDIX A

Drainage Exhibits

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 SLATER HANIFAN GROUP CONSULTING ENGINEERS & PLANNERS 5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118 PHONE (702) 284-5300 FAX (702) 284-5399	RICHMOND AMERICAN HOMES		DATE: JUNE 2014	PROJECT NO.
	CONNOR HILLS		DRAFTER: ETM	RAH1310.000
	LOCATION MAP		DESIGNER: ETM	EXHIBIT A
			CHECKED: SOA	SHEET 1 OF 1



DATE: JUNE 2014	PROJECT NO.
DRAFTER: ETM	RAH1310.000
DESIGNER: ETM	EXHIBIT B
CHECKED: SOA	



EXHIBIT C

FACILITY INVENTORY
FIGURE F - 13

Existing Facility.....	E	
Proposed or Modified Facility.....	P	Bottom Width.....W
Contingency Level		
Category B.....	P0	Depth.....D
Master Plan.....	P1	
Preliminary Design.....	P2	Side Slope, H:V.....SS
Design.....	P3	

<u>Construction Features</u>			
Cast in Place Concrete Pipe.....	C1PCP	Reinforced Concrete Arch Culvert.....	RCAC
Corrugated Metal Arch Pipe Culvert.....	CMAP	Reinforced Concrete Box.....	RCB
Corrugated Metal Pipe Culvert.....	CMPC	Reinforced Concrete Box Culvert.....	RCBC
High Density Polyethylene.....	HDPE	Reinforced Concrete Pipe.....	RCP
Horizontal Elliptical Reinforced Concrete Pipe.....	HERCP	Reinforced Concrete Pipe Culvert.....	RCPC
Reinforced Concrete Arch Pipe.....	RCAP	Storm Sewer Pipe.....	SSP

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)
EKHU		ELKHORN AND HUALAPAI						
0000	E	6' X 5' RCB Overflow Structure	48	638	CNW29-C	WEST3	0.51	0.91
0001	E	6' X 5' RCAP	72	638	CNW29-C	WEST3	0.51	0.91
0003	E	6' X 4' RCAP	980	638	CNW29-C	WEST3	0.51	3.61
0020	E	6' X 5' RCAP	150	638	CNW26-C	WEST3	0.51	3.61
0023	E	8' X 5' RCAP	1200	638	CNW26-C	WEST3	0.51	0.90
GOEC		GOWAN NORTH - EL CAPITAN BRANCH						
0176	P1	78' RCP	1320	363	CCPFR-C	ALLGOW3	0.46	1.15
GONO		GOWAN NORTH SYSTEM						
0511	P1	7' X 6' RCB	1320	546	CCPHV-C	ALLGOW3	0.60	1.14
LVMD		LAS VEGAS WASH - MIDDLE						
2490	E	2: 13' X 7' RCB	2555	2278	CNW168-C	CWEST3	4.69	0.40
2507	E	2: 13' X 9' RCB	2831	2278	CNW168-C	CWEST3	4.69	0.36
2525	E	24' X 8' RCB	1140	1913	CNW159-C	CWEST3	3.91	0.40
2550	E	24' X 8' RCB	1445	1664	CD161-C	CWEST3	3.41	0.40
2574	E	24' X 8' RCB	1430	1664	CD161-C	CWEST3	3.41	0.40
2599	E	Cone Chnl 24'W 7'D 2:1 SS	1577	1565	CNW162-C	CWEST3	3.03	0.50
2632	E	18' X 5' RCB	1580	968	CNW138-C	WEST3	1.16	0.46
2661	E	18' X 5' RCB	2640	968	CNW138-C	WEST3	1.16	0.46
2711	E	10' X 5' RCB	1320	968	CNW138-C	WEST3	1.16	1.54
2737	E	10' X 5' RCB	1320	818	CNW139-C	WEST3	0.93	2.22
2763	E	6' X 5' RCB	1320	818	CNW139-C	WEST3	0.93	1.79
2789	E	6' X 5' RCB	1470	818	CNW139-C	WEST3	0.93	2.17
MOHU		MOCCASIN - HUALAPAI BRANCH						
0000	P0	14' X 8' RCB	1920	761	2CNW45-N	LOWER3	2.10	0.50
0036	P0	10' X 8' RCB	2550	368	CNW45-N	LOWER3	1.15	0.50
0085	P0	72' RCP	790	368	CNW45-N	LOWER3	1.15	3.00
0100	P0	Natural Wash	850	65	DMODB1	LOWER3	0.81	3.00
0116	P0	60' RCPC	12	65	DMODB1	LOWER3	0.81	3.00
0118	P0	Natural Wash	3455	65	DMODB1	LOWER3	0.81	3.00
MOIR		MOCCASIN - IRON MOUNTAIN BRANCH						
0000	P0	66' RCP	2770	446	2CNW33-C	LOWER3	1.76	3.60
MOKC		MOCCASIN AND KYLE CANYON						
0000	P1	11' X 8' RCB	5450	2662	CNW35-C	LOWER3	2.69	3.40
MOSM		MOCCASIN AND SHEEP MOUNTAIN PARKWAY						
0000	P0	14' X 9' RCB	3370	3778	CNW64-C	LOWER3	5.32	2.40
0064	P0	14' X 8' RCB	880	3505	CNW50-C	LOWER3	4.99	3.00
0080	P0	14' X 8' RCB	710	3325	2CNW35-C	LOWER3	4.80	3.00
MSWV		MOUNTAIN SPA/VISTA RANCH						
0000	E	6: 12' X 5' RCBC @ Grand Teton	273	679	CNW163-C	CWEST3	1.67	0.40
0005	E	Grass Chnl 100'W 4.5'D 10:1 SS	6325	679	CNW163-C	CWEST3	1.67	0.40
0125	E	Grass Chnl 100'W 4.5'D 10:1 SS	1300	116	CNW147E	WEST3	1.54	0.40
RACO		RACEL STREET COLLECTOR						
0000	E	96' RCP Baffled Energy Dissipator	54	497	CNW111S	WEST3	0.55	4.20
0001	E	78' RCP	3245	497	CNW111S	WEST3	0.55	2.46
0064	E	78' RCP	2650	423	DNW111S	WEST3	0.44	2.09
RCBC		RANCHO ROAD SYSTEM - BELTWAY CHANNEL						
0000	E	6' X 5' RCB	1052	222	FADB	WEST3	1.60	1.04
0002	E	54' RCP Outlet with 41" Orifice	503	222	FADB	WEST3	1.60	2.38
0003	E	2,341 cfs PMF Spillway		2341	FADBIN	WEST3	1.60	
0004	E	76 ac-ft Fort Apache Detention Basin		1255	FADBIN	WEST3	1.60	
0007	E	Energy Dissipator	100	1255	FADBIN	WEST3	1.60	
0009	E	12' X 6' RCBC @ Fort Apache Detention Basin	133	1255	FADBIN	WEST3	1.60	1.79
0012	E	Cone Chnl 12'W 6'-7'D 0:1 SS	1937	1255	FADBIN	WEST3	1.60	3.15
0048	E	12' X 6' RCBC @ Grand Canyon	140	1040	CMNA1	WEST3	1.32	3.15
0051	E	Cone Chnl 12'W 6'-8'D 0:1 SS	2660	1040	CMNA1	WEST3	1.32	3.44
0096	E	1: 10' X 6' and 1: 6' X 6' RCBC @ Hualapai Way	190	1040	CMNA1	WEST3	1.32	1.93
0100	E	Cone Chnl 12'W 5.5'D 0:1 SS	2085	598	CDMNA1	WEST3	0.48	2.88
0140	E	Cone Chnl 10'W 5'D 0:1 SS	2155	598	CDMNA1	WEST3	0.48	1.65

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
RCHB		RANCHO ROAD SYSTEM - BELTWAY						
0034	E	Conc Chnl 21W 8'D 0.1 SS	1000	2631	CNW1C-W	WEST3	4.68	1.19
0053	E	2-12" X 8" RCBC @ South Ramp Connector	85	2304	CDW1C1	WEST3	4.31	1.40
0054	E	Conc Chnl 21W 8'D 0.1 SS	432	2304	CDW1C1	WEST3	4.31	1.51
0062	E	Transition Structure	130	2304	CDW1C1	WEST3	4.31	1.51
0065	E	24" X 7" RCB	480	2304	CDW1C1	WEST3	4.31	0.30
0074	E	24" X 6" RCB	50	2226	CNWBC6-C	WEST3	4.17	0.30
0075	E	20" X 6" RCBC @ Beltway	428	2226	CNWBC6-C	WEST3	4.17	2.81
0083	P1	20" X 6" RCB	950	2226	CNWBC6-C	WEST3	4.17	2.49
0101	P1	Conc Chnl 20W 7'D 0.1 SS	980	2226	CNWBC6-C	WEST3	4.17	2.38
0120	E	20" X 6" RCBC @ Grand Montecilo	120	2226	CNWBC6-C	WEST3	4.17	1.00
0122	P1	Conc Chnl 16"20W 6'D 0.1 SS	350	2226	CNWBC6-C	WEST3	4.17	1.84
0130	P1	Conc Chnl 16W 6'D 0.1 SS	1012	2226	CNWBC6-C	WEST3	4.17	2.67
0149	P1	Conc Chnl 16W 6"7'D 0.1 SS	87	1888	CNWBC3	WEST3	3.75	2.27
0151	P1	Conc Chnl 16W 7'D 0.1 SS	1255	1888	CNWBC3	WEST3	3.75	2.65
0171	E	16" X 6" RCBC @ El Capitan Way	234	1888	CNWBC3	WEST3	3.75	1.75
0175	E	Conc Chnl 14W 7'D 0.1 SS	1220	1888	CNWBC3	WEST3	3.75	2.93
0198	E	Conc Chnl 14W 7'D 0.1 SS	225	1402	CNWBA6-C	WEST3	3.61	2.93
0227	E	12" X 6" RCB	1885	1402	CNWBA6-C	WEST3	3.61	1.02
0250	E	12" X 6" RCB	3200	1402	CNWBA6-C	WEST3	3.61	1.00
0275	P1	7" X 6" RCB	2650	973	CNW66-C	WEST3	1.75	3.30
0295	P1	7" X 6" RCB	2875	973	CNW66-C	WEST3	1.75	3.30
TSDB		TULE SPRINGS DRAINAGE SYSTEM						
0000	E	2-10" X 4" RCBC @ Echo Grande	100	26	TULEDB	WEST3	1.35	1.04
0002	E	36" RCP with 22" Orifice Plate	320	26	TULEDB	WEST3	1.35	0.33
0010	E	14,013 cfs PMF Spillway		14013	CTULEDB	WEST3	1.35	
0011	E	117 ac-ft North Environmental Enhancement Area		804	CTULEDB	WEST3	1.35	
0012	E	Energy Dissipator	260	376	CNW148-C	WEST3	0.52	
0023	P1	84" RCP	1320	376	CNW148-C	WEST3	0.52	0.80
0059	P1	78" RCP	2640	376	CNW148-C	WEST3	0.52	1.00

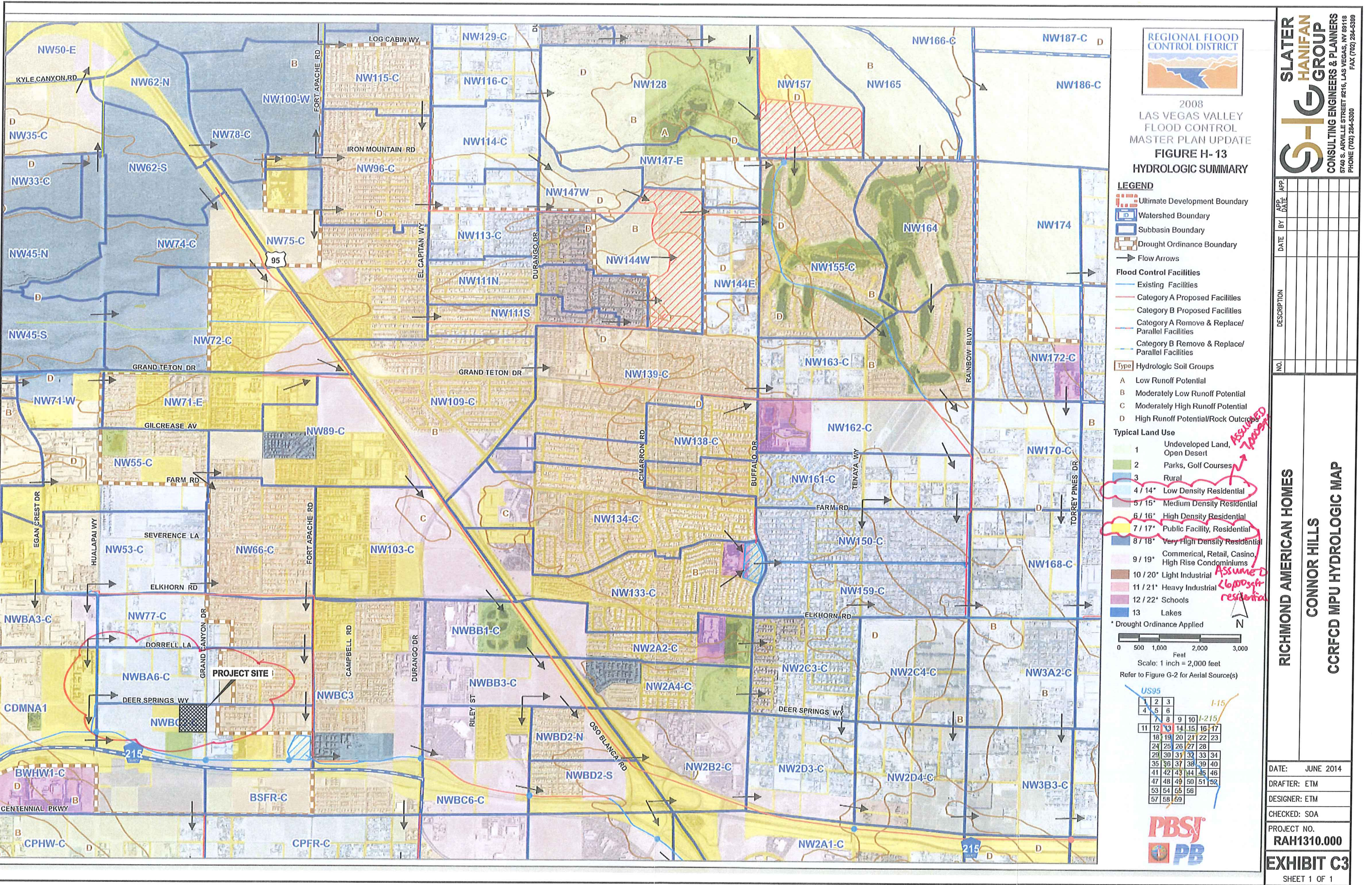
* The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.

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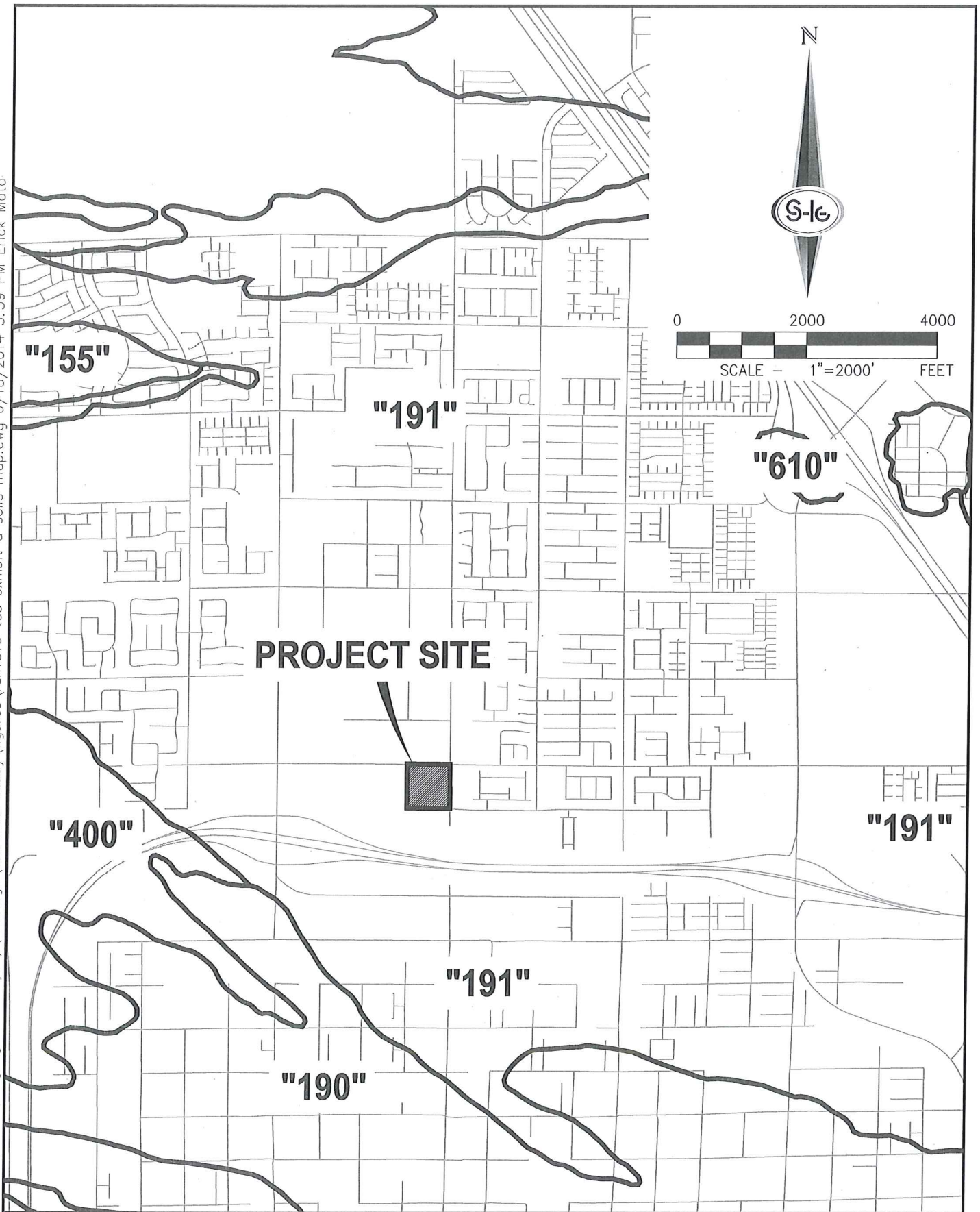
RICHMOND AMERICAN HOMES

CONNOR HILLS
CCRFCD MPU FACILITIES INVENTORY MAP

DATE: JUNE 2014
DRAFTER: ETM
DESIGNER: ETM
CHECKED: SOA
PROJECT NO. RAH1310.000



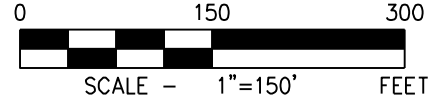
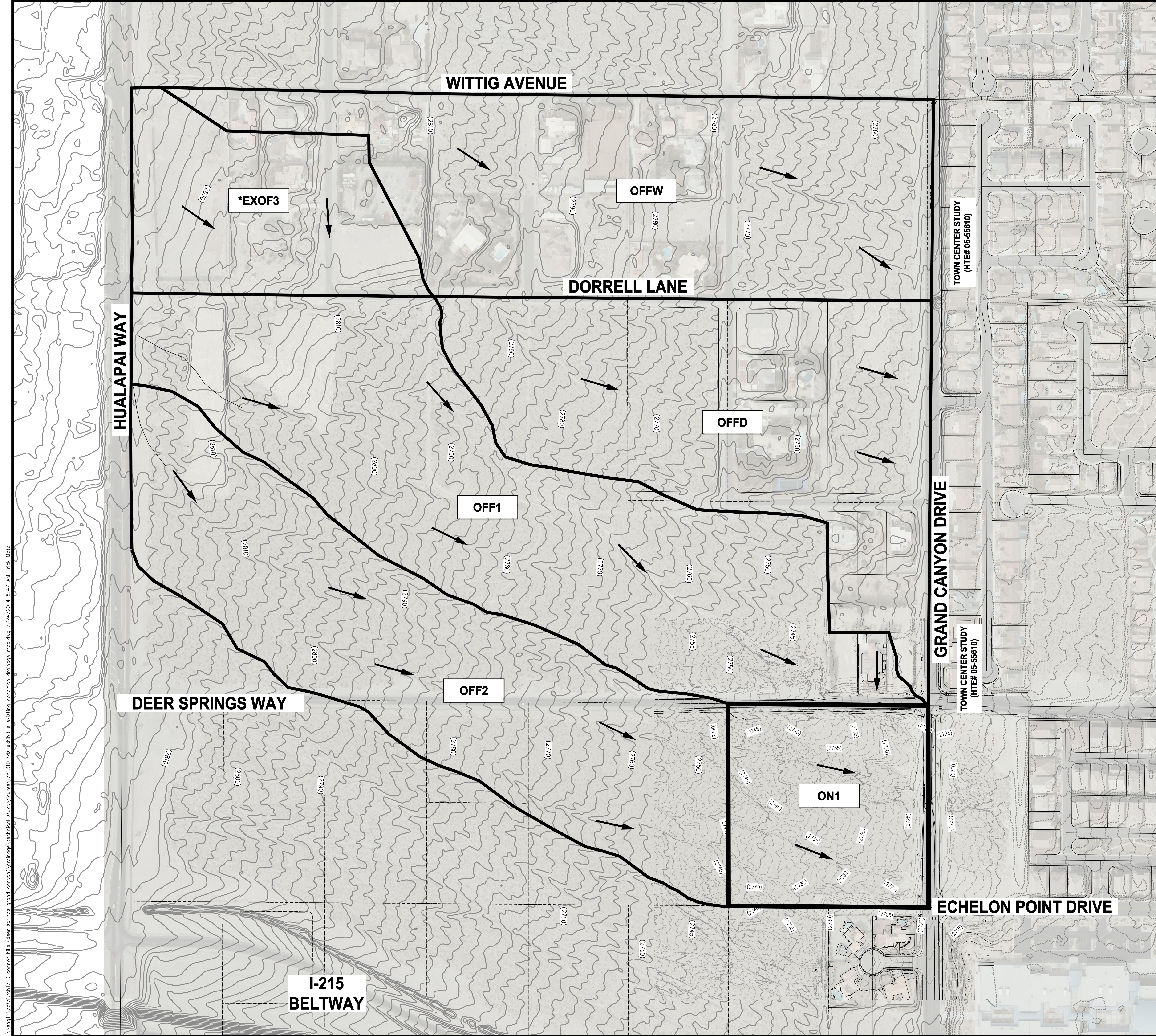
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S-I-G
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RICHMOND AMERICAN HOMES
CONNOR HILLS
SOILS MAP

DATE: JUNE 2014	PROJECT NO. RAH1310.000
DRAFTER: ETM	EXHIBIT D SHEET 1 OF 1
DESIGNER: ETM	
CHECKED: SOA	



LEGEND	
	BASIN BOUNDARY
	BASIN ID
	FLOW DIRECTION

Existing Condition Flow Rate Summary			
Basin/Concentration Point ID	Area (ac)	Q ₁₀ (cfs)	Q ₁₅ (cfs)
OFF1	34.1	15	1
OFF2	28.4	12	1
OFFW	29.4	7	<1
OFFD	26.4	9	<1
ON1	10.2	6	<1
*EXOF3	11.5	6	<1

*REFERENCED FROM THE DEER SPRINGS AND GRAND CANYON STUDY

NO.	DESCRIPTION	DATE	BY	APP. DATE

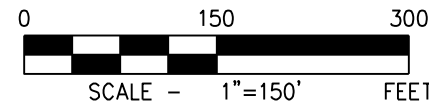
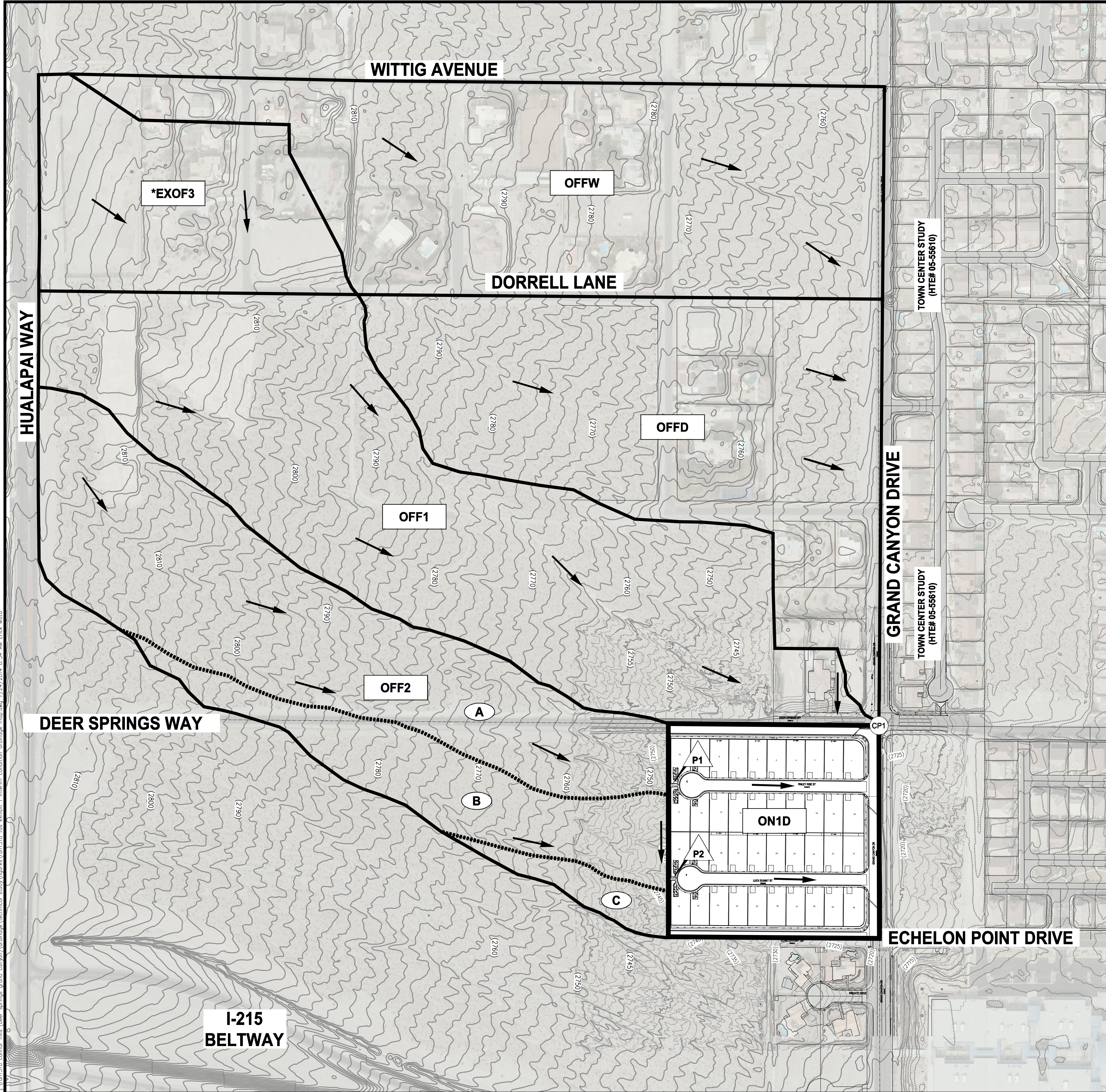
RICHMOND AMERICAN HOMES

CONNOR HILLS

EXISTING CONDITION DRAINAGE MAP

DATE:	JULY 2014
DRAFTER:	ETM
DESIGNER:	ETM
CHECKED:	SOA
PROJECT NO.	RAH1310.000

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LEGEND	
	BASIN BOUNDARY
	PRO-RATED SUBBASIN BOUNDARY
	BASIN ID
	CONCENTRATION POINT
	FLOW DIRECTION
	FACILITY ID

Interim Condition Flow Rate Summary			
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)
OFF1	34.1	15	1
OFF2	28.4	12	1
OFFW	29.4	7	<1
OFFD	26.4	9	<1
ON1D	10.2	15	3
*EXOF3	11.5	6	<1
CP1	N/A	37	2

*REFERENCED FROM THE DEER SPRINGS AND GRAND CANYON STUDY

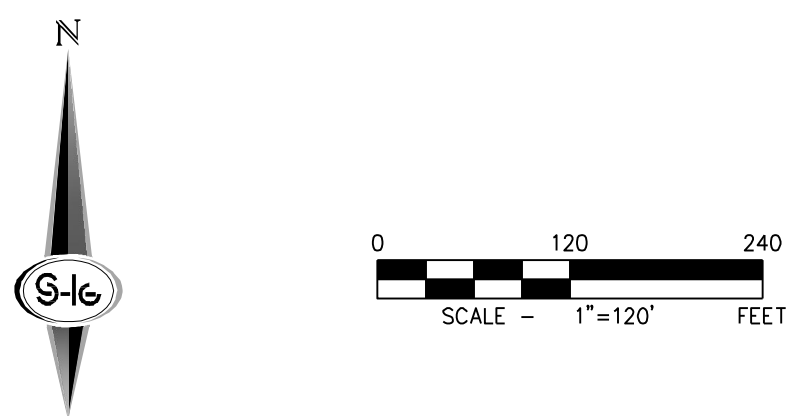
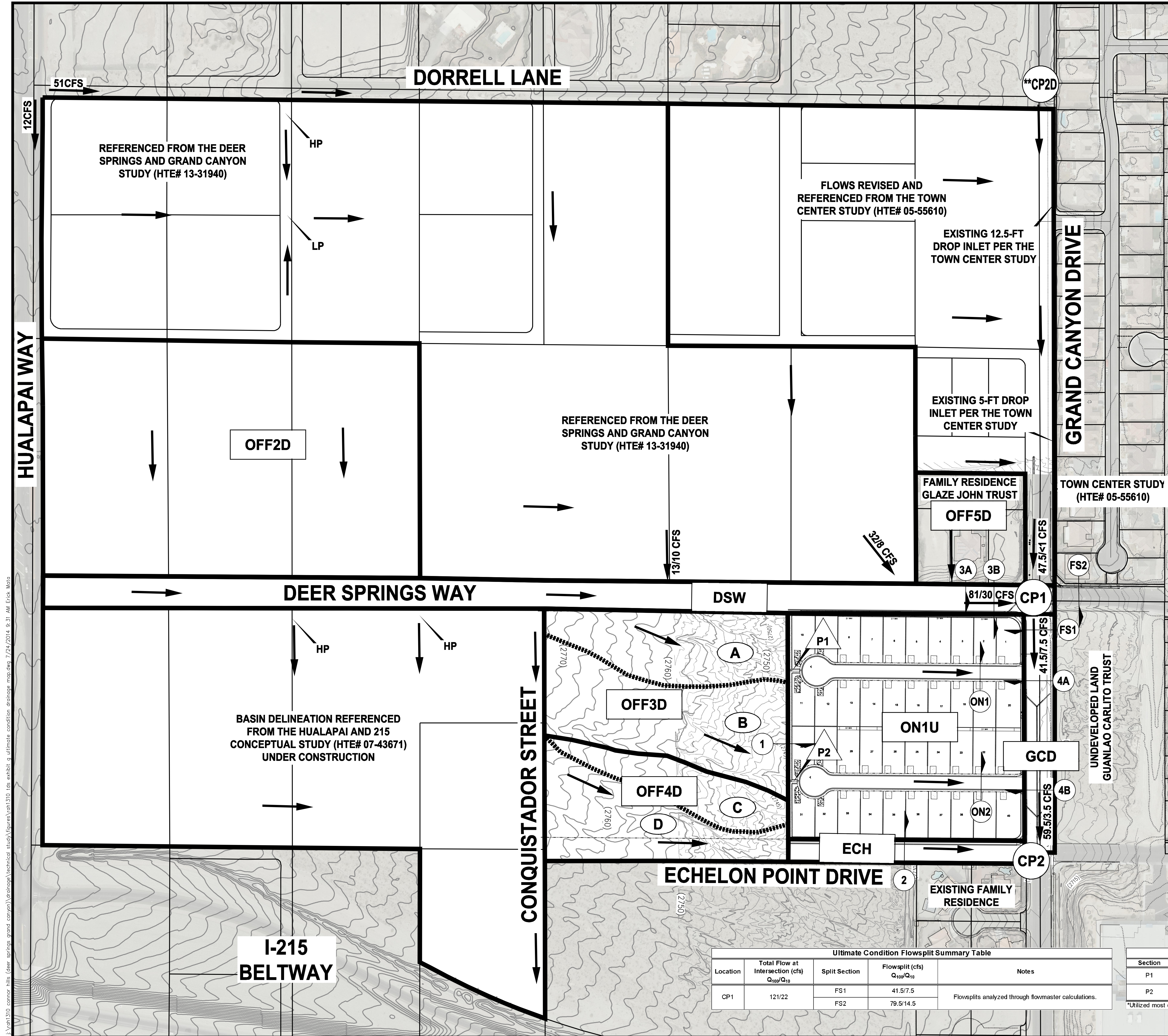
Interim Condition 100-Yr Prorated Flow Summary			
Basin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
OFF2	12	28.4	0.4
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
A	8	19.6	0.4
B	3	7.3	0.4
C	1	1.5	0.4
TOTAL	12	28.4	

* NOTE ALL OFFSITE FLOWS GENERATED IN THE INTERIM CONDITION ARE LOWER THAN THOSE IN THE ULTIMATE CONDITION. THEREFORE, ALL ANALYSES WERE MADE UTILIZING ULTIMATE CONDITION FLOW PARAMETERS.

NO.	DESCRIPTION	DATE	BY	APP. DATE

RICHMOND AMERICAN HOMES
CONNOR HILLS
INTERIM CONDITION DRAINAGE MAP

DATE:	JULY 2014
DRAFTER:	ETM
DESIGNER:	ETM
CHECKED:	SOA
PROJECT NO.	RAH1310.000



LEGEND	
	BASIN BOUNDARY
	BASIN ID
	FLOW DIRECTION
	CONCENTRATION POINT
	FLOWMASTER SECTION
	FACILITY ID

Ultimate Condition Flow Rate Summary			
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)
OFF2D	14.3	21.0	4.0
OFF3D	5.9	17.0	7.0
OFF4D	3.9	12.0	5.0
OFF5D	2.0	<1.0	<1.0
ON1U	8.6	12.0	3.0
GCD	1.2	5.0	2.0
DSW	4.9	17.0	9.0
ECH	0.9	4.0	2.0
**CP2D	N/A	68.0	<1.0
CP1 (OFF2D + DSW + *13/10CFS + *32/8CFS + OFF3D + OFF4D + *47.5/1CFS - 8CFS PROPOSED DI)	N/A	121.0	22.0
CP2 (41.5/7.5CFS FLOWSPLIT + OFF3D + OFF4D + ON1U + GCD + ECH - 16CFS PROPOSED DIS)	N/A	75.5	10.5

*REFERENCED FROM THE DEER SPRINGS GRAND CANYON STUDY
**REFERENCED FROM THE TOWN CENTER STUDY

Ultimate Condition 100-Yr Prorated Flow Summary			
Basin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
OFF3D	17	5.9	2.9
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
A	7	2.4	2.9
B	10	3.5	2.9
TOTAL	17	5.9	
Basin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
OFF4D	12	3.9	3.1
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
C	4	1.4	3.1
D	8	2.5	3.1
TOTAL	12	3.9	

Ultimate Condition 10-Yr Prorated Flow Summary			
Basin	Q ₁₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
OFF3D	7	5.9	1.2
Subbasin	Q ₁₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
A	3	2.4	1.2
B	4	3.5	1.2
TOTAL	7	5.9	

Ultimate Condition 100-Year Hydraulic Summary Table					
Cross Section	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	DxV
ON1 (Q = OFF3D-A + ON1U2)	3.64	13.0	0.35	5.10	1.79
ON2 (Q = OFF3D-B + ON1U2)	3.43	16.0	0.38	5.17	1.96
RATING TABLE PROVIDED					
1 (Q = OFF4D + ECH)	3.55	16.0	0.38	5.23	1.99
HALF STREET CAPACITY SECTION					
3B (Q = OFF2D + DSW + *13CFS + *32CFS + OFF5D)	2.98	81.0	0.62	6.29	3.90
4A (Q = 41.5CFS FLOWSPLIT + OFF3D-A + ON1U2)	0.86	54.5	0.66	3.51	2.32
4B (Q = OFF3D-B + ON1U2 + GCD + 46.5CFS SECTION 4A BYPASS)	0.86	67.5	0.70	3.67	2.57

*REFERENCED FROM THE DEER SPRINGS AND GRAND CANYON STUDY

Ultimate Condition 10-Year Street Flow Summary					
Cross Section	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	Dry Lane (ft)
3B (Q = CP1 + 8CFS COLLECTED)	2.98	30.0	0.46	5.4	15.5
4A (Q = 7.5CFS FLOWSPLIT + OFF3D-A + ON1U2)	0.86	12.0	0.43	2.8	17.0
4B (Q = OFF3D-B + ON1U2 + GCD + 4CFS SECTION 4A BYPASS)	0.86	11.5	0.42	2.7	17.5

Ultimate Condition Flowsplit Summary Table				
Location	Total Flow at Intersection (cfs) Q ₁₀₀ /Q ₁₀	Split Section	Flowsplit (cfs) Q ₁₀₀ /Q ₁₀	Notes
CP1	121/22	FS1	41.5/7.5	Flowsplits analyzed through flowmaster calculations.
		FS2	79.5/14.5	

Ultimate Condition Drainage Easement Hydraulic Summary				
Section	Flow (cfs)	Width (ft)	Type of Analysis	Depth (ft)
P1	*10	10	Normal Depth	7.19
			Weir	N/A
P2	*10	10	Normal Depth	5.26
			Weir	N/A

*Utilized most conservative flow.

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SLATER
HANIFAN
GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89148

PHONE (702) 264-5300

APP. DATE

BY

DATE

DESCRIPTION

NO.

RICHMOND AMERICAN HOMES

CONNOR HILLS

ULTIMATE CONDITION DRAINAGE MAP

DATE: JULY 2014

DRAFTER: ETM

DESIGNER: ETM

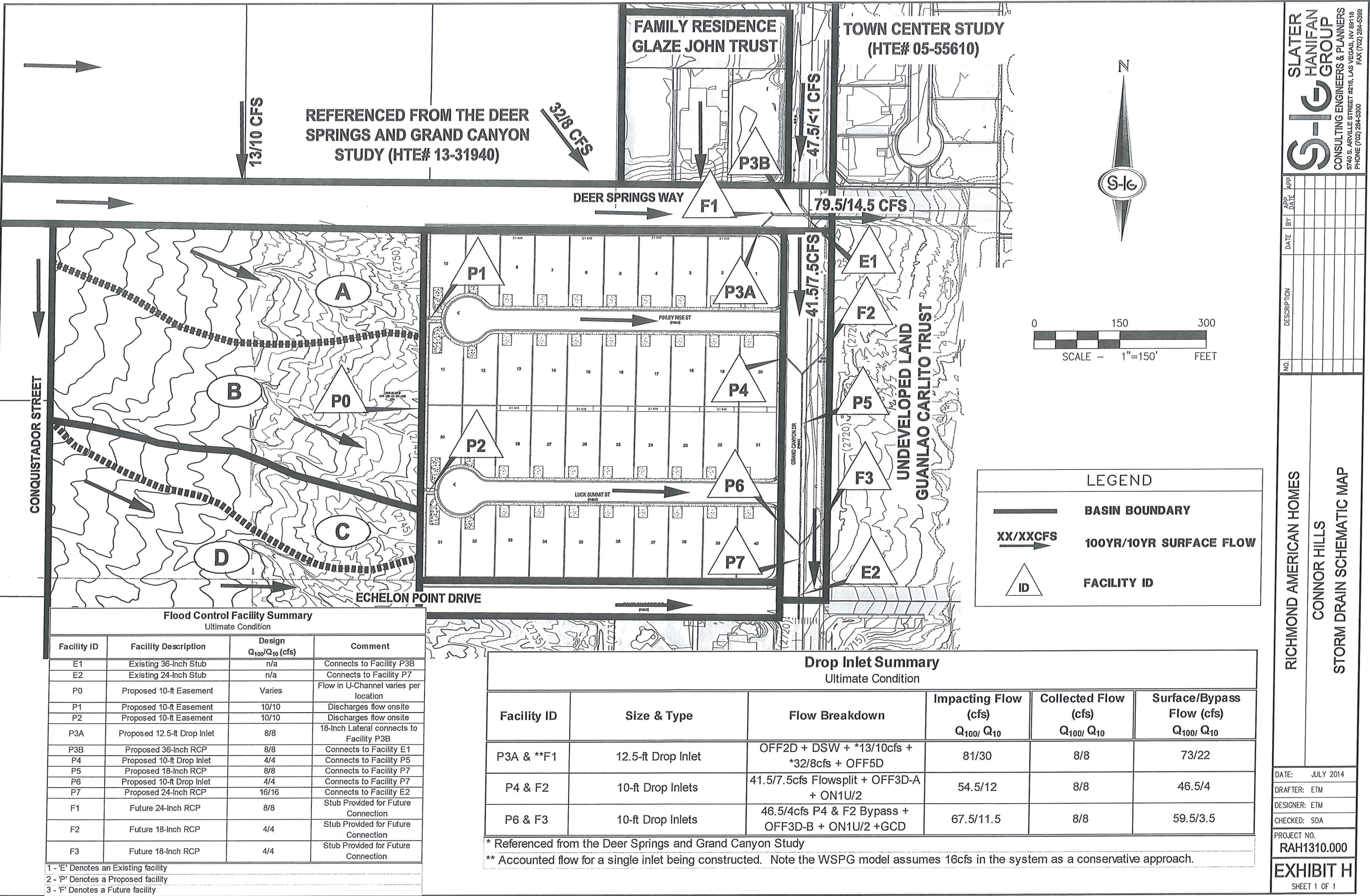
CHECKED: SOA

PROJECT NO.
RAH1310.000

EXHIBIT G

SHEET 1 OF 1

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APPENDIX B

Precipitation, Curve Number & Lag Time Data

Precipitation

Rainfall and Precipitation Computation

Project Name: Connor Hills

Date: 6/19/2014

File Name: RAH1310 Precipitation Calcs.xls

By: ETM

Data:

Project is located in: Township: 19 S. Range: 60 E. Section: 19

Reference:

APN Map

Site is NOT located in the McCarran Airport Rainfall Area

Figure 513*

Rainfall Depth-Duration-Frequency 10-Year, 6-Hour: 1.30 inches

Figure 503*

Rainfall Depth-Duration-Frequency 100-Year, 6-Hour: 2.10 inches

Figure 506*

Precipitation Adjustment Ratios:

10-Year: 1.24

Table 501*

100-Year: 1.43

Table 501*

Six Hour Depth Area Reduction Factors (DARF):

Area (gross acres): 10.0 = 0.0156 square miles

Table 502*

DARF = 1.00

Calculations:

$P_{10} = 1.61$ 10-Year Precipitation (in)

$P_{100} = 3.00$ 100-Year Precipitation (in)

$P_{10}/P_{100} = 0.54$ HEC-1 Multiple Ratio Value

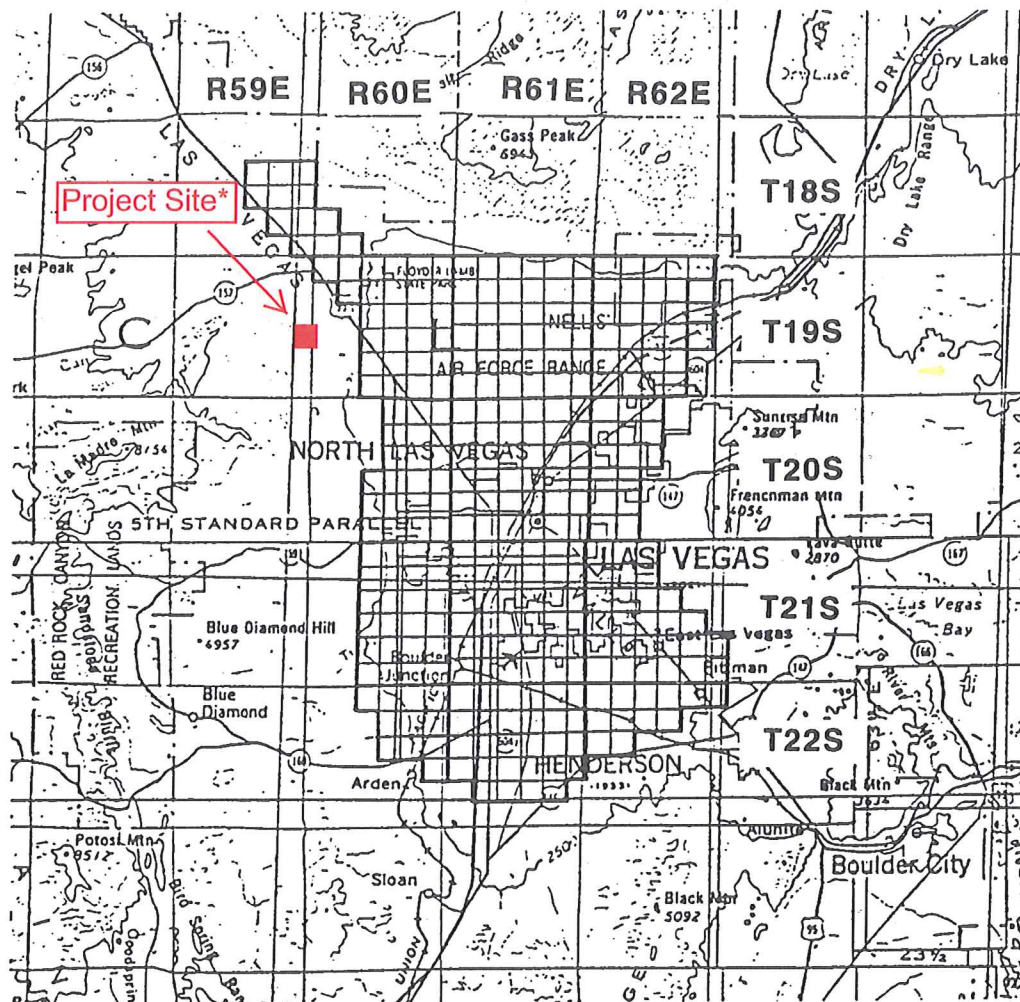
Equations:

$P = (\text{Rainfall}) * (\text{Precipitation Adjustment Ratio}) * (\text{Depth Area Reduction Factor})$

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage De

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



*Project site not located within the McCarran Rainfall area (T19-R60-S19)

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

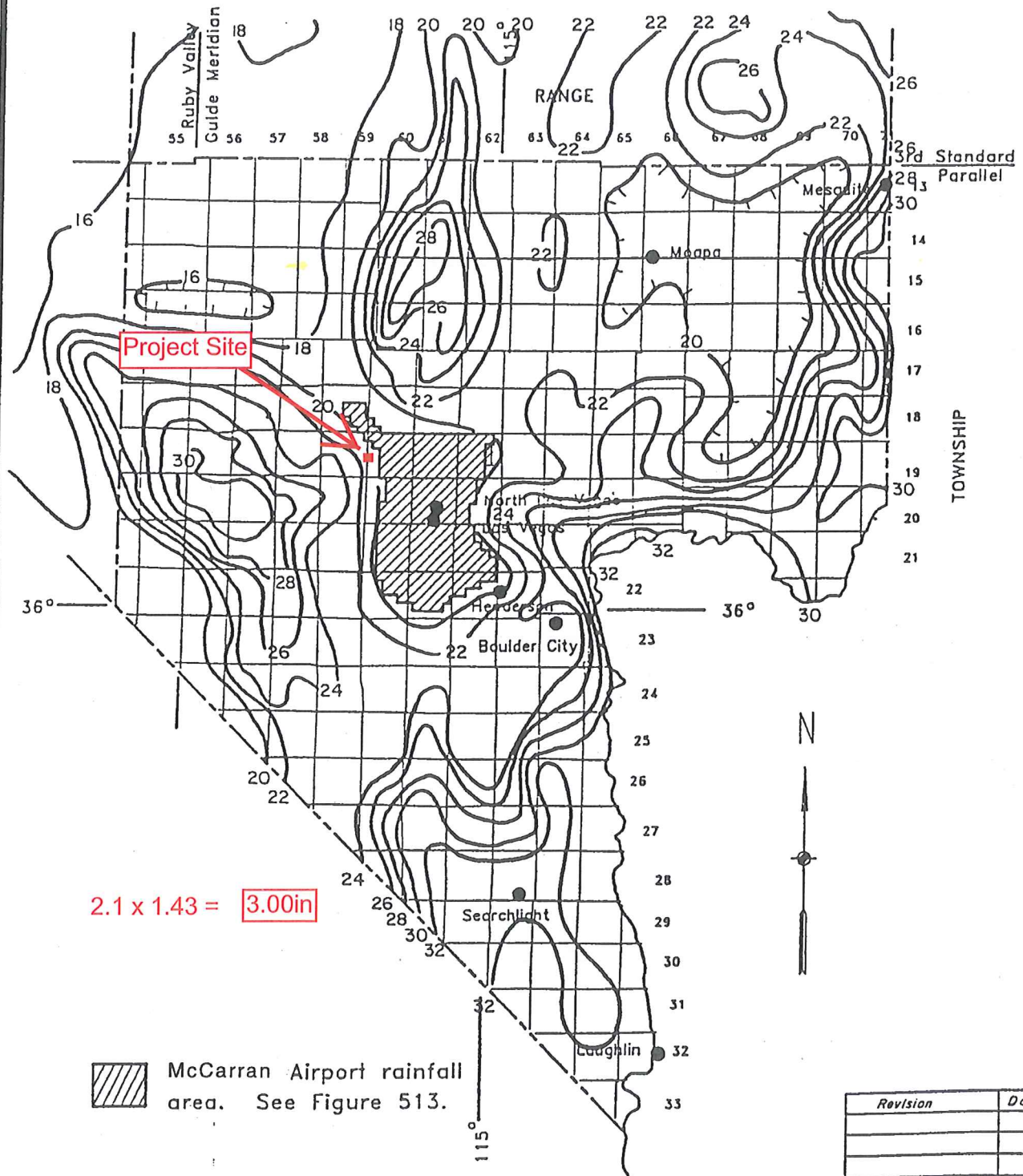
Notes:

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

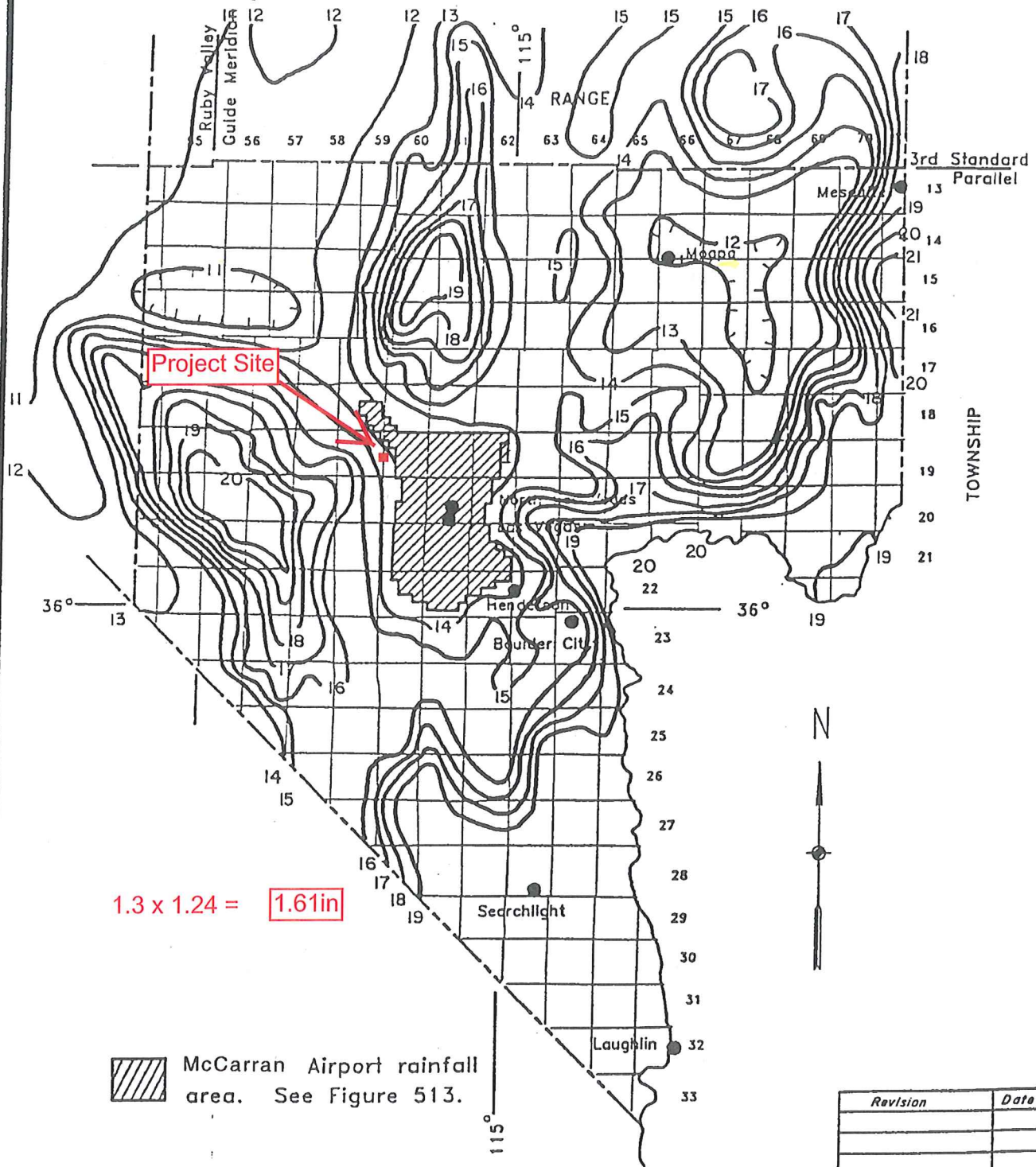
HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RAINFALL DEPTH-DURATION-FREQUENCY 100-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RAINFALL DEPTH-DURATION-FREQUENCY 10-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

PRECIPITATION ADJUSTMENT RATIOS

<u>Recurrence Interval</u>	<u>Ratio to NOAA Atlas 2</u>
2-year	1.00
5-year	1.16
10-year	1.24
25-year	1.33
50-year	1.39
100-year	1.43

- NOTE: 1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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>

**WRC
ENGINEERING**

REFERENCE:

USACE, Los Angeles District, 1988

TABLE 502

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

Curve Number

Data:

Reference:

Soil Type & Description	A	B	C	D
191 Dalian very cobbly fine sandy loam, 2 to 8 percent slopes	100%	0%	0%	0%

Exhibit D
SCS Soil Data

Land Use	A	B	C	D
Desert Shrub (poor)	63	77	85	88
Residential (7,000 sf)	76	84	89	91
Residential (<6,000 sf)	89	92	94	95
Residential (80,000 sf)	46	65	77	82
Roadway	98	98	98	98

EXISTING CONDITION

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFF1	191	100.0%	Desert Shrub (poor)	100%	0%	0%	0%	63	77	85	88	34.1	63.00
TOTAL PERCENT		100.0%						TOTAL AREA				34.1	63.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFF2	191	100.0%	Desert Shrub (poor)	100%	0%	0%	0%	63	77	85	88	28.4	63.00
TOTAL PERCENT		100.0%						TOTAL AREA				28.4	63.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFFW	191	48.5%	Desert Shrub (poor)	100%	0%	0%	0%	63	77	85	88	14.3	30.56
	191	51.5%	Residential (20,000 sf)	100%	0%	0%	0%	54	70	80	85	15.1	27.81
TOTAL PERCENT		100.0%						TOTAL AREA				29.4	58.37

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFFD	191	70.1%	Desert Shrub (poor)	100%	0%	0%	0%	63	77	85	88	18.5	44.16
	191	29.9%	Residential (20,000 sf)	100%	0%	0%	0%	54	70	80	85	7.9	16.14
TOTAL PERCENT		100.0%						TOTAL AREA				26.4	60.31

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
ON1E	191	100.0%	Desert Shrub (poor)	100%	0%	0%	0%	63	77	85	88	10.2	63.00
TOTAL PERCENT		100.0%						TOTAL AREA				10.2	63.00

INTERIM CONDITION

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
ON1D	191	100.0%	Residential (7,000 sf)	100%	0%	0%	0%	76	84	89	91	10.2	76.00
TOTAL PERCENT		100.0%						TOTAL AREA				10.2	76.00

ULTIMATE CONDITION

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
ON1U	191	100.0%	Residential (7,000 sf)	100%	0%	0%	0%	76	84	89	91	8.6	76.00
TOTAL PERCENT		100.0%						TOTAL AREA				8.6	76.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFF2D	191	100.0%	Residential (7,000 sf)	100%	0%	0%	0%	76	84	89	91	14.3	76.00
TOTAL PERCENT		100.0%						TOTAL AREA				14.3	76.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFF3D	191	100.0%	Residential (<6,000 sf)	100%	0%	0%	0%	89	92	94	95	5.9	89.00
TOTAL PERCENT		100.0%						TOTAL AREA				5.9	89.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFF4D	191	100.0%	Residential (<6,000 sf)	100%	0%	0%	0%	89	92	94	95	3.9	89.00
TOTAL PERCENT		100.0%						TOTAL AREA				3.9	89.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
OFF5D	191	100.0%	Residential (80,000 sf)	100%	0%	0%	0%	46	65	77	82	2.0	46.00
TOTAL PERCENT		100.0%						TOTAL AREA				2.0	46.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
GCD	191	100.0%	Roadway	100%	0%	0%	0%	98	98	98	98	1.2	98.00
TOTAL PERCENT		100.0%						TOTAL AREA				1.2	98.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
DSW	191	100.0%	Roadway	100%	0%	0%	0%	98	98	98	98	4.9	98.00
TOTAL PERCENT		100.0%						TOTAL AREA				4.9	98.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATE D CN
				A	B	C	D	A	B	C	D		
ECH	191	100.0%	Roadway	100%	0%	0%	0%	98	98	98	98	0.9	98.00
TOTAL PERCENT		100.0%						TOTAL AREA				0.9	98.00



United States
Department of
Agriculture

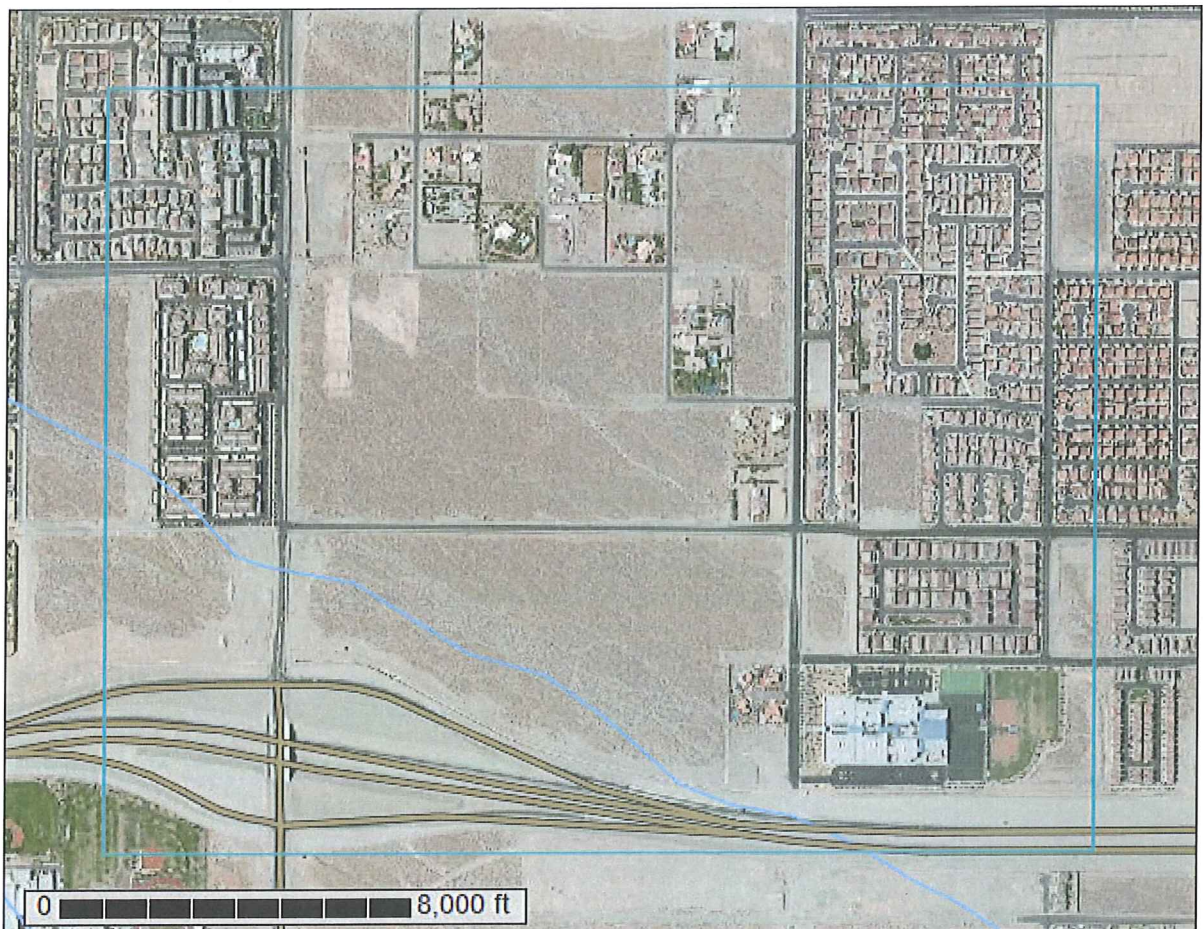
NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Las Vegas Valley Area, Nevada, Part of Clark County

Connor Hills



June 17, 2014

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features (Connor Hills)

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

Water Features—Las Vegas Valley Area, Nevada, Part of Clark County										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>	<i>Ft</i>				
191—Dalian very cobbly fine sandy loam, 2 to 8 percent slopes										
Dalian	A	Low	Jan-Dec	—	—	—	—	None	—	None
400—Tencee very gravelly fine sandy loam, 2 to 8 percent slopes										
Tencee	D	Very high	Jan-Dec	—	—	—	—	None	—	None

Lag Time Data

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Project Name: Connor Hills
 Description:
 File Name: RAH1310 Lag Time Standard Form 4.xls
 By: ETM
 Date: 7/15/2014

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag		
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA MI ²	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min	Tc Calc.	Total Length Feet	Tc Check	Tlag Hours
			[1]		[2]			[3]			[4]	[5]	[6]	[7]	[8]	[9]	[10]

EXISTING CONDITION

OFF1	E	63.0	0.442	34.1	0.0533	431	3.25	16.61	2203	3.50	2.77	5.50	8.17	24.78			0.248
OFF2	E	63.0	0.442	28.4	0.0444	290	2.07	15.84	2143	3.60	2.81	5.58	7.88	23.71			0.237
OFFW	D	58.4	0.380	29.4	0.0459	300	1.33	20.40	2725	3.30	3.67	5.56	8.94	29.34	3025	26.806	0.268
OFFD	D	60.3	0.406	26.4	0.0413	150	2.67	11.03	2380	2.89	3.43	5.20	8.45	19.48	2530	24.056	0.195
ON1E	E	63.0	0.442	10.2	0.0159	65	3.10	6.55	1039	2.40	2.29	4.55	5.61	12.16			0.122

INTERIM CONDITION

ON1D	D	76.0	0.613	10.2	0.0159	120	1.00	9.60	1039	3.64	3.85	5.84	3.70	13.30	1159	16.439	0.133
------	---	------	-------	------	--------	-----	------	------	------	------	------	------	------	-------	------	--------	-------

ULTIMATE CONDITION

ON1U	D	76.0	0.613	8.6	0.0134	120	1.00	9.60	1039	3.64	3.85	5.84	3.70	13.30	1159	16.439	0.133
OFF2D	D	76.0	0.613	14.3	0.0223	214	3.30	8.61	865	3.50	3.78	5.72	3.27	11.88	1079	15.994	0.119
OFF3D	D	89.0	0.785	5.9	0.0092	170	2.35	5.56	664	3.60	3.83	5.81	2.65	8.21	834	14.633	0.082
OFF4D	D	89.0	0.785	3.9	0.0061	80	3.70	3.28	476	3.78	3.93	5.95	2.02	5.30	556	13.089	0.053
OFF5D	D	46.0	0.217	2.0	0.0031	93	1.00	15.32	192	1.00	2.02	3.06	1.58	16.91	285	11.583	0.116
GCD	D	98.0	0.904	1.2	0.0019	30	2.00	1.54	617	1.00	2.02	3.06	4.76	6.30	647	13.594	0.063
DSW	D	98.0	0.904	4.9	0.0077	30	2.00	1.54	2630	3.85	3.96	6.00	8.02	9.55	2660	24.778	0.096
ECH	D	98.0	0.904	0.9	0.0014	20	2.00	1.25	628	3.58	3.82	5.79	2.55	3.80	648	13.600	0.050

- [1] $K = 0.0132 (CN) - 0.39$ [5] For Existing Conditions: $V2 = 29.4 * (S/100)^{0.5}$ [9] $Tc = (L/180) + 10$
 [2] $A = Area/640$ For Developed Conditions: $V2 = 30.6 * (S/100)^{0.5}$ [10] $Tlag = (0.6 * Tc)/60$
 [3] $Ti = (1.8 * (1.1 - K) * L^{0.5}) / S^{0.33}$ [6] $Tt = L / (60 * V)$ [11] Min Tlag = 0.05
 [4] For Existing Conditions: $V1 = 14.8 * (S/100)^{0.5}$ [7] $Tc = Ti + Tt$ Note: For Travel Time Calcs: V1 applies to first
 For Developed Conditions: $V1 = 20.2 * (S/100)^{0.5}$ [8] Total L = Initial L + Travel L 500 feet and V2 applies to remaining distance.

REFERENCE :

STANDARD FORM 4

APPENDIX C

Hydrologic Analyses

Existing Condition HEC-1 Analysis


```

*****
*
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*
* JUN 1998
*
* VERSION 4.1
*
*
* RUN DATE 15JUL14 TIME 15:17:31
*
*
*****
*****

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

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

```

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

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

1

HEC-1 INPUT

PAGE 1

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*DIAGRAM
1 ID SLATER HANIFAN GROUP
2 ID CONNOR HILLS
3 ID RICHMOND AMERICAN HOMES
4 ID EXISTING CONDITION
5 ID
6 ID RETURN PERIOD ----- 100-YR & 10-YR
7 ID DISTRIBUTION ----- 6-HOUR SDN3
8 ID PROJECT NO. ----- RAH1310.000
9 ID FILENAME ----- EX.H1
10 ID DATE ----- 07/15/2014
11 ID MODELED BY ----- ETM
12 ID
13 ID PRECIPITATION STORM EVENT RATIOS
14 ID STORM EVENT RATIO
15 ID 100-YR 1.00
16 ID 10-YR 0.54
17 ID
18 IT 5 0 0 300
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 1.00 0.54
*
22 KK OFF1
23 KM UNDEVELOPED OFFSITE BASIN
24 BA 0.0533
25 PB 3.00
26 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
27 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
28 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
29 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
30 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
31 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
32 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
33 PC 0.998 0.999 1
34 LS 0 63.0
35 UD 0.248
*
36 KK OFF2
37 KM UNDEVELOPED OFFSITE BASIN
38 BA .0444
39 LS 0 63.0
40 UD 0.237
*
41 KK OFFW
42 KM OFFSITE BASIN
43 BA .0459
44 LS 0 58.4
45 UD 0.268
*

```

1

HEC-1 INPUT

PAGE 2

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
46 KK OFFD
47 KM OFFSITE BASIN
48 BA .0413
49 LS 0 60.3
50 UD 0.195
*

```


EX.OUT
51 KK ON1E
52 KM UNDEVELOPED ONSITE BASIN
53 BA .0159
54 LS 0 63.0
55 UD 0.122
*
56 ZZ

1 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
22 OFF1
*
36 OFF2
*
41 OFFW
*
46 OFFD
*
51 ON1E

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****

* * *

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *

* JUN 1998 *

* VERSION 4.1 *

* RUN DATE 15JUL14 TIME 15:17:31 *

* * *

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*

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*

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*

*

*

SLATER HANIFAN GROUP
CONNOR HILLS
RICHMOND AMERICAN HOMES
EXISTING CONDITION

RETURN PERIOD ----- 100-YR & 10-YR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- RAH1310.000
FILENAME ----- EX.H1
DATE ----- 07/15/2014
MODELED BY ----- ETM

PRECIPITATION STORM EVENT RATIOS
STORM EVENT RATIO
100-YR 1.00
10-YR 0.54

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

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

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .54

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

OPERATION STATION AREA PLAN RATIOS APPLIED TO PRECIPITATION
RATIO 1 RATIO 2
1.00 .54
Page 2

					EX.OUT	
HYDROGRAPH AT						
+	OFF1	.05	1	FLOW TIME	15. 3.75	1. 5.00
HYDROGRAPH AT						
+	OFF2	.04	1	FLOW TIME	12. 3.75	1. 4.92
HYDROGRAPH AT						
+	OFFW	.05	1	FLOW TIME	7. 3.83	0. 5.08
HYDROGRAPH AT						
+	OFFD	.04	1	FLOW TIME	9. 3.75	0. 4.92
HYDROGRAPH AT						
+	ON1E	.02	1	FLOW TIME	6. 3.58	0. 4.92

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

Interim Condition HEC-1 Analysis

INT.OUT

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1*****
*****
*
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*
* JUN 1998
*
* VERSION 4.1
*
*
* RUN DATE 15JUL14 TIME 14:17:40
*
*
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* HYDROLOGIC ENGINEERING CENTER
*
* 609 SECOND STREET
*
* DAVIS, CALIFORNIA 95616
*
* (916) 756-1104
*

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X X XXXXXX XXXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX XXXX X
X X X X X X
X X X X X X
X X XXXXXX 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 SLATER HANIFAN GROUP
2 ID CONNOR HILLS
3 ID RICHMOND AMERICAN HOMES
4 ID INTERIM CONDITION
5 ID
6 ID RETURN PERIOD ----- 100-YR & 10-YR
7 ID DISTRIBUTION ----- 6-HOUR SDN3
8 ID PROJECT NO. ----- RAH1310.000
9 ID FILENAME ----- INT.H1
10 ID DATE ----- 07/15/2014
11 ID MODELED BY ----- ETM
12 ID
13 ID PRECIPITATION STORM EVENT RATIOS
14 ID STORM EVENT RATIO
15 ID 100-YR 1.00
16 ID 10-YR 0.54
17 ID
18 IT 5 0 0 300
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 1.00 0.54
*
22 KK OFF1
23 KM UNDEVELOPED OFFSITE BASIN
24 BA 0.0533
25 PB 3.00
26 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130
27 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
28 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
29 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
30 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
31 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
32 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
33 PC 0.998 0.999 1
34 LS 0 63.0
35 UD 0.248
*
36 KK OFF2
37 KM UNDEVELOPED OFFSITE BASIN
38 BA .0444
39 LS 0 63.0
40 UD 0.237
*
41 KK OFFW
42 KM OFFSITE BASIN
43 BA .0459
44 LS 0 58.4
45 UD 0.268
*

```

1

HEC-1 INPUT

PAGE 2

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
46 KK OFFD
47 KM OFFSITE BASIN
48 BA .0413
49 LS 0 60.3
50 UD 0.195
*

```

INT.OUT

51	KK	ON1D	
52	KM	DEVELOPED ONSITE BASIN	
53	BA	.0159	
54	LS	0	76.0
55	UD	0.133	
	*		
56	ZZ		

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

22 OFF1

36 OFF2

41 OFFW

46 OFFD

51 ON1D

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

FLOOD HYDROGRAPH PACKAGE (HEC-1)

JUN 1998

VERSION 4.1

RUN DATE 15JUL14 TIME 14:17:40

U.S. ARMY CORPS OF ENGINEERS

HYDROLOGIC ENGINEERING CENTER

609 SECOND STREET

DAVIS, CALIFORNIA 95616

(916) 756-1104

SLATER HANIFAN GROUP

CONNOR HILLS

RICHMOND AMERICAN HOMES

INTERIM CONDITION

RETURN PERIOD ----- 100-YR & 10-YR

DISTRIBUTION ----- 6-HOUR SDN3

PROJECT NO. ----- RAH1310.000

FILENAME ----- INT.H1

DATE ----- 07/15/2014

MODELED BY ----- ETM

PRECIPITATION STORM EVENT RATIOS

STORM EVENT	RATIO
100-YR	1.00
10-YR	0.54

19 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

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

COMPUTATION INTERVAL .08 HOURS

TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

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

JP MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION

RATIOS OF PRECIPITATION

1.00 .54

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

FLOW IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES

TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2
				1.00	.54

Page 2

					INT.OUT	
HYDROGRAPH AT						
+	OFF1	.05	1	FLOW TIME	15. 3.75	1. 5.00
HYDROGRAPH AT						
+	OFF2	.04	1	FLOW TIME	12. 3.75	1. 4.92
HYDROGRAPH AT						
+	OFFW	.05	1	FLOW TIME	7. 3.83	0. 5.08
HYDROGRAPH AT						
+	OFFD	.04	1	FLOW TIME	9. 3.75	0. 4.92
HYDROGRAPH AT						
+	ON1D	.02	1	FLOW TIME	15. 3.58	3. 3.58

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

Ultimate Condition HEC-1 Analysis

ULT.OUT

```

1*****
*****
*
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*
* JUN 1998 *
*
* VERSION 4.1 *
*
* RUN DATE 10JUL14 TIME 09:46:24 *
*
*
*****
*****

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

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X X XXXXXX XXXX X
X X X X X
X X X X X
XXXXXX XXXX XXXX
X X X X X
X X X X X
X X XXXXXX XXXX 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 -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,

DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*DIAGRAM
ID SLATER HANIFAN GROUP
ID CONNOR HILLS
ID RICHMOND AMERICAN HOMES
ID ULTIMATE CONDITION
ID
ID RETURN PERIOD ----- 100-YR & 10-YR
ID DISTRIBUTION ----- 6-HOUR SDN3
ID PROJECT NO. ----- RAH1310.000
ID FILENAME ----- ULT.H1
ID DATE ----- 07/10/2014
ID MODELED BY ----- ETM
ID
ID PRECIPITATION STORM EVENT RATIOS
ID STORM EVENT RATIO
ID 100-YR 1.00
ID 10-YR 0.54
ID
ID IT 5 0 0 300
ID IO 5 0 0
ID IN 5 0 0
ID JR PREC 1.00 0.54
*
22 KK OFF2D
23 KM DEVELOPED OFFSITE BASIN
24 BA 0.0223
25 PB 3.00
26 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
27 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
28 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
29 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
30 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
31 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
32 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
33 PC 0.998 0.999 1
34 LS 0 76.0
35 UD 0.119
*
36 KK DSW
37 KM DEVELOPED DEER SPRINGS ROADWAY
38 BA .0077
39 LS 0 98.0
40 UD 0.096
*
41 KK OFF5D
42 KM DEVELOPED OFFSITE BASIN
43 BA .0031
44 LS 0 46.0
45 UD 0.116
*

```

1

HEC-1 INPUT

PAGE 2

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
46 KK CP1
47 KM COMBINES OFF2D, DSW AND OFF5D
48 HC 3
*
49 KK OFF3D
50 KM DEVELOPED OFFSITE BASIN

```

ULT.OUT

51	BA	.0092	
52	LS	0	89.0
53	UD	0.082	
	*		
54	KK	OFF4D	
55	KM	DEVELOPED OFFSITE BASIN	
56	BA	.0061	
57	LS	0	89.0
58	UD	0.053	
	*		
59	KK	ONIU	
60	KM	DEVELOPED ONSITE BASIN	
61	BA	.0134	
62	LS	0	76.0
63	UD	0.133	
	*		
64	KK	GCD	
65	KM	DEVELOPED GRAND CANYON ROADWAY	
66	BA	.0019	
67	LS	0	98.0
68	UD	0.063	
	*		
69	KK	ECH	
70	KM	DEVELOPED ECHELON ROADWAY	
71	BA	.0014	
72	LS	0	98.0
73	UD	0.050	
	*		
74	KK	CP2	
75	KM	COMBINES OFF3D, OFF4D, ON1D, GCD AND ECH	
76	HC	5	
	*		
77	ZZ		

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
 NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

```

22 OFF2D
  .
  .
36 . DSW
  .
41 . OFF5D
  .
46 CP1.....
  .
49 . OFF3D
  .
54 . OFF4D
  .
59 . ONIU
  .
64 . GCD
  .
69 . ECH
  .
74 . CP2.....
  .
  
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

 *
 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 *
 * RUN DATE 10JUL14 TIME 09:46:24 *
 *

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

SLATER HANIFAN GROUP
 CONNOR HILLS
 RICHMOND AMERICAN HOMES
 ULTIMATE CONDITION

RETURN PERIOD ----- 100-YR & 10-YR
 DISTRIBUTION ----- 6-HOUR SDN3
 PROJECT NO. ----- RAH1310.000
 FILENAME ----- ULT.H1
 DATE ----- 07/10/2014
 MODELED BY ----- ETM

PRECIPITATION STORM EVENT RATIOS
 STORM EVENT RATIO

21CFS/22
 CFS

9.5CFS

APPENDIX D

FlowMaster Hydraulic Computations

SECTION ON1 (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION ON1 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.64 %
Discharge	13.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.35 ft
Elevation Range	0.00 to 0.60
Flow Area	2.5 ft ²
Wetted Perimeter	22.15 ft
Top Width	21.34 ft
Actual Depth	0.35 ft
Critical Elevation	0.46 ft
Critical Slope	0.46 %
Velocity	5.10 ft/s
Velocity Head	0.40 ft
Specific Energy	0.76 ft
Froude Number	2.60
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+07.0	0.013
0+07.0	0+40.0	0.016
0+40.0	0+47.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.60
0+05.0	0.50
0+05.5	0.48
0+05.5	0.00
0+07.0	0.13
0+07.0	0.17
0+23.5	0.50
0+40.0	0.17
0+40.0	0.13

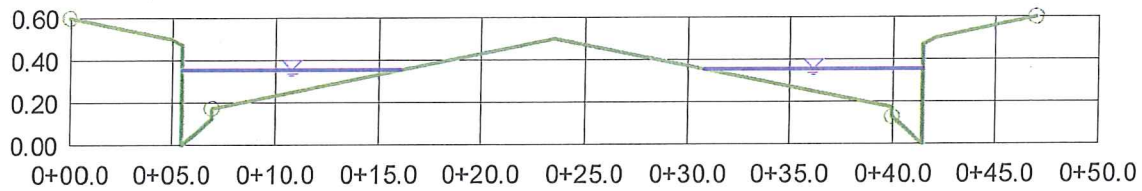
SECTION ON1 (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+41.5	0.00
0+41.5	0.48
0+42.0	0.50
0+47.0	0.60

SECTION ON1 (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION ON1 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.64 %
Water Surface Elevation	0.35 ft
Elevation Range	0.00 to 0.60
Discharge	13.00 cfs



V:10.0
H:1
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SECTION ON2 (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION ON2 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.43 %
Discharge	16.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.38 ft
Elevation Range	0.00 to 0.60
Flow Area	3.1 ft ²
Wetted Perimeter	24.63 ft
Top Width	23.78 ft
Actual Depth	0.38 ft
Critical Elevation	0.50 ft
Critical Slope	0.48 %
Velocity	5.17 ft/s
Velocity Head	0.41 ft
Specific Energy	0.79 ft
Froude Number	2.52
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

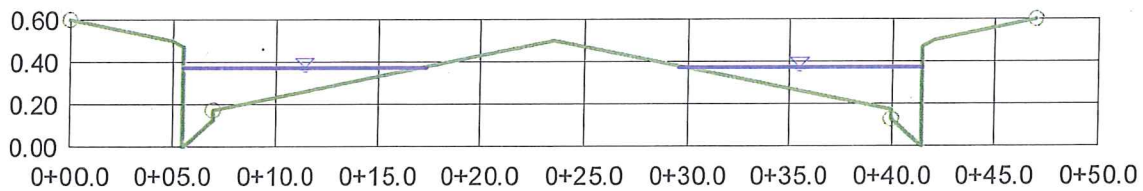
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+07.0	0.013
0+07.0	0+40.0	0.016
0+40.0	0+47.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.60
0+05.0	0.50
0+05.5	0.48
0+05.5	0.00
0+07.0	0.13
0+07.0	0.17
0+23.5	0.50
0+40.0	0.17
0+40.0	0.13

SECTION ON2 (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION ON2 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.43 %
Water Surface Elevation	0.38 ft
Elevation Range	0.00 to 0.60
Discharge	16.00 cfs



V:10.0
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Offsite Perimeter Street Calculations

Section 1 (100-YR) Rating Table

Rating Table for Irregular Channel

Project Description	
Worksheet	Section 1 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (%)	0.50	2.00	0.10
Discharge (cfs)	4.00	12.00	1.00

Channel Slope (%)	Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.50	4.00	0.30	3.31	1.2	4.60	4.00
0.60	4.00	0.29	3.51	1.1	4.57	4.00
0.70	4.00	0.27	3.68	1.1	4.54	4.00
0.80	4.00	0.26	3.84	1.0	4.52	4.00
0.90	4.00	0.25	3.99	1.0	4.50	4.00
1.00	4.00	0.24	4.12	1.0	4.49	4.00
1.10	4.00	0.24	4.25	0.9	4.47	4.00
1.20	4.00	0.23	4.36	0.9	4.46	4.00
1.30	4.00	0.22	4.47	0.9	4.45	4.00
1.40	4.00	0.22	4.58	0.9	4.44	4.00
1.50	4.00	0.21	4.68	0.9	4.43	4.00
1.60	4.00	0.21	4.77	0.8	4.42	4.00
1.70	4.00	0.21	4.86	0.8	4.41	4.00
1.80	4.00	0.20	4.95	0.8	4.40	4.00
1.90	4.00	0.20	5.04	0.8	4.40	4.00
2.00	4.00	0.20	5.12	0.8	4.39	4.00
0.50	5.00	0.35	3.59	1.4	4.70	4.00
0.60	5.00	0.33	3.81	1.3	4.66	4.00
0.70	5.00	0.31	4.00	1.3	4.63	4.00
0.80	5.00	0.30	4.17	1.2	4.60	4.00
0.90	5.00	0.29	4.33	1.2	4.58	4.00
1.00	5.00	0.28	4.48	1.1	4.56	4.00
1.10	5.00	0.27	4.61	1.1	4.54	4.00
1.20	5.00	0.26	4.74	1.1	4.53	4.00
1.30	5.00	0.26	4.86	1.0	4.51	4.00
1.40	5.00	0.25	4.98	1.0	4.50	4.00
1.50	5.00	0.25	5.08	1.0	4.49	4.00
1.60	5.00	0.24	5.19	1.0	4.48	4.00
1.70	5.00	0.24	5.29	0.9	4.47	4.00
1.80	5.00	0.23	5.38	0.9	4.46	4.00
1.90	5.00	0.23	5.48	0.9	4.46	4.00
2.00	5.00	0.22	5.56	0.9	4.45	4.00
0.50	6.00	0.39	3.84	1.6	4.78	4.00
0.60	6.00	0.37	4.07	1.5	4.74	4.00
0.70	6.00	0.35	4.27	1.4	4.70	4.00
0.80	6.00	0.34	4.46	1.3	4.67	4.00

Section 1 (100-YR) Rating Table **Rating Table for Irregular Channel**

Channel Slope (%)	Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.90	6.00	0.32	4.63	1.3	4.65	4.00
1.00	6.00	0.31	4.79	1.3	4.63	4.00
1.10	6.00	0.30	4.93	1.2	4.61	4.00
1.20	6.00	0.30	5.07	1.2	4.59	4.00
1.30	6.00	0.29	5.20	1.2	4.58	4.00
1.40	6.00	0.28	5.32	1.1	4.56	4.00
1.50	6.00	0.28	5.44	1.1	4.55	4.00
1.60	6.00	0.27	5.55	1.1	4.54	4.00
1.70	6.00	0.27	5.66	1.1	4.53	4.00
1.80	6.00	0.26	5.76	1.0	4.52	4.00
1.90	6.00	0.26	5.86	1.0	4.51	4.00
2.00	6.00	0.25	5.96	1.0	4.50	4.00
0.50	7.00	0.43	4.05	1.7	4.86	4.00
0.60	7.00	0.41	4.30	1.6	4.81	4.00
0.70	7.00	0.39	4.52	1.5	4.77	4.00
0.80	7.00	0.37	4.71	1.5	4.74	4.00
0.90	7.00	0.36	4.89	1.4	4.72	4.00
1.00	7.00	0.35	5.06	1.4	4.69	4.00
1.10	7.00	0.34	5.22	1.3	4.67	4.00
1.20	7.00	0.33	5.36	1.3	4.65	4.00
1.30	7.00	0.32	5.50	1.3	4.64	4.00
1.40	7.00	0.31	5.63	1.2	4.62	4.00
1.50	7.00	0.30	5.76	1.2	4.61	4.00
1.60	7.00	0.30	5.88	1.2	4.60	4.00
1.70	7.00	0.29	5.99	1.2	4.58	4.00
1.80	7.00	0.29	6.10	1.1	4.57	4.00
1.90	7.00	0.28	6.21	1.1	4.56	4.00
2.00	7.00	0.28	6.31	1.1	4.55	4.00
0.50	8.00	0.47	4.25	1.9	4.94	4.00
0.60	8.00	0.44	4.51	1.8	4.89	4.00
0.70	8.00	0.42	4.74	1.7	4.84	4.00
0.80	8.00	0.40	4.95	1.6	4.81	4.00
0.90	8.00	0.39	5.14	1.6	4.78	4.00
1.00	8.00	0.38	5.31	1.5	4.75	4.00
1.10	8.00	0.37	5.48	1.5	4.73	4.00
1.20	8.00	0.36	5.63	1.4	4.71	4.00
1.30	8.00	0.35	5.78	1.4	4.69	4.00
1.40	8.00	0.34	5.91	1.4	4.68	4.00
1.50	8.00	0.33	6.05	1.3	4.66	4.00
1.60	8.00	0.32	6.17	1.3	4.65	4.00
1.70	8.00	0.32	6.29	1.3	4.64	4.00
1.80	8.00	0.31	6.41	1.2	4.62	4.00
1.90	8.00	0.31	6.52	1.2	4.61	4.00
2.00	8.00	0.30	6.62	1.2	4.60	4.00
0.50	9.00	0.51	4.43	2.0	5.02	4.00
0.60	9.00	0.48	4.70	1.9	4.96	4.00
0.70	9.00	0.46	4.94	1.8	4.91	4.00
0.80	9.00	0.44	5.16	1.7	4.87	4.00
0.90	9.00	0.42	5.36	1.7	4.84	4.00
1.00	9.00	0.41	5.54	1.6	4.81	4.00
1.10	9.00	0.39	5.71	1.6	4.79	4.00
1.20	9.00	0.38	5.88	1.5	4.77	4.00
1.30	9.00	0.37	6.03	1.5	4.75	4.00

Section 1 (100-YR) Rating Table
Rating Table for Irregular Channel

Channel Slope (%)	Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
1.40	9.00	0.36	6.17	1.5	4.73	4.00
1.50	9.00	0.36	6.31	1.4	4.71	4.00
1.60	9.00	0.35	6.44	1.4	4.70	4.00
1.70	9.00	0.34	6.57	1.4	4.69	4.00
1.80	9.00	0.34	6.69	1.3	4.67	4.00
1.90	9.00	0.33	6.80	1.3	4.66	4.00
2.00	9.00	0.33	6.92	1.3	4.65	4.00
0.50	10.00	0.54	4.59	2.2	5.09	4.00
0.60	10.00	0.51	4.87	2.1	5.03	4.00
0.70	10.00	0.49	5.12	2.0	4.98	4.00
0.80	10.00	0.47	5.35	1.9	4.93	4.00
0.90	10.00	0.45	5.56	1.8	4.90	4.00
1.00	10.00	0.43	5.75	1.7	4.87	4.00
1.10	10.00	0.42	5.93	1.7	4.84	4.00
1.20	10.00	0.41	6.10	1.6	4.82	4.00
1.30	10.00	0.40	6.26	1.6	4.80	4.00
1.40	10.00	0.39	6.41	1.6	4.78	4.00
1.50	10.00	0.38	6.55	1.5	4.76	4.00
1.60	10.00	0.37	6.69	1.5	4.75	4.00
1.70	10.00	0.37	6.82	1.5	4.73	4.00
1.80	10.00	0.36	6.95	1.4	4.72	4.00
1.90	10.00	0.35	7.07	1.4	4.71	4.00
2.00	10.00	0.35	7.19	1.4	4.70	4.00
0.50	11.00	0.58	4.74	2.3	5.16	4.00
0.60	11.00	0.55	5.04	2.2	5.09	4.00
0.70	11.00	0.52	5.30	2.1	5.04	4.00
0.80	11.00	0.50	5.53	2.0	4.99	4.00
0.90	11.00	0.48	5.75	1.9	4.96	4.00
1.00	11.00	0.46	5.95	1.8	4.92	4.00
1.10	11.00	0.45	6.14	1.8	4.90	4.00
1.20	11.00	0.44	6.31	1.7	4.87	4.00
1.30	11.00	0.42	6.48	1.7	4.85	4.00
1.40	11.00	0.41	6.63	1.7	4.83	4.00
1.50	11.00	0.41	6.78	1.6	4.81	4.00
1.60	11.00	0.40	6.92	1.6	4.79	4.00
1.70	11.00	0.39	7.06	1.6	4.78	4.00
1.80	11.00	0.38	7.19	1.5	4.76	4.00
1.90	11.00	0.38	7.32	1.5	4.75	4.00
2.00	11.00	0.37	7.44	1.5	4.74	4.00
0.50	12.00	0.61	4.88	2.5	5.23	4.00
0.60	12.00	0.58	5.19	2.3	5.16	4.00
0.70	12.00	0.55	5.46	2.2	5.10	4.00
0.80	12.00	0.53	5.70	2.1	5.05	4.00
0.90	12.00	0.51	5.93	2.0	5.01	4.00
1.00	12.00	0.49	6.13	2.0	4.98	4.00
1.10	12.00	0.47	6.33	1.9	4.95	4.00
1.20	12.00	0.46	6.51	1.8	4.92	4.00
1.30	12.00	0.45	6.68	1.8	4.90	4.00
1.40	12.00	0.44	6.84	1.8	4.88	4.00
1.50	12.00	0.43	6.99	1.7	4.86	4.00
1.60	12.00	0.42	7.14	1.7	4.84	4.00
1.70	12.00	0.41	7.28	1.6	4.82	4.00
1.80	12.00	0.40	7.42	1.6	4.81	4.00

Section 1 (100-YR) Rating Table **Rating Table for Irregular Channel**

Channel Slope (%)	Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
1.90	12.00	0.40	7.55	1.6	4.79	4.00
2.00	12.00	0.39	7.67	1.6	4.78	4.00

SECTION 2 (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 2 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.55 %
Discharge	16.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.38 ft
Elevation Range	0.00 to 0.70
Flow Area	3.1 ft ²
Wetted Perimeter	24.46 ft
Top Width	23.62 ft
Actual Depth	0.38 ft
Critical Elevation	0.50 ft
Critical Slope	0.48 %
Velocity	5.23 ft/s
Velocity Head	0.43 ft
Specific Energy	0.80 ft
Froude Number	2.56
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+10.0	0.025
0+10.0	0+12.0	0.013
0+12.0	0+48.0	0.016
0+48.0	0+50.0	0.013
0+50.0	0+55.0	0.025
0+55.0	0+60.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.70
0+05.0	0.60
0+10.0	0.50
0+10.5	0.48
0+10.5	0.00

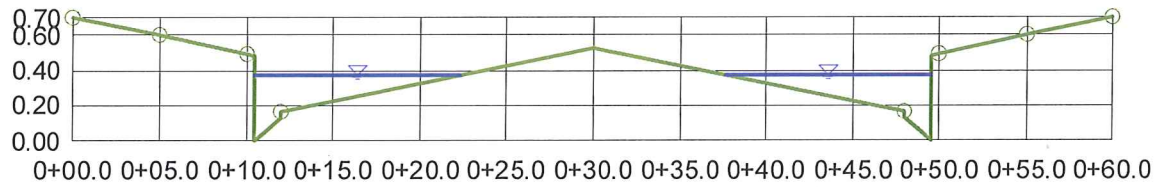
SECTION 2 (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+12.0	0.13
0+12.0	0.17
0+30.0	0.53
0+48.0	0.17
0+48.0	0.13
0+49.5	0.00
0+49.5	0.48
0+50.0	0.50
0+55.0	0.60
0+60.0	0.70

SECTION 2 (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 2 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.55 %
Water Surface Elevation	0.38 ft
Elevation Range	0.00 to 0.70
Discharge	16.00 cfs



V: 10.0
H: 1
NTS

SECTION 3A HALF STEET CAPACITY

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 3A HALF STEET CAPACITY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	2.98 %
Water Surface Elevation	0.77 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Elevation Range	0.00 to 0.77
Discharge	86.46 cfs
Flow Area	11.7 ft ²
Wetted Perimeter	40.64 ft
Top Width	40.00 ft
Actual Depth	0.77 ft
Critical Elevation	1.00 ft
Critical Slope	0.43 %
Velocity	7.38 ft/s
Velocity Head	0.85 ft
Specific Energy	1.62 ft
Froude Number	2.40
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.11 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+40.0	0.016

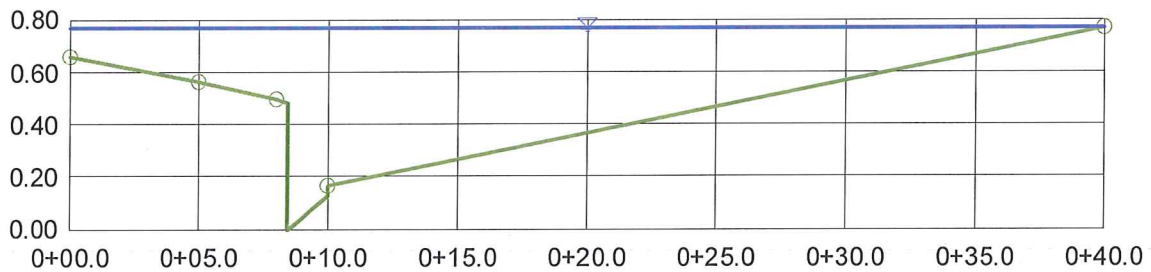
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77

SECTION 3A HALF STEET CAPACITY

Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 3A HALF STEET CAPACITY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.015
Channel Slope	2.98 %
Water Surface Elevation	0.77 ft
Elevation Range	0.00 to 0.77
Discharge	86.46 cfs



V:10.0
H:1
NTS

SECTION 3B DRY LANE CAPACITY

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 3B DRY LANE CAPACITY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	2.98 %
Water Surface Elevation	0.39 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 0.77
Discharge	16.58 cfs
Flow Area	3.4 ft ²
Wetted Perimeter	25.88 ft
Top Width	25.00 ft
Actual Depth	0.39 ft
Critical Elevation	0.50 ft
Critical Slope	0.49 %
Velocity	4.88 ft/s
Velocity Head	0.37 ft
Specific Energy	0.76 ft
Froude Number	2.34
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

SECTION 3B DRY LANE CAPACITY

Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

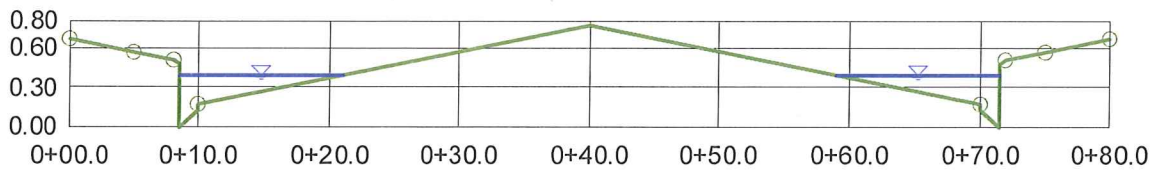
SECTION 3B DRY LANE CAPACITY Cross Section for Irregular Channel

Project Description

Worksheet	SECTION 3B DRY LANE CAPACITY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data

Mannings Coefficient	0.014
Channel Slope	2.98 %
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 0.77
Discharge	16.58 cfs



V: 10.0
H: 1
NTS

SECTION 3B (10-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 3B (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.98 %
Discharge	30.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.46 ft
Elevation Range	0.00 to 0.77
Flow Area	5.5 ft ²
Wetted Perimeter	33.46 ft
Top Width	32.43 ft
Actual Depth	0.46 ft
Critical Elevation	0.60 ft
Critical Slope	0.50 %
Velocity	5.43 ft/s
Velocity Head	0.46 ft
Specific Energy	0.92 ft
Froude Number	2.32
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+02.0	0.013
0+02.0	0+62.0	0.016
0+62.0	0+64.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.50
0+00.5	0.48
0+00.5	0.00
0+02.0	0.13
0+02.0	0.17
0+32.0	0.77
0+62.0	0.17
0+62.0	0.13
0+63.5	0.00

SECTION 3B (10-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+63.5	0.48
0+64.0	0.50

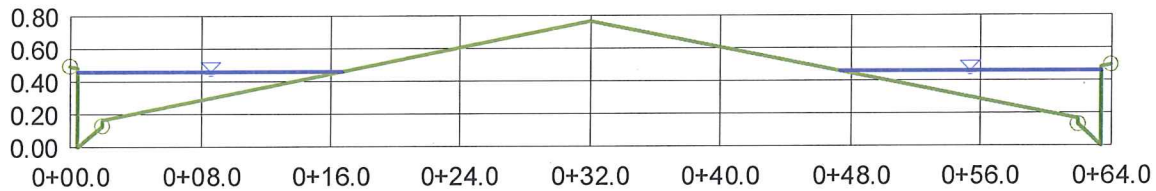
SECTION 3B (10-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 3B (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	2.98 %
Water Surface Elevation	0.46 ft
Elevation Range	0.00 to 0.77
Discharge	30.00 cfs

$$\text{Dry Lane} = \frac{.77 - .46}{.02} = 15.5'$$

* 12.5-ft DI TO COLLECT 80FS FROM THE SOUTH SIDE OF DEER SPRINGS TO MEET DRY LANE.



V:10.0
H:1
NTS

SECTION 3B (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 3B (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.98 %
Discharge	81.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.62 ft
Elevation Range	0.00 to 0.77
Flow Area	12.9 ft ²
Wetted Perimeter	62.82 ft
Top Width	61.75 ft
Actual Depth	0.62 ft
Critical Elevation	0.79 ft
Critical Slope	0.44 %
Velocity	6.29 ft/s
Velocity Head	0.62 ft
Specific Energy	1.24 ft
Froude Number	2.43
Flow Type	Supercritical

DXV = 3.90

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

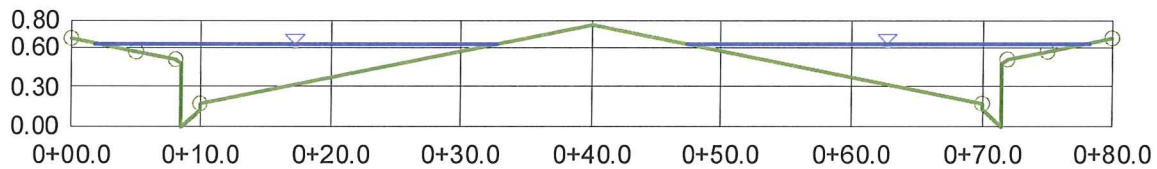
SECTION 3B (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION 3B (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 3B (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	2.98 %
Water Surface Elevation	0.62 ft
Elevation Range	0.00 to 0.77
Discharge	81.00 cfs



V:10.0
H:1
NTS

SECTION 4 (10-YR) DRY LANE CAPACITY

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 4 DRY LANE CAPACITY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.86 %
Discharge	9.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 0.77
Flow Area	3.4 ft ²
Wetted Perimeter	26.00 ft
Top Width	25.12 ft
Actual Depth	0.39 ft
Critical Elevation	0.42 ft
Critical Slope	0.53 %
Velocity	2.63 ft/s
Velocity Head	0.11 ft
Specific Energy	0.50 ft
Froude Number	1.25
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

SECTION 4 (10-YR) DRY LANE CAPACITY
Worksheet for Irregular Channel

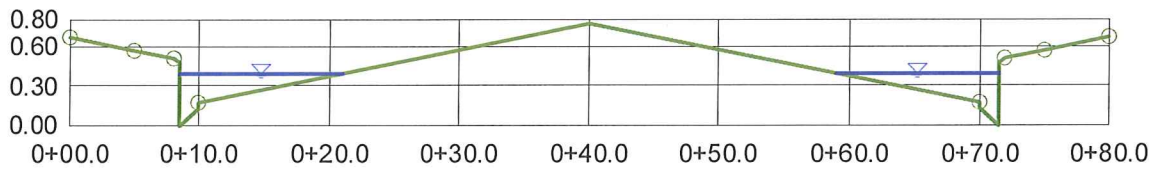
Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION 4 (10-YR) DRY LANE CAPACITY

Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 4 DRY LANE CAPACITY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.86 %
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 0.77
Discharge	9.00 cfs



V:10.0
H:1
NTS

SECTION 4A (10-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 4A (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.86 %
Discharge	12.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.43 ft
Elevation Range	0.00 to 0.77
Flow Area	4.4 ft ²
Wetted Perimeter	29.53 ft
Top Width	28.58 ft
Actual Depth	0.43 ft
Critical Elevation	0.45 ft
Critical Slope	0.54 %
Velocity	2.76 ft/s
Velocity Head	0.12 ft
Specific Energy	0.54 ft
Froude Number	1.24
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

SECTION 4A (10-YR)
Worksheet for Irregular Channel

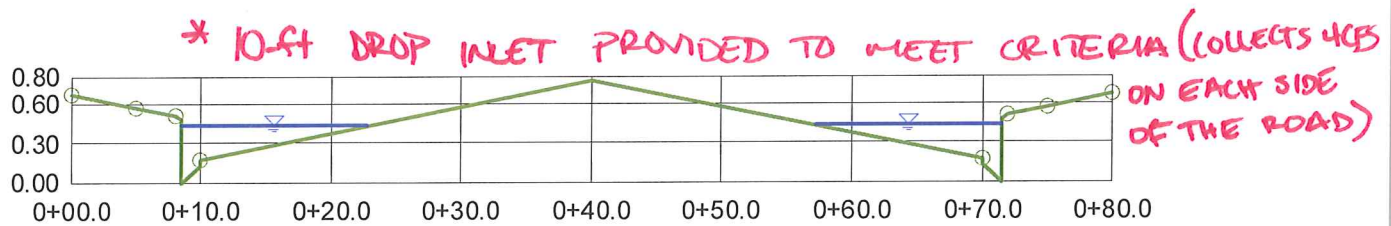
Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION 4A (10-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 4A (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.86 %
Water Surface Elevation	0.43 ft
Elevation Range	0.00 to 0.77
Discharge	12.00 cfs

$$\text{DRYLANE} = \frac{.77 - .43}{.02} = 17\text{-ft}$$



V:10.0
H:1
NTS

SECTION 4A (100-YR) Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 4A (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.86 %
Discharge	54.50 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.66 ft
Elevation Range	0.00 to 0.77
Flow Area	15.5 ft ²
Wetted Perimeter	70.47 ft
Top Width	69.40 ft
Actual Depth	0.66 ft
Critical Elevation	0.71 ft
Critical Slope	0.48 %
Velocity	3.51 ft/s
Velocity Head	0.19 ft
Specific Energy	0.86 ft
Froude Number	1.31
Flow Type	Supercritical

$$D \times V = 2.31$$

Calculation Messages:

Water elevation exceeds lowest end station by 0.4011667e-2 ft.
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48

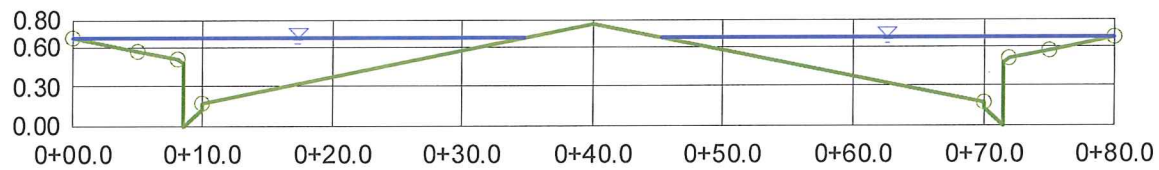
SECTION 4A (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+08.5	0.00
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION 4A (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 4A (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.86 %
Water Surface Elevation	0.66 ft
Elevation Range	0.00 to 0.77
Discharge	54.50 cfs



V:10.0
H:1
NTS

SECTION 4B (10-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 4B (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.86 %
Discharge	11.50 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.42 ft
Elevation Range	0.00 to 0.77
Flow Area	4.2 ft ²
Wetted Perimeter	28.99 ft
Top Width	28.05 ft
Actual Depth	0.42 ft
Critical Elevation	0.45 ft
Critical Slope	0.54 %
Velocity	2.74 ft/s
Velocity Head	0.12 ft
Specific Energy	0.54 ft
Froude Number	1.25
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

SECTION 4B (10-YR)
Worksheet for Irregular Channel

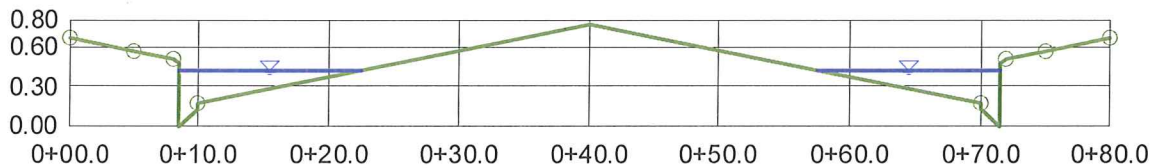
Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION 4B (10-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 4B (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.86 %
Water Surface Elevation	0.42 ft
Elevation Range	0.00 to 0.77
Discharge	11.50 cfs

$$\text{DRY LANE} = \frac{.77 - .42}{.02} = 17.5\text{-ft}$$



V: 10.0
H: 1
NTS

* 10-ft DROP INLET PROVIDED TO MEET
STREET FLOW CRITERIA
(COLLECTS 4CFS ON EACH SIDE OF THE ROAD)

SECTION 4B (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 4B (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.86 %
Discharge	67.50 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 0.77
Flow Area	18.4 ft ²
Wetted Perimeter	74.57 ft
Top Width	73.41 ft
Actual Depth	0.70 ft
Critical Elevation	0.76 ft
Critical Slope	0.49 %
Velocity	3.67 ft/s
Velocity Head	0.21 ft
Specific Energy	0.91 ft
Froude Number	1.29
Flow Type	Supercritical

$$DXU = 2.56$$

Calculation Messages:
 Water elevation exceeds lowest end station by 0.44129152e-1 ft.
 Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48

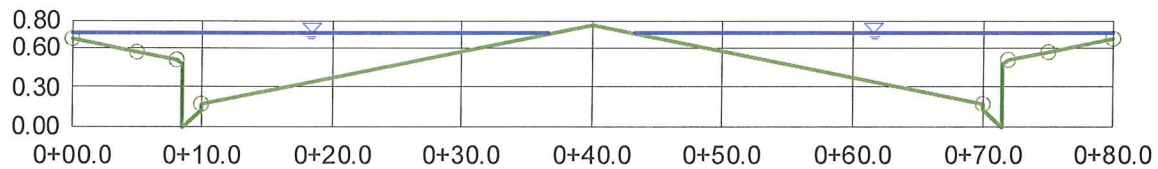
SECTION 4B (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+08.5	0.00
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION 4B (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 4B (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	0.86 %
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 0.77
Discharge	67.50 cfs



V: 10.0
H: 1
NTS

Flowsplit Analysis

SECTION FS1 (10-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION FS1 (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.86 %
Discharge	7.50 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 0.77
Flow Area	2.9 ft ²
Wetted Perimeter	23.92 ft
Top Width	23.08 ft
Actual Depth	0.37 ft
Critical Elevation	0.40 ft
Critical Slope	0.52 %
Velocity	2.56 ft/s
Velocity Head	0.10 ft
Specific Energy	0.47 ft
Froude Number	1.26
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

SECTION FS1 (10-YR)
Worksheet for Irregular Channel

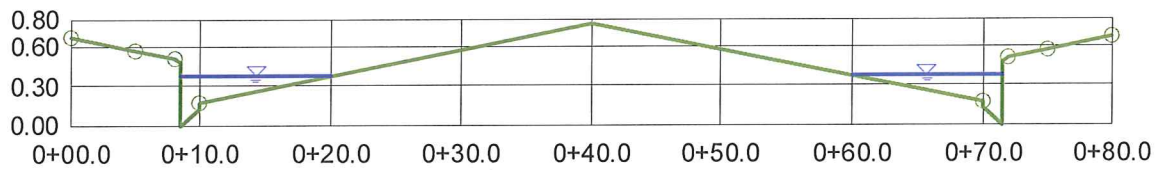
Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION FS1 (10-YR)

Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION FS1 (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	0.86 %
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 0.77
Discharge	7.50 cfs



V: 10.0
H: 1
NTS

SECTION FS1 (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION FS1 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.86 %
Discharge	41.50 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.62 ft
Elevation Range	0.00 to 0.77
Flow Area	12.4 ft ²
Wetted Perimeter	61.18 ft
Top Width	60.11 ft
Actual Depth	0.62 ft
Critical Elevation	0.66 ft
Critical Slope	0.49 %
Velocity	3.35 ft/s
Velocity Head	0.17 ft
Specific Energy	0.79 ft
Froude Number	1.30
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

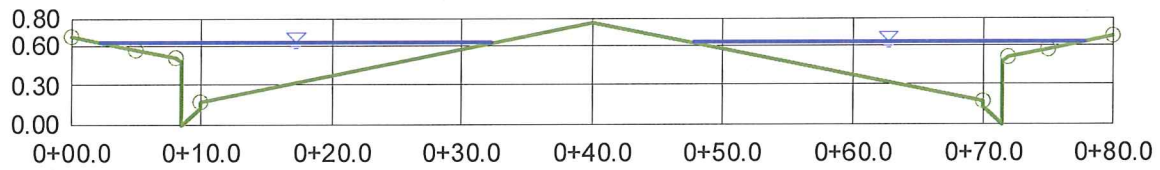
SECTION FS1 (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION FS1 (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION FS1 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.86 %
Water Surface Elevation	0.62 ft
Elevation Range	0.00 to 0.77
Discharge	41.50 cfs



V:10.0
H:1
NTS

SECTION FS2 (10-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION FS2 (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.00 %
Discharge	14.50 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 0.77
Flow Area	3.0 ft ²
Wetted Perimeter	24.30 ft
Top Width	23.46 ft
Actual Depth	0.37 ft
Critical Elevation	0.48 ft
Critical Slope	0.48 %
Velocity	4.80 ft/s
Velocity Head	0.36 ft
Specific Energy	0.73 ft
Froude Number	2.36
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

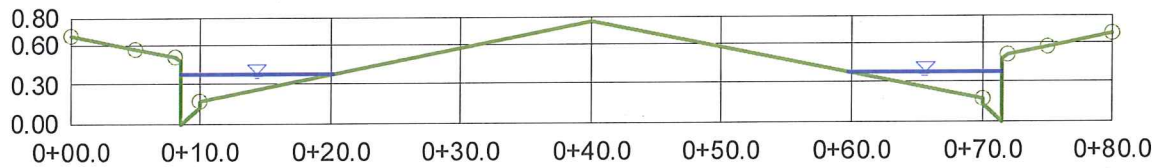
SECTION FS2 (10-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION FS2 (10-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION FS2 (10-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.00 %
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 0.77
Discharge	14.50 cfs



V:10.0
H:1
NTS

SECTION FS2 (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION FS2 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.00 %
Discharge	79.50 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.62 ft
Elevation Range	0.00 to 0.77
Flow Area	12.6 ft ²
Wetted Perimeter	62.05 ft
Top Width	60.99 ft
Actual Depth	0.62 ft
Critical Elevation	0.79 ft
Critical Slope	0.44 %
Velocity	6.29 ft/s
Velocity Head	0.62 ft
Specific Energy	1.24 ft
Froude Number	2.44
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.013
0+05.0	0+08.0	0.025
0+08.0	0+10.0	0.013
0+10.0	0+70.0	0.016
0+70.0	0+72.0	0.013
0+72.0	0+75.0	0.025
0+75.0	0+80.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.66
0+05.0	0.56
0+08.0	0.50
0+08.5	0.48
0+08.5	0.00

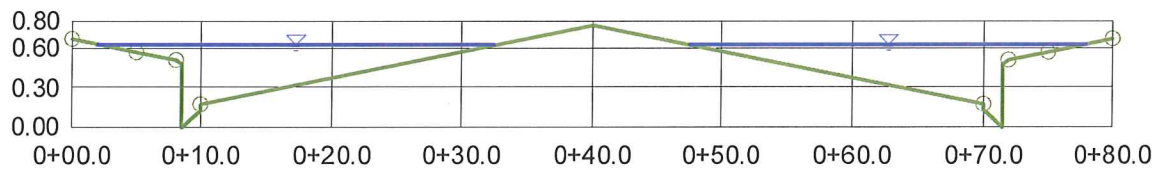
SECTION FS2 (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.0	0.13
0+10.0	0.17
0+40.0	0.77
0+70.0	0.17
0+70.0	0.13
0+71.5	0.00
0+71.5	0.48
0+72.0	0.50
0+75.0	0.56
0+80.0	0.66

SECTION FS2 (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION FS2 (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.00 %
Water Surface Elevation	0.62 ft
Elevation Range	0.00 to 0.77
Discharge	79.50 cfs



V:10.0
H:1
NTS

Easement Analyses

Facility P1 - Normal Depth **Worksheet for Irregular Channel**

Project Description	
Worksheet	Facility P1 - Normal Depth
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.00 %
Discharge	10.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.35 ft
Elevation Range	0.00 to 0.60
Flow Area	1.4 ft ²
Wetted Perimeter	4.70 ft
Top Width	4.00 ft
Actual Depth	0.35 ft
Critical Elevation	0.64 ft
Critical Slope	0.42 %
Velocity	7.19 ft/s
Velocity Head	0.80 ft
Specific Energy	1.15 ft
Froude Number	2.15
Flow Type	Supercritical

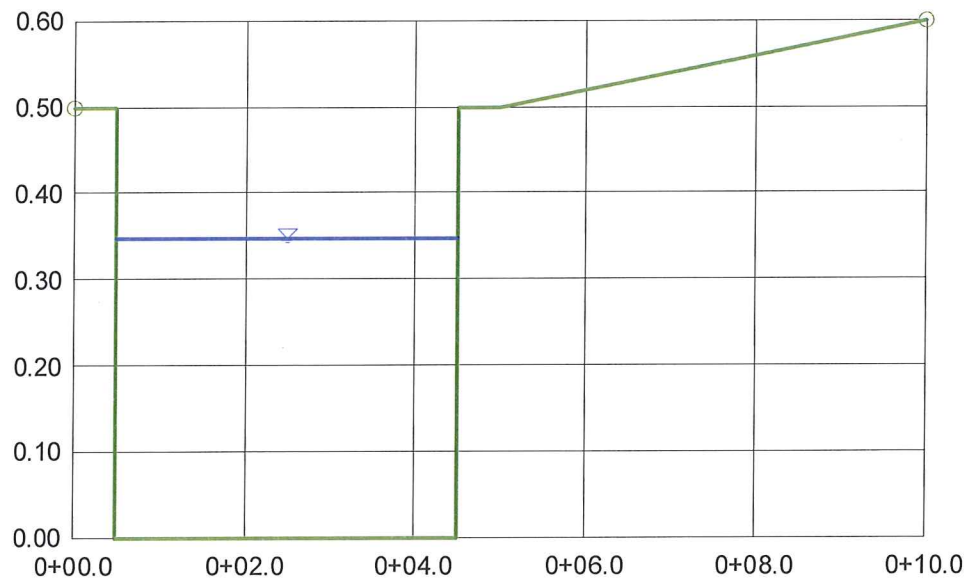
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+10.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.50
0+00.5	0.50
0+00.5	0.00
0+04.5	0.00
0+04.5	0.50
0+05.0	0.50
0+10.0	0.60

Facility P1 - Normal Depth **Cross Section for Irregular Channel**

Project Description	
Worksheet	Facility P1 - Normal Depth
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.00 %
Water Surface Elevation	0.35 ft
Elevation Range	0.00 to 0.60
Discharge	10.00 cfs



V:10.0
H:1
NTS

Facility P1 - Weir Depth
Worksheet for Broad Crested Weir

Project Description	
Worksheet	Facility P1 - Weir Depth
Type	Broad Crested Weir
Solve For	Headwater Elevation

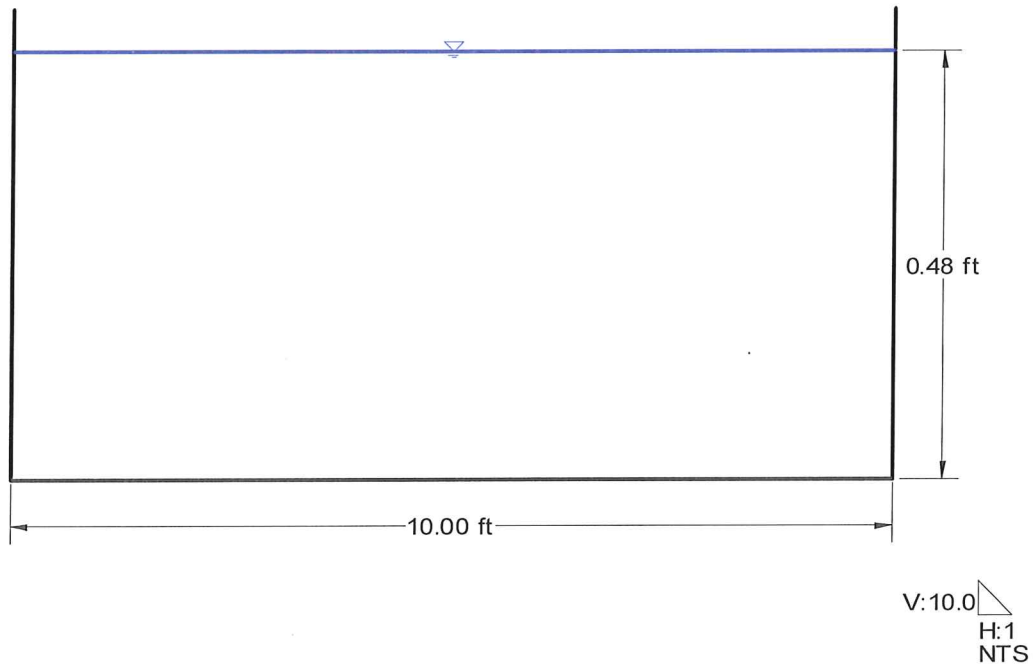
Input Data	
Discharge	10.00 cfs
Crest Elevation	0.00 ft
Tailwater Elevation	0.35 ft
Crest Surface Type	Paved
Crest Breadth	20.00 ft
Crest Length	10.00 ft

Results	
Headwater Elevation	0.48 ft
Headwater Height Above Crest	0.48 ft
Tailwater Height Above Crest	0.35 ft
Discharge Coefficient	3.01 US
Submergence Factor	1.00
Adjusted Discharge Coefficient	3.01 US
Flow Area	4.8 ft ²
Velocity	2.08 ft/s
Wetted Perimeter	10.96 ft
Top Width	10.00 ft

Facility P1 - Weir Depth **Cross Section for Broad Crested Weir**

Project Description	
Worksheet	Facility P1 - Weir Depth
Type	Broad Crested Weir
Solve For	Headwater Elevation

Section Data	
Discharge	10.00 cfs
Headwater Elevation	0.48 ft
Crest Elevation	0.00 ft
Tailwater Elevation	0.35 ft
Crest Surface Type	Paved
Crest Breadth	20.00 ft
Crest Length	10.00 ft



Facility P2 - Normal Depth Worksheet for Irregular Channel

Project Description	
Worksheet	Facility P2 - Normal Depth
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.76 %
Discharge	10.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.48 ft
Elevation Range	0.00 to 0.60
Flow Area	1.9 ft ²
Wetted Perimeter	4.95 ft
Top Width	4.00 ft
Actual Depth	0.48 ft
Critical Elevation	0.64 ft
Critical Slope	0.42 %
Velocity	5.26 ft/s
Velocity Head	0.43 ft
Specific Energy	0.91 ft
Froude Number	1.35
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+10.0	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	0.50
0+00.5	0.50
0+00.5	0.00
0+04.5	0.00
0+04.5	0.50
0+05.0	0.50
0+10.0	0.60

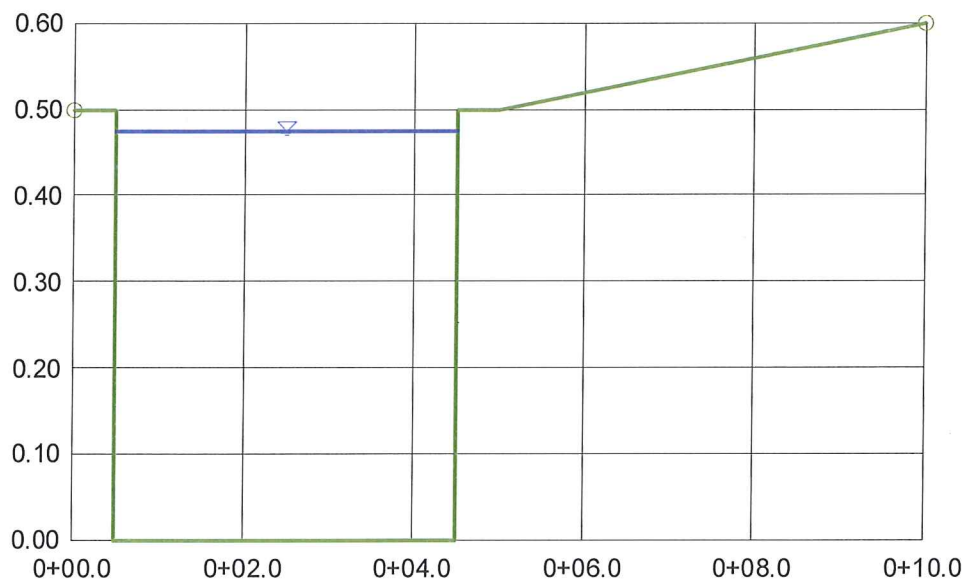
Facility P2 - Normal Depth Cross Section for Irregular Channel

Project Description

Worksheet	Facility P2 - Normal Depth
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.013
Channel Slope	0.76 %
Water Surface Elevation	0.48 ft
Elevation Range	0.00 to 0.60
Discharge	10.00 cfs



V:10.0
H:1
NTS

Facility P2 - Weir Depth **Worksheet for Broad Crested Weir**

Project Description	
Worksheet	Facility P2 - Weir Depth
Type	Broad Crested Weir
Solve For	Headwater Elevation

Input Data	
Discharge	10.00 cfs
Crest Elevation	0.00 ft
Tailwater Elevation	0.48 ft
Crest Surface Type	Paved
Crest Breadth	20.00 ft
Crest Length	10.00 ft

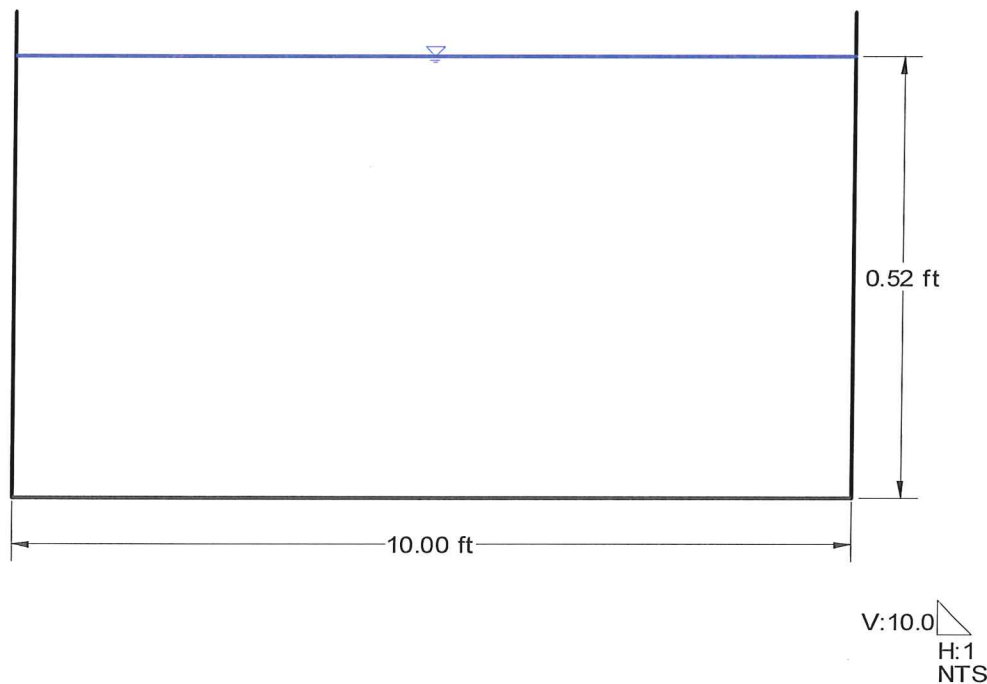
Results	
Headwater Elevation	0.52 ft
Headwater Height Above Crest	0.52 ft
Tailwater Height Above Crest	0.48 ft
Discharge Coefficient	3.01 US
Submergence Factor	0.88
Adjusted Discharge Coefficient	2.66 US
Flow Area	5.2 ft²
Velocity	1.92 ft/s
Wetted Perimeter	11.04 ft
Top Width	10.00 ft

Facility P2 - Weir Depth

Cross Section for Broad Crested Weir

Project Description	
Worksheet	Facility P2 - Weir Depth
Type	Broad Crested Weir
Solve For	Headwater Elevation

Section Data	
Discharge	10.00 cfs
Headwater Elevation	0.52 ft
Crest Elevation	0.00 ft
Tailwater Elevation	0.48 ft
Crest Surface Type	Paved
Crest Breadth	20.00 ft
Crest Length	10.00 ft



APPENDIX E

Storm Drain Computations

Drop Inlet Analysis

Project:		Connor Hills
Title:		Type CM2 Drop Inlet (Continuous Grade) @ Section 3B
Subtitle:		12.5-ft Drop Inlet
By:		ETM
Date:		7/15/2014
Input:	Variable:	Input:
Street Flow (cfs)	Q	15.0
Longitudinal Slope (ft/ft)	S _o	0.0298
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	5.43
Street Flow Depth (ft)	D	0.46
Street Cross Slope (ft/ft)	S _x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D _g	2.0
Length of Grate (ft)	L _g	10.0
Length of Curb Opening (ft)	L _c	12.50
Clogging Factor - Grate (%)	CF _g	50%
Clogging Factor - Curb (%)	CF _c	50%
Effective Grate Length (ft)	L _{ge}	5.0
Effective Curb Opening Length (ft)	L _{ce}	6.25
Output (Grate):	Equation:	Output (Grate):
¹ R _f - Frontal Flow Factor	1-0.09*(V-V _x) if V>V _x ; else Frontal Flow Factor=1	1.00
² V _o - Splash Over Velocity (fps)	V _x =p+q*L _g -r*L _{ge} ² +sy*L _{ge} ³ ; where p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate)	10.55
¹ E - Grate Flow Ratio	Frontal Flow/Side Flow	0.25
² Q _w - Frontal Flow (cfs)	Q _w = Q[1-(1-(W/T)) ^{2.67}]	3.75
¹ Q _s - Side Flow (cfs)	Q _s = Q-Q _w	11.2
¹ T - Side Flow Spread (ft)	(D-D _g)/S _x	14.67
¹ R _s - Side Flow Factor	1/(1+(0.15*V ^{1.8})/(S _x *L _{ge} ^{2.3}))	0.20
¹ Q _{gi} - Intercepted Flow (cfs)	(R _f *E+R _s *(1-E))*Q	6.1
Output (Curb):	Equation:	Output (Curb):
¹ S _e - Equivalent Cross Slope (ft/ft)	S _x +S _g *E	0.048
Q _{sx} - Remaining Flow After Grate Interception (cfs)	Q-Q _{gi}	8.946
S _g - Gutter Cross Slope (ft/ft)	D _g /W	0.111
¹ L _t - Effective Interception Length (ft)	0.60*Q _{sx} ^{0.42} *S _o ^{0.30} *(1/n*S _e) ^{0.6}	38.90
¹ Q _{ci} - Intercepted Flow (cfs)	(1-(1-L _{ce} /L _t) ^{1.8})*Q _{sx}	2.4
	or Q _{sx} if L _t is less than L _{ce}	
Output (Combination):		Output (Combination):
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	8

SOUTH HALF OF
DEER SPRINGS WAY →

¹ Formula referenced from the CCRFCD Manual

² Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

Project:		Connor Hills
Title:		Type CM2 Drop Inlet (Continuous Grade) @ Section 4A
Subtitle:		10-ft Drop Inlet
By:		ETM
Date:		7/16/2014
Input:	Variable:	Input:
Street Flow (cfs)	Q	12.0
Longitudinal Slope (ft/ft)	S _o	0.0086
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	2.76
Street Flow Depth (ft)	D	0.43
Street Cross Slope (ft/ft)	S _x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D _g	2.0
Length of Grate (ft)	L _g	7.5
Length of Curb Opening (ft)	L _c	10.00
Clogging Factor - Grate (%)	CF _g	50%
Clogging Factor - Curb (%)	CF _c	50%
Effective Grate Length (ft)	L _{ge}	3.8
Effective Curb Opening Length (ft)	L _{ce}	5.00
Output (Grate):	Equation:	Output (Grate):
¹ R _f - Frontal Flow Factor	1-0.09*(V-V _x) if V>V _x ; else Frontal Flow Factor=1	1.00
² V _o - Splash Over Velocity (fps)	V _x =p+q*L _g -r*L _{ge} ² +sy*L _{ge} ³ ; where p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate)	7.98
¹ E - Grate Flow Ratio	Frontal Flow/Side Flow	0.28
² Q _w - Frontal Flow (cfs)	Q _w = Q[1-(1-(W/T)) ^{2.67}]	3.31
¹ Q _s - Side Flow (cfs)	Q _s = Q-Q _w	8.7
T - Side Flow Spread (ft)	(D-D _g)/S _x	13.17
¹ R _s - Side Flow Factor	1/(1+(0.15*V ^{1.8})/(S _x *L _{ge} ^{2.3}))	0.31
¹ Q _{gi} - Intercepted Flow (cfs)	(R _f *E+R _s *(1-E))*Q	6.0
Output (Curb):	Equation:	Output (Curb):
¹ S _e - Equivalent Cross Slope (ft/ft)	S _x +S _g *E	0.051
Q _{sx} - Remaining Flow After Grate Interception (cfs)	Q-Q _{gi}	5.999
S _g - Gutter Cross Slope (ft/ft)	D _g /W	0.111
¹ L _t - Effective Interception Length (ft)	0.60*Q _{sx} ^{0.42} *S _o ^{0.30} /(1/n*S _e) ^{0.6}	21.88
¹ Q _{ci} - Intercepted Flow (cfs)	(1-(1-L _{ce} /L _t) ^{1.8})*Q _{sx}	2.2
	or Q _{sx} if L _t is less than L _{ce}	
Output (Combination):		Output (Combination):
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	8

¹ Formula referenced from the CCRFCD Manual

² Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

Project:	Connor Hills	
Title:	Type CM2 Drop Inlet (Continuous Grade) @ Section 4B	
Subtitle:	10-ft Drop Inlet	
By:	ETM	
Date:	7/16/2014	
Input:	Variable:	Input:
Street Flow (cfs)	Q	11.5
Longitudinal Slope (ft/ft)	S_o	0.0086
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	2.74
Street Flow Depth (ft)	D	0.42
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2.0
Length of Grate (ft)	L_g	7.5
Length of Curb Opening (ft)	L_c	10.00
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	3.8
Effective Curb Opening Length (ft)	L_{ce}	5.00
Output (Grate):	Equation:	Output (Grate):
¹ R_f - Frontal Flow Factor	$1 - 0.09 \cdot (V - V_x)$ if $V > V_x$; else Frontal Flow Factor = 1	1.00
² V_o - Splash Over Velocity (fps)	$V_x = p + q \cdot L_g - r \cdot L_{ge}^2 + s \cdot y \cdot L_{ge}^3$; where $p = 0.30, q = 4.85, r = 1.31, s = 0.15$ (for Vane Grate)	7.98
¹ E - Grate Flow Ratio	Frontal Flow/Side Flow	0.29
² Q_w - Frontal Flow (cfs)	$Q_w = Q[1 - (1 - (W/T))^{2.67}]$	3.29
¹ Q_s - Side Flow (cfs)	$Q_s = Q - Q_w$	8.2
T - Side Flow Spread (ft)	$(D - D_g)/S_x$	12.67
¹ R_s - Side Flow Factor	$1 / (1 + (0.15 \cdot V^{1.8}) / (S_x \cdot L_{ge}^{2.3}))$	0.31
¹ Q_{gi} - Intercepted Flow (cfs)	$(R_f \cdot E + R_s \cdot (1 - E)) \cdot Q$	5.9
Output (Curb):	Equation:	Output (Curb):
¹ S_e - Equivalent Cross Slope (ft/ft)	$S_x + S_g \cdot E$	0.052
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q - Q_{gi}$	5.648
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.111
¹ L_t - Effective Interception Length (ft)	$0.60 \cdot Q_{sx}^{0.42} \cdot S_o^{0.30} \cdot (1/n \cdot S_e)^{0.6}$	21.06
¹ Q_{ci} - Intercepted Flow (cfs)	$(1 - (1 - L_{ce}/L_t)^{1.8}) \cdot Q_{sx}$	2.2
	or Q_{sx} if L_t is less than L_{ce}	
Output (Combination):		Output (Combination):
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	8

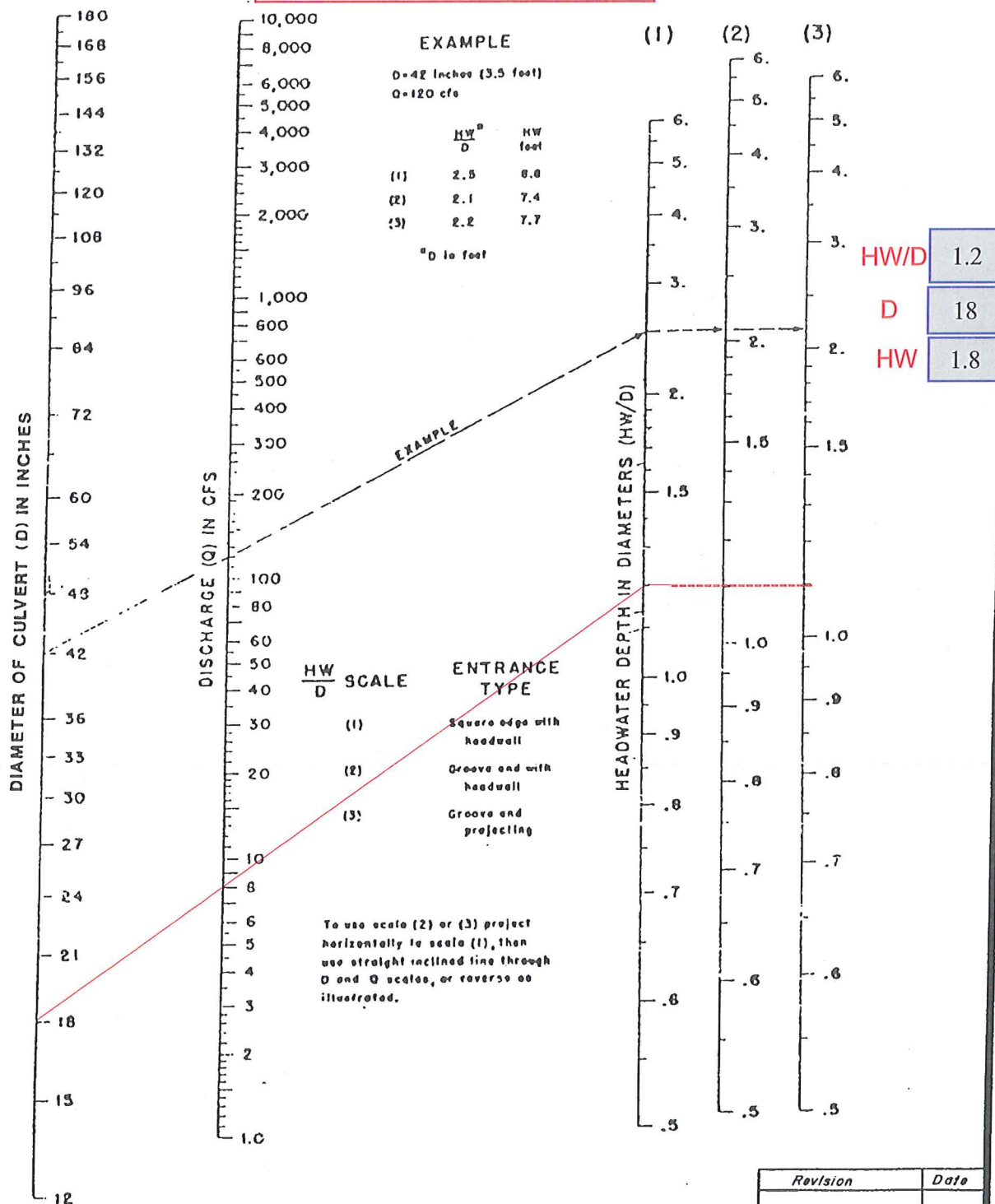
¹ Formula referenced from the CCRFCD Manual

² Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

Deer Springs Lateral : Q=8 CFS

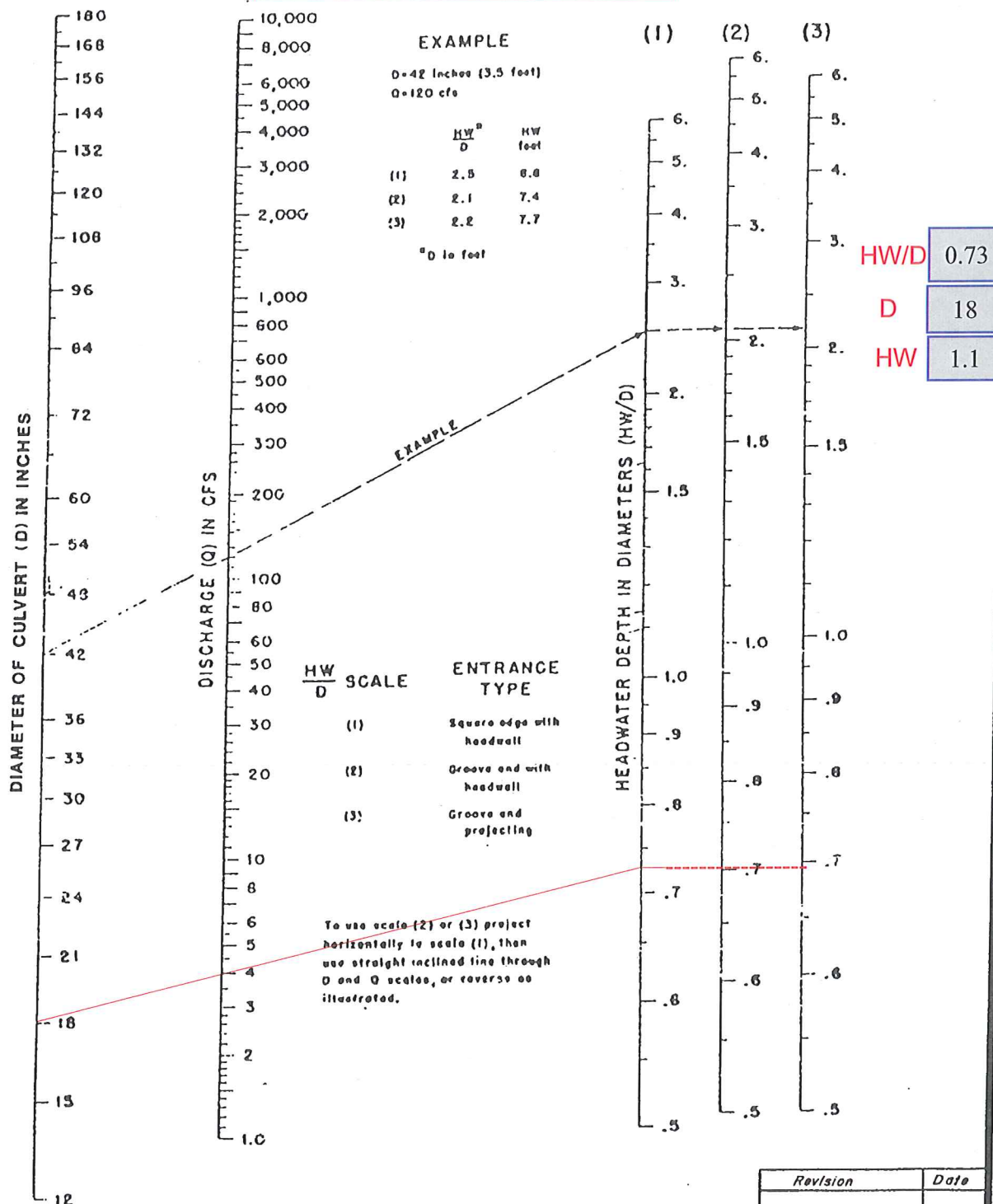


Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

Grand Canyon Lateral #3: Q=4 CFS



Revision	Date

WRC
ENGINEERING

REFERENCE:

USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

WSPG Model

STORM SEWER HYDRAULIC CALCULATIONS

STATION			CONDUIT DATA				FLOW DATA							LOSS		HGL		COMMENTS			
FROM	TO	SIZE / TYPE	INVERTS		LENGTH	A (FT ²)	R (FT)	Φ	Q (CFS)	V (FPS)	H _v = V ² /2g (FT)	S _f (FT/FT)	PIPE	H _f	D/S HGL ELEV.	PIPE	U/S HGL ELEV.	PRESS. FLOW?	OTHER		
			D / S ELEV.	U / S ELEV.									PIPE	H _f (FT)	D/S HGL ELEV.	PIPE	U/S HGL ELEV.				
100	148.15	Round 18" RCP	17.22	17.70	48.15	1.767146	0.375	0.004925	4	2.263537	0.079559	0.001444136		0.070	18.92		18.990	No	FUTURE 18" LATERAL #4		
100	141.01	Round 18" RCP	14.71	15.12	41.01	1.767146	0.375	0.004925	4	2.263537	0.079559	0.001444136		0.059	16.52		16.579	No	PROPOSED 18" LATERAL #3		
100	148.13	Round 18" RCP	14.71	15.19	48.13	1.767146	0.375	0.004925	4	2.263537	0.079559	0.001444136		0.070	16.52		16.590	No	FUTURE 18" LATERAL #5		
Sf = Φ Hv / R ^{1.33}																Φ = 2g (n ²) / 2.21				1 - Where pipes are not under pressure, assume U/S HGL is at top of pipe	

0	T1	CONNOR HILLS (SHG JOB NO. RAH1310.000) - TECHNICAL DRAINAGE STUDY			
	T2	RICHMOND AMERICAN HOMES			
	T3	ULTIMATE CONDITION DEER SPRINGS WAY STORM DRAIN	23.00		
	SO	100.00 19.65 36			
	R	161.27 20.01 36	.013		45.00 1
	JX	161.27 20.01 18	.013	8.	20.01 45.
	R	192.38 21.10 18	.013		45.00 1
	SH	192.38 21.10 18			
	CD	18 4	1.5		
	CD	24 4	2.0		
	CD	30 4	2.5		
	CD	36 4	3.0		
	CD	42 4	3.5		
	CD	48 4	4.0		

DSU.OUT

DATE: 7/22/2014
TIME: 18: 6

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING
F0515P
PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	HEIGHT	1 BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														

F 0 5 1 5 P
PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING
CONNOR HILLS (SHG Job No. RAH1310.000) - TECHNICAL DRAINAGE STUDY
RICHMOND AMERICAN HOMES
ULTIMATE CONDITION DEER SPRINGS WAY STORM DRAIN
F 0 5 1 5 P
PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO 1 IS A SYSTEM OUTLET
U/S DATA
STATION 100.00
INVERT SECT 19.65 36
W S ELEV 23.00

ELEMENT NO 2 IS A REACH
U/S DATA
STATION 161.27
INVERT SECT 20.01 36
N 0.013

ELEMENT NO 3 IS A JUNCTION
U/S DATA
STATION 161.27
INVERT SECT 20.01 18
Q3 0.013
Q4 0.0
INVERT-3 INVERT-4
20.01 20.01
PHI 3 PHI 4
45.00 0.00
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 4 IS A REACH
U/S DATA
STATION 192.38
INVERT SECT 21.10 18
N 0.013

ELEMENT NO 5 IS A SYSTEM HEADWORKS
U/S DATA
STATION 192.38
INVERT SECT 21.10 18
W S ELEV 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HOWKDS, W.S.ELEV = INV + DC
LICENSEE: SLATER HANIFAN GROUP
F0515P
PAGE 1

WATER SURFACE PROFILE LISTING
CONNOR HILLS (SHG Job No. RAH1310.000) - TECHNICAL DRAINAGE STUDY
RICHMOND AMERICAN HOMES
ULTIMATE CONDITION DEER SPRINGS WAY STORM DRAIN

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO AVBPR PIER
100.00	19.65	3.350	23.000	16.0	2.26	0.080	23.080	0.00	1.277	3.00	0.00	0.00	0
61.27	0.00588					0.00575	0.04						
161.27	20.01	3.041	23.051	16.0	2.26	0.080	23.131	0.00	1.277	3.00	0.00	0.00	0
JUNCT STR	0.00000					0.003187	0.00						

Page 1

B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY®

DSU.OUT

GCU.WSP

O		CONNOR HILLS (SHG Job No.	RAH1310.000)	- TECHNICAL DRAINAGE STUDY	GCU.WSP
T1		T2 RICHMOND AMERICAN HOMES.			
T3		ULTIMATE CONDITION GRAND CANYON DRIVE STORM DRAIN			
S0		100.00	13.17 24	15.17	
R		152.13	14.21 24	.013	1
JX		157.13	14.71 18	18 .013	45.
R		449.07	17.22 18	.013	45.00 1
JX		449.07	17.22 18	18 .013	45.
R		490.08	17.63 18	.013	45.00 1
SH		490.08	17.63 18		
CD		18 4	1.5		
CD		24 4	2.0		

0
Q
t

4.0

GCU.WSQ

DATE: 7/22/2014
TIME: 11:29

GCU OUT

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING F051SP PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	HEIGHT 1	BASE WIDTH	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD 18	4						1.50												
CD 24	4						2.00												

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

CONNOR HILLS (SHG Job NO. RAH1310.000) - TECHNICAL DRAINAGE STUDY

HEADING LINE NO 2 IS -

RICHMOND AMERICAN HOMES

HEADING LINE NO 3 IS -

ULTIMATE CONDITION GRAND CANYON DRIVE STORM DRAIN F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

PAGE NO 2

W S ELEV 15.17

ELEMENT NO	1 IS A SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 2	IS A REACH	U/S DATA	STATION	INVERT	SECT	INVERT	SECT	0.00	0.00	0.00	1

ELEMENT NO	3 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 3	IS A JUNCTION	U/S DATA	STATION	INVERT	SECT <td>INVERT</td> <td>SECT</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>1</td>	INVERT	SECT	0.00	0.00	0.00	1

ELEMENT NO	4 IS A REACH	U/S DATA	STATION	INVERT	SECT	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 4	IS A REACH	U/S DATA	STATION	INVERT	SECT <td>INVERT</td> <td>SECT</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>1</td>	INVERT	SECT	0.00	0.00	0.00	1

ELEMENT NO	5 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 5	IS A JUNCTION	U/S DATA	STATION	INVERT	SECT <td>INVERT</td> <td>SECT</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>1</td>	INVERT	SECT	0.00	0.00	0.00	1

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO	6 IS A REACH	U/S DATA	STATION	INVERT	SECT	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 6	IS A REACH	U/S DATA	STATION	INVERT	SECT <td>INVERT</td> <td>SECT</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>1</td>	INVERT	SECT	0.00	0.00	0.00	1

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

*** WARNING NO 2 *** WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: SLATER HANITAN GROUP

CONNOR HILLS (SHG Job NO. RAH1310.000) - TECHNICAL DRAINAGE STUDY

RICHMOND AMERICAN HOMES

ULTIMATE CONDITION GRAND CANYON DRIVE STORM DRAIN

STATION INVERT ELEV DEPTH OF FLOW W.S. ELEV Q VEL VEL HEAD ENERGY SUPER CRITICAL DEPTH

L/ELEV SO

100.00 13.17 2.000 15.170 16.0 5.09 0.403 15.573 0.00 1.442

GCU.OUT

HYDRAULIC JUMP

104.62	13.26	1.056	14.318	16.0	9.51	1.403	15.721	0.00	1.442	2.00	0.00	0.00	0.00
10.25	0.01995					.016008	0.16			1.000			
114.87	13.47	1.082	14.549	16.0	9.22	1.319	15.868	0.00	1.442	2.00	0.00	0.00	0.00
13.99	0.01995					.014450	0.20			1.000			
128.86	13.75	1.125	14.871	16.0	8.79	1.199	16.070	0.00	1.442	2.00	0.00	0.00	0.00
8.91	0.01995					.012764	0.11			1.000			
137.77	13.92	1.170	15.093	16.0	8.38	1.090	16.183	0.00	1.442	2.00	0.00	0.00	0.00
6.01	0.01995					.011286	0.07			1.000			
143.78	14.04	1.217	15.260	16.0	7.99	0.991	16.251	0.00	1.442	2.00	0.00	0.00	0.00
3.93	0.01995					.009994	0.04			1.000			
147.71	14.12	1.268	15.390	16.0	7.62	0.901	16.291	0.00	1.442	2.00	0.00	0.00	0.00
2.61	0.01995					.008866	0.02			1.000			
150.32	14.17	1.321	15.495	16.0	7.26	0.819	16.314	0.00	1.442	2.00	0.00	0.00	0.00
1.36	0.01995					.007881	0.01			1.000			
151.68	14.20	1.379	15.580	16.0	6.92	0.744	16.324	0.00	1.442	2.00	0.00	0.00	0.00
0.45	0.01995					.007020	0.00			1.000			

LICENSEE: SLATER HANIFAN GROUP

FO515P
WATER SURFACE PROFILE LISTING
CONORR HILLS (SHG Job No. RAHL310.000) - TECHNICAL DRAINAGE STUDY
RICHMOND AMERICAN HOMES
ULTIMATE CONDITION GRAND CANYON DRIVE STORM DRAIN

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.ELEV.	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO	AVBPR
L/ELEM	SO					SF AVE	HF								
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
152.13	14.21	1.442	15.652	16.0	6.60	0.676	16.328	0.00	1.442	2.00	0.00	0.00	0.00	0	0.00
JUNCT STR	0.10000					.006208	0.03								
157.13	14.71	1.811	16.521	8.0	4.53	0.318	16.839	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
130.50	0.00860					.005737	0.75			1.030					
287.63	15.83	1.500	17.332	8.0	4.53	0.318	17.650	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
33.20	0.00860					.005371	0.18			1.030					
320.83	16.12	1.360	17.477	8.0	4.75	0.350	17.827	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
13.43	0.00860					.005250	0.07			1.030					
334.26	16.23	1.280	17.513	8.0	4.98	0.385	17.898	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
9.78	0.00860					.005684	0.06			1.030					
344.04	16.32	1.213	17.530	8.0	5.22	0.423	17.953	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
5.84	0.00860					.006255	0.04			1.030					
349.88	16.37	1.155	17.522	8.0	5.48	0.466	17.988	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
HYDRAULIC JUMP															
349.88	16.37	1.030	17.397	8.0	6.18	0.594	17.991	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
38.61	0.00860					.008707	0.34			1.030					
388.49	16.70	1.030	17.729	8.0	6.18	0.594	18.323	0.00	1.096	1.50	0.00	0.00	0.00	0	0.00
54.83	0.00860					.008514	0.47			1.030					

Worst Case Flow @ Grand Canyon & Echelon Worksheet for Circular Channel

Project Description	
Worksheet	Worst Case Flow @ Grand Canyon & Echelon
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	1.53 %
Diameter	24.0 in

→ REFERENCED FROM THE MIDDLE SCHOOL STUDY

Results	
Depth	2.00 ft
Discharge	27.98 cfs
Flow Area	3.1 ft ²
Wetted Perimeter	6.28 ft
Top Width	0.00 ft
Critical Depth	1.83 ft
Percent Full	100.0 %
Critical Slope	1.33 %
Velocity	8.91 ft/s
Velocity Head	1.23 ft
Specific Energy	3.23 ft
Froude Number	0.00
Maximum Discharge	30.10 cfs
Discharge Full	27.98 cfs
Slope Full	1.53 %
Flow Type	N/A

≈ 28 CFS > 11 cfs (FLOW COLLECTED BY CONNOR HILLS)
+

11 CFS (COLLECTED BY MIDDLE SCHOOL STUDY DROP INLET)

28 CFS > 27 CFS, THEREFORE TOP OF
PIPE HGL UTILIZED FOR DESIGN

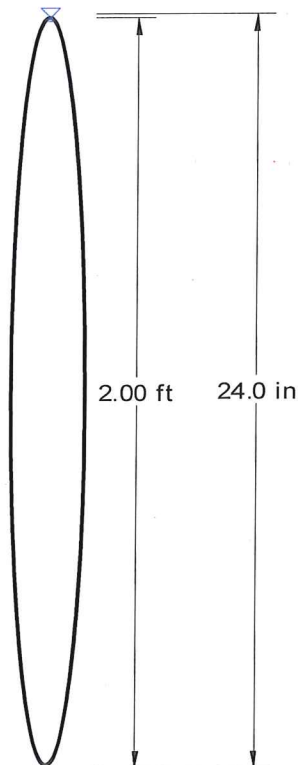
Worst Case Flow @ Grand Canyon & Echelon Cross Section for Circular Channel

Project Description

Worksheet	Worst Case Flow @ Grand Canyon & Echelon
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Section Data

Mannings Coefficient	0.013
Channel Slope	1.53 %
Depth	2.00 ft
Diameter	24.0 in
Discharge	27.98 cfs



V: 10.0
H: 1
NTS

APPENDIX F

Finished Floor Analysis

CONNOR HILLS FINISH FLOOR - CITY OF LAS VEGAS JURISDICTION										
INPUT INFORMATION					FINISHED FLOORS					NOTES
Lot Number	Hydraulic Section Utilized	T/C ¹ (ft)	F/L ² (ft)	D ₁₀₀ (ft)	Flowline F.F. _{min} ³ (ft)	T/C + 6" F.F. _{min} ⁴ (ft)	F.F. _{Design} (ft)	Flowline Check	T/C + 6" Check	See References on Last Sheet
1	ON1	2725.92	2725.42	0.35	2726.12	2726.42	2727.7	OK	OK	
2	ON1	2728.10	2727.60	0.35	2728.30	2728.60	2729.9	OK	OK	
3	ON1	2730.29	2729.79	0.35	2730.49	2730.79	2732.1	OK	OK	
4	ON1	2732.47	2731.97	0.35	2732.67	2732.97	2734.3	OK	OK	
5	ON1	2734.66	2734.16	0.35	2734.86	2735.16	2736.5	OK	OK	
6	ON1	2736.84	2736.34	0.35	2737.04	2737.34	2738.6	OK	OK	
7	ON1	2739.02	2738.52	0.35	2739.22	2739.52	2740.8	OK	OK	
8	ON1	2741.21	2740.71	0.35	2741.41	2741.71	2743.0	OK	OK	
9	ON1	2743.49	2742.99	0.35	2743.69	2743.99	2745.3	OK	OK	
10	ON1	2744.91	2744.41	0.35	2745.11	2745.41	2747.3	OK	OK	
11	ON1	2744.88	2744.38	0.35	2745.08	2745.38	2747.2	OK	OK	
12	ON1	2743.40	2742.90	0.35	2743.60	2743.90	2745.2	OK	OK	
13	ON1	2741.19	2740.69	0.35	2741.39	2741.69	2743.0	OK	OK	
14	ON1	2739.01	2738.51	0.35	2739.21	2739.51	2740.8	OK	OK	
15	ON1	2736.82	2736.32	0.35	2737.02	2737.32	2738.6	OK	OK	
16	ON1	2734.64	2734.14	0.35	2734.84	2735.14	2736.4	OK	OK	
17	ON1	2732.45	2731.95	0.35	2732.65	2732.95	2734.2	OK	OK	
18	ON1	2730.27	2729.77	0.35	2730.47	2730.77	2732.1	OK	OK	
19	ON1	2728.09	2727.59	0.35	2728.29	2728.59	2729.9	OK	OK	
20	ON1	2725.90	2725.40	0.35	2726.10	2726.40	2727.7	OK	OK	
21	ON2	2723.43	2722.93	0.38	2723.69	2723.93	2725.2	OK	OK	
22	ON2	2725.49	2724.99	0.38	2725.75	2725.99	2727.3	OK	OK	
23	ON2	2727.55	2727.05	0.38	2727.81	2728.05	2729.3	OK	OK	
24	ON2	2729.60	2729.10	0.38	2729.86	2730.10	2731.4	OK	OK	
25	ON2	2731.66	2731.16	0.38	2731.92	2732.16	2733.5	OK	OK	
26	ON2	2733.72	2733.22	0.38	2733.98	2734.22	2735.5	OK	OK	
27	ON2	2735.78	2735.28	0.38	2736.04	2736.28	2737.6	OK	OK	
28	ON2	2737.83	2737.33	0.38	2738.09	2738.33	2739.6	OK	OK	
29	ON2	2739.95	2739.45	0.38	2740.21	2740.45	2741.7	OK	OK	
30	ON2	2741.40	2740.90	0.38	2741.66	2741.90	2743.7	OK	OK	
31	ON2	2741.37	2740.87	0.38	2741.63	2741.87	2743.7	OK	OK	
32	ON2	2739.81	2739.31	0.38	2740.07	2740.31	2741.6	OK	OK	
33	ON2	2737.73	2737.23	0.38	2737.99	2738.23	2739.5	OK	OK	
34	ON2	2735.68	2735.18	0.38	2735.94	2736.18	2737.5	OK	OK	
35	ON2	2733.62	2733.12	0.38	2733.88	2734.12	2735.4	OK	OK	
36	ON2	2731.56	2731.06	0.38	2731.82	2732.06	2733.4	OK	OK	
37	ON2	2729.50	2729.00	0.38	2729.76	2730.00	2731.3	OK	OK	
38	ON2	2727.45	2726.95	0.38	2727.71	2727.95	2729.2	OK	OK	
39	ON2	2725.39	2724.89	0.38	2725.65	2725.89	2727.2	OK	OK	
40	ON2	2723.33	2722.83	0.38	2723.59	2723.83	2725.1	OK	OK	

Where:
1: Top of Curb at High Side of Lot
2: TC-0.38 (For Roll Curb), TC-0.5 (For L Curb)
3: Minimum Allowable Finished Floor Elevation above flowline elevation @ high side of lot = (2 x D₁₀₀) + F/L
4: City of Las Vegas minimum allowable finished floor elevation = T.C. @ high side of lot + 6-inches
5: These lots have an adjacent solid grouted wall that protects the FF.

City of Las Vegas Finished Floor Criteria:
-The finished floor shall be set a 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 WSEL in the street.
-The finished floor shall be set a vertical distance of at least 6-inches above the highest adjacent top of curb.

Finished Floors Adjacent to Drainage Easements						
Lot	High TC/FL ¹	Flow Depth ²	Min FF ³	Design FF	Check	Solid Grout
10	2744.95	0.48	2746.93	2747.30	OK	No
11	2744.95	0.48	2746.93	2747.20	OK	No
30	2741.06	0.52	2743.08	2743.70	OK	No
31	2741.06	0.52	2743.08	2743.70	OK	No

1: High TC/FL is at the high side of the drainage easement flowline or the highest TC adjacent to the easement if flow is weiring over the curb.

2: Flow depth is either normal depth or weir depth (whichever is higher).

3: Min FF is the High TC/FL plus the Flow Depth plus 18 inches.

APPENDIX G

Reference Material

Technical Drainage Study for Deer Springs and Grand Canyon

Approval Letter(s)



Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: dlc@ClarkCountyNV.gov

Drainage Study Approval Letter

Date: January 13, 2014
Firm: TCE
Engineer: John McAvoy, P.E.
Address: 3277 East Warm Springs Road, Suite 400, Las Vegas, NV 89120
Phone: (702) 932-6125
Fax: (702) 932-6129
E-mail: jmcavoy@tce-lv.com

Subject: Technical Drainage Study for Deer Springs and Grand Canyon
Location: SEC of Dorrell Lane and Eula Street
APN: 125-19-202-001, -002, -003, -004, -009, -010, -011, -012
125-19-299-003
Sec, Township, Range: S19, T19S, R60E
Flood Zone & Panel: Zone X, 1745E, Dated September 27, 2002
Application Tracking #: 13-31940



Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Technical	08/08/2013	09/18/2013	WG	
Addendum #1	11/01/2013	12/31/2013	WG	
Supplement	01/06/2014	01/13/2014	WG	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is required
	City of Henderson	Adjacent to or Impacts Henderson
X	City of Las Vegas	Adjacent to or Impacts Las Vegas
	City of North Las Vegas	Adjacent to or Impacts North Las Vegas
	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corp of Engineers	Impacts a USACE Facility
	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

The referenced **Technical Drainage Study** has been reviewed and is accepted as complying with minimum improvement standards. As set forth in the subject drainage study, the following measures will be taken to mitigate flood hazards.

The site shall be graded with respect to drainage as shown on "Grand Canyon/Deer Springs", grading plan sheets C1, C2, C3, G1, G2, G3, G4, D1, D2, signed and sealed by Gary S. Kazio, P.E., on January 6, 2014 and sheets P1, P2, P3, P4, P5, P6, P8, P16 signed and sealed by Gary S. Kazio, P.E., on October 31, 2014.

Check appropriate conditions

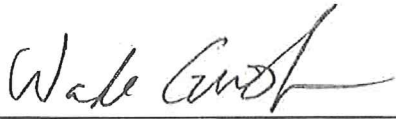
X	Retaining/screen wall combination may be in excess of current Clark County Unified Development Code, Chapter 30.64.050.
	A FEMA Elevation Certificate, completed by a licensed surveyor, must be submitted to and approved by CCPW Development Review Plan Check prior to the issuance of Certificates of Occupancy for those structures.
X	Mylars of the grading plan must be submitted to the CCPW Development Review Plan Check for approval signatures prior to map recordation (residential) or permit issuance (commercial).
	An administrative variance to allow the finished floor elevation(s) to be set below the current Clark County criteria must be approved. The finished floor variance must be submitted to CCPW Development Review front counter after drainage study approval and prior to offsite final review.
	The grading plan will be reviewed by the Building Office Operations Division to ensure compliance with the ADA access requirements. Revisions to the grading plan may be required if the site accessibility design does not comply with the requirements set forth in the Accessibility Chapter of the Clark County Building Code.
	The plans show work is proposed on another property. Notarized written permission must be obtained prior to plan approval. A grading permit must be obtained from Building Dept prior to grading.
X	Right-of-way dedication must be verified.
	Any previously approved drainage easements that are not being used must be vacated.
	Per <i>Regional Flood Control District policies and Procedures manual, Section VIII. D. 13. Uniform Regulations for the Control of Drainage</i> , the Engineer of Record shall provide As-Built plans or record drawings to the District after completion and final inspection of such privately installed flood control facilities that have regional flood control significance.
	Structural calculations are required. The structural calculations, plans, and details must be approved prior to "Offsite" submittal and prior to CCRFCD submittal, if applicable.
X	Plan revisions can be found on the red-lined plans and must be addressed.
X	Prepare drainage easement documents as shown on the grading plans.

Additional Conditions:

1. Note the latest plan set provided did not include revised profile sheets. Any changes made on the grading plan sheets will need to be reflected in future profile sheets.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

By

 for:

W. Layne Weber, P.E., CFM
Principal Engineer
Clark County Public Works
Development Review

CITY OF LAS VEGAS			DATE:	
INTER-OFFICE MEMORANDUM			March 19, 2014	
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: Deer Springs and Grand Canyon (Project in Clark County for CLV Concurrence)			COPIES TO: Thomason Consulting Engineers	
Cross Streets:	NWQ Deer Springs Way & Grand Canyon Dr		Richmond American Homes	
File Number:	F:\Depot\DSMemos\DS4652A-REV.doc		Bart Anderson, P.E., DevCo	
Parcel Number:	125-19-202-001 & more		CCPW	
Zoning Action:	N/A			
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	1/28/2014	2/11/2014	Not Approved	\$400.00	346218: \$400
Revised Memo	3/19/2014	3/19/2014	See Comments Below	N/C	N/C
			TOTAL FEES (LDDRS):	\$400.00	****

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 Public Works Department concurrence.

City of Las Vegas Flood Control staff has reviewed the Technical Drainage Study, including the Addendum #1 of the subject development "**Deer Springs and Grand Canyon**" within the jurisdiction of the **County of Clark**. **City of Las Vegas** concurs with the acceptance of the drainage study by the **Clark County Public Works Department**. The review of this project was limited to issues of flood control significance to the **City of Las Vegas**.

Please note that this letter of concurrence is issued only for the original design at the intersection of Dorrell Lane and Eula Street with no roundabout as proposed by Richmond American Homes / Thomason Consulting Engineers.

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 Update 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 OF REMARKS

ays

T/R/S: T19S/R60E/19
AREA G-19

Drainage Exhibits

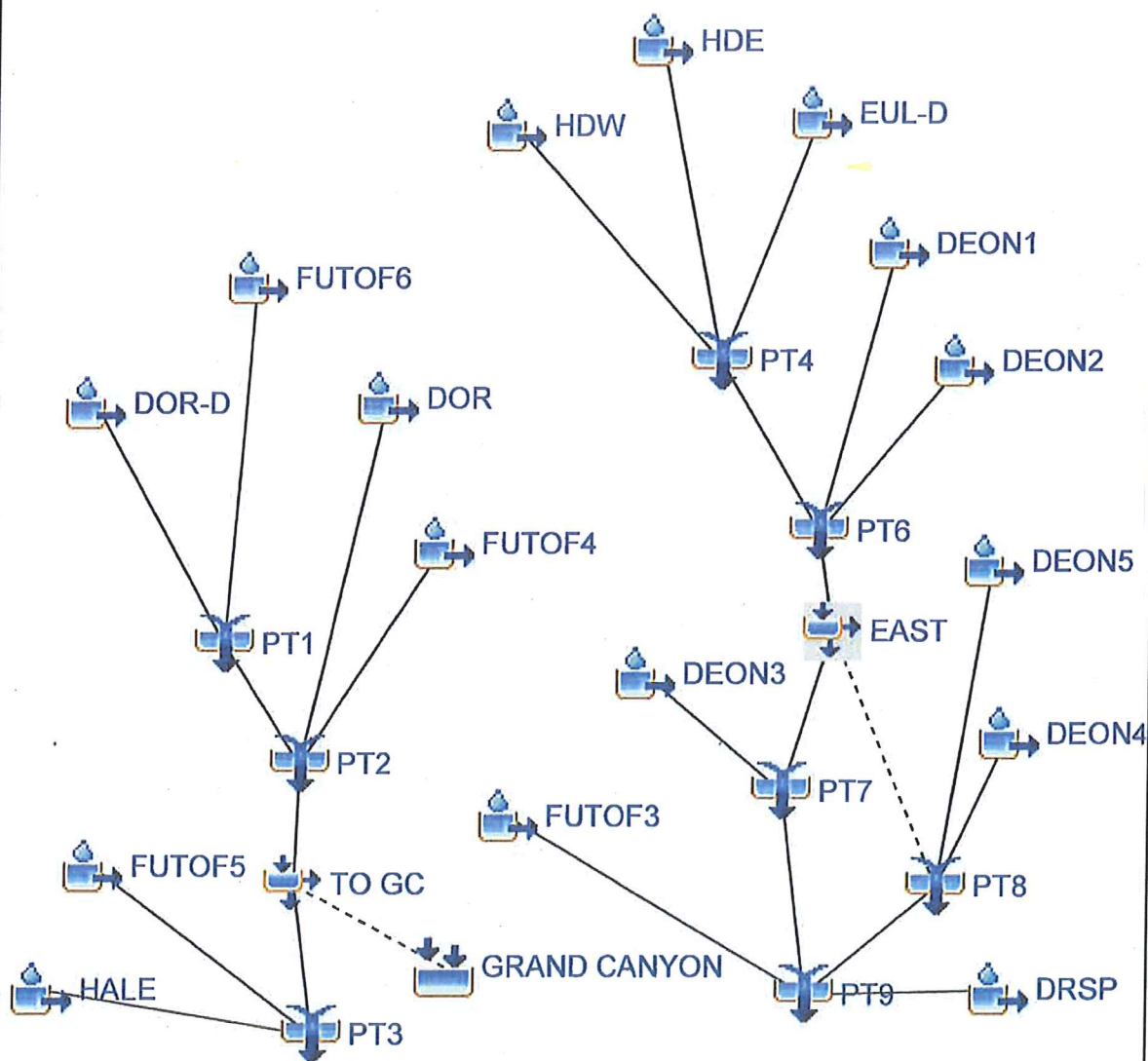


HEC-HMS

Project : Deer Springs Add1

Basin Model : FULL100

Oct 30 16:10:37 PDT 2013



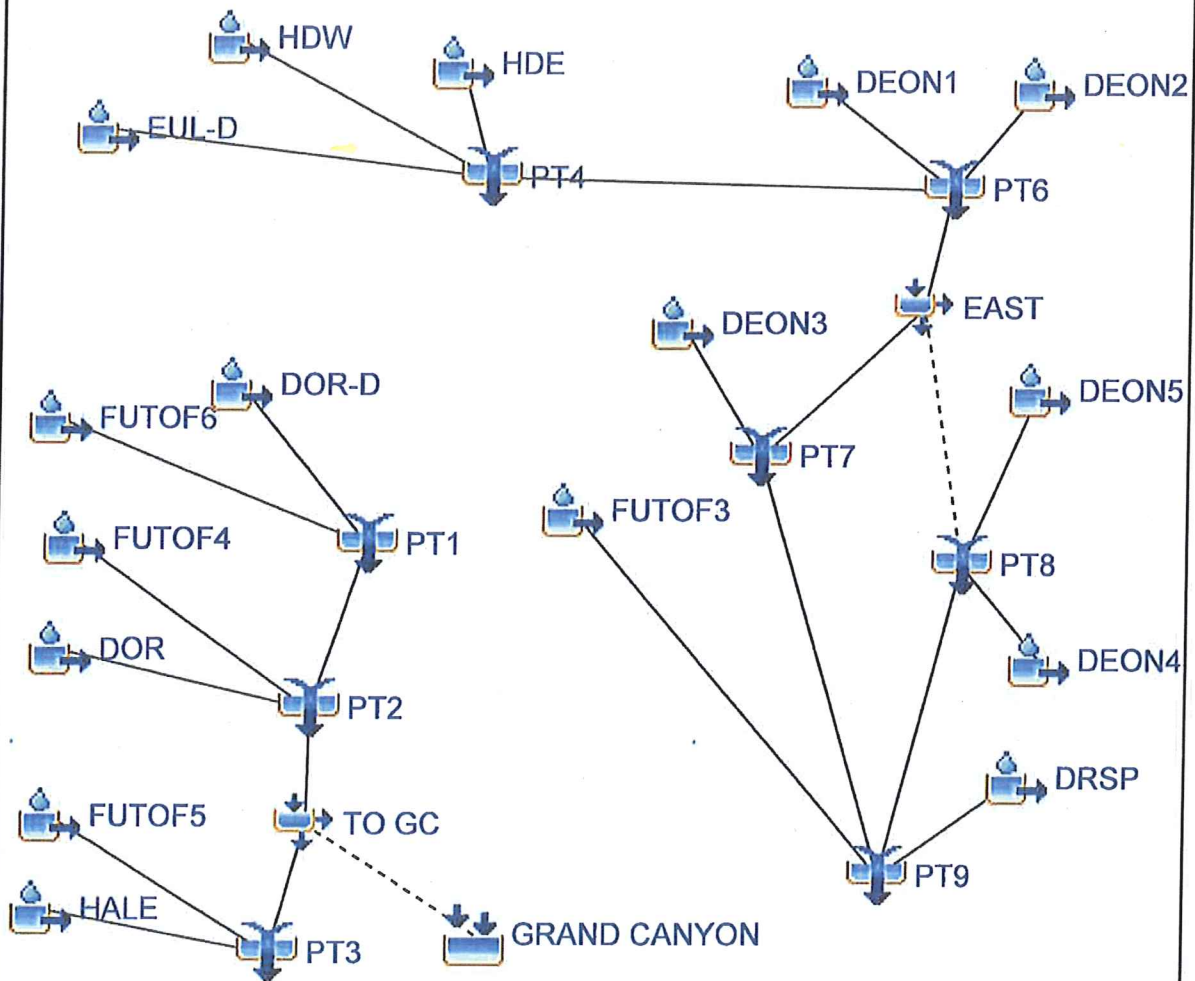


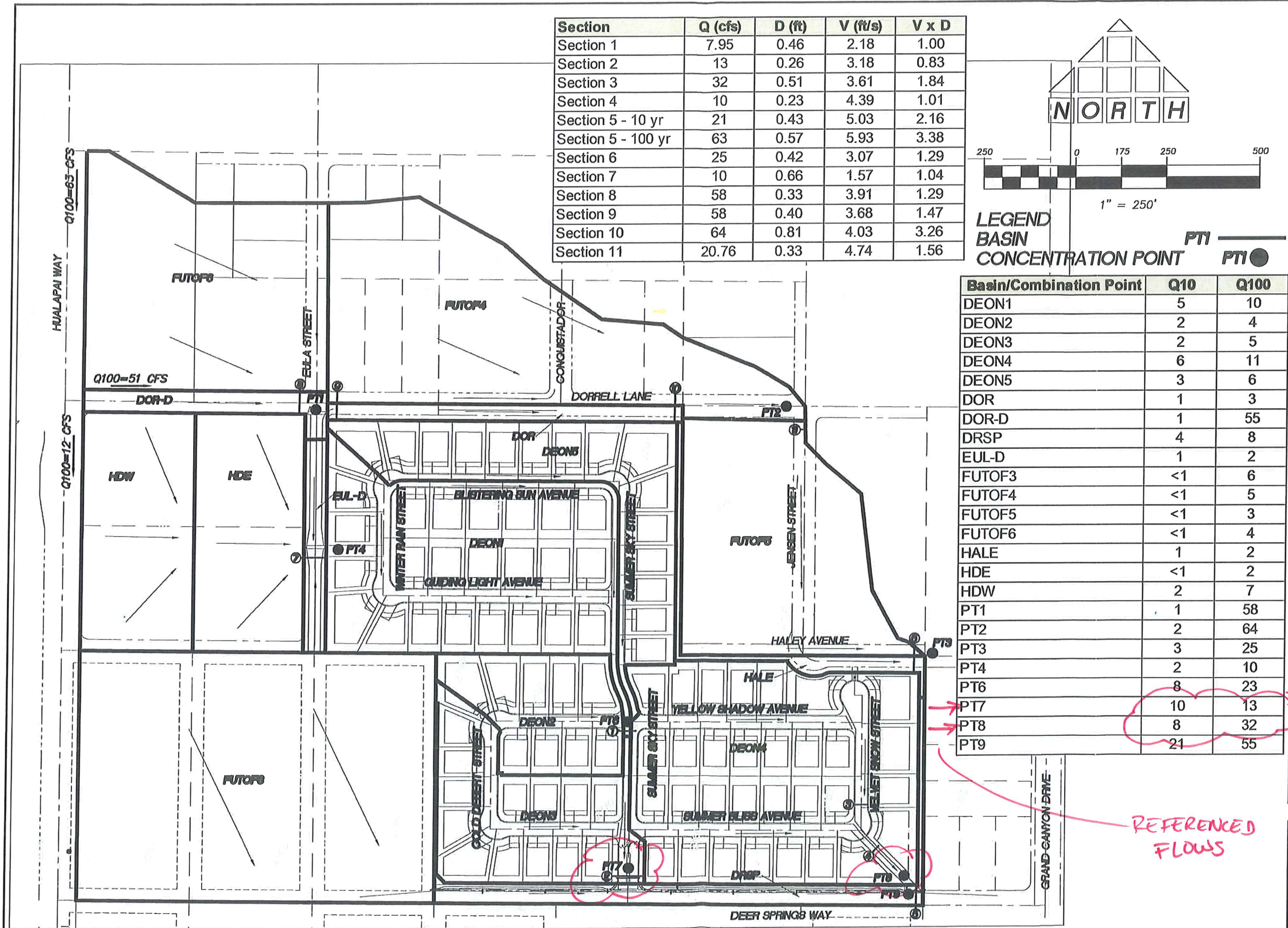
HEC-HMS

Project : Deer Springs Add1

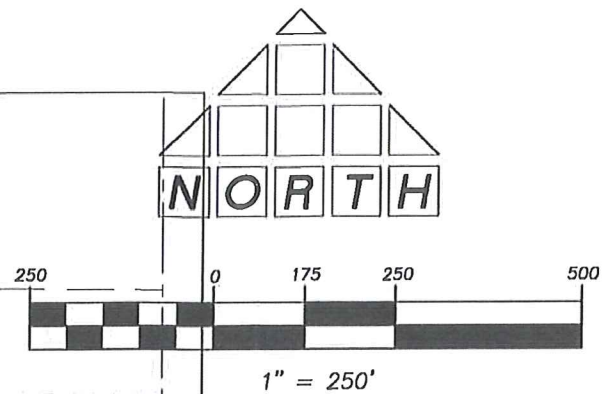
Basin Model : FULL10

Oct 30 16:09:30 PDT 2013





Section	Q (cfs)	D (ft)	V (ft/s)	V x D
Section 1	7.95	0.46	2.18	1.00
Section 2	13	0.26	3.18	0.83
Section 3	32	0.51	3.61	1.84
Section 4	10	0.23	4.39	1.01
Section 5 - 10 yr	21	0.43	5.03	2.16
Section 5 - 100 yr	63	0.57	5.93	3.38
Section 6	25	0.42	3.07	1.29
Section 7	10	0.66	1.57	1.04
Section 8	58	0.33	3.91	1.29
Section 9	58	0.40	3.68	1.47
Section 10	64	0.81	4.03	3.26
Section 11	20.76	0.33	4.74	1.56



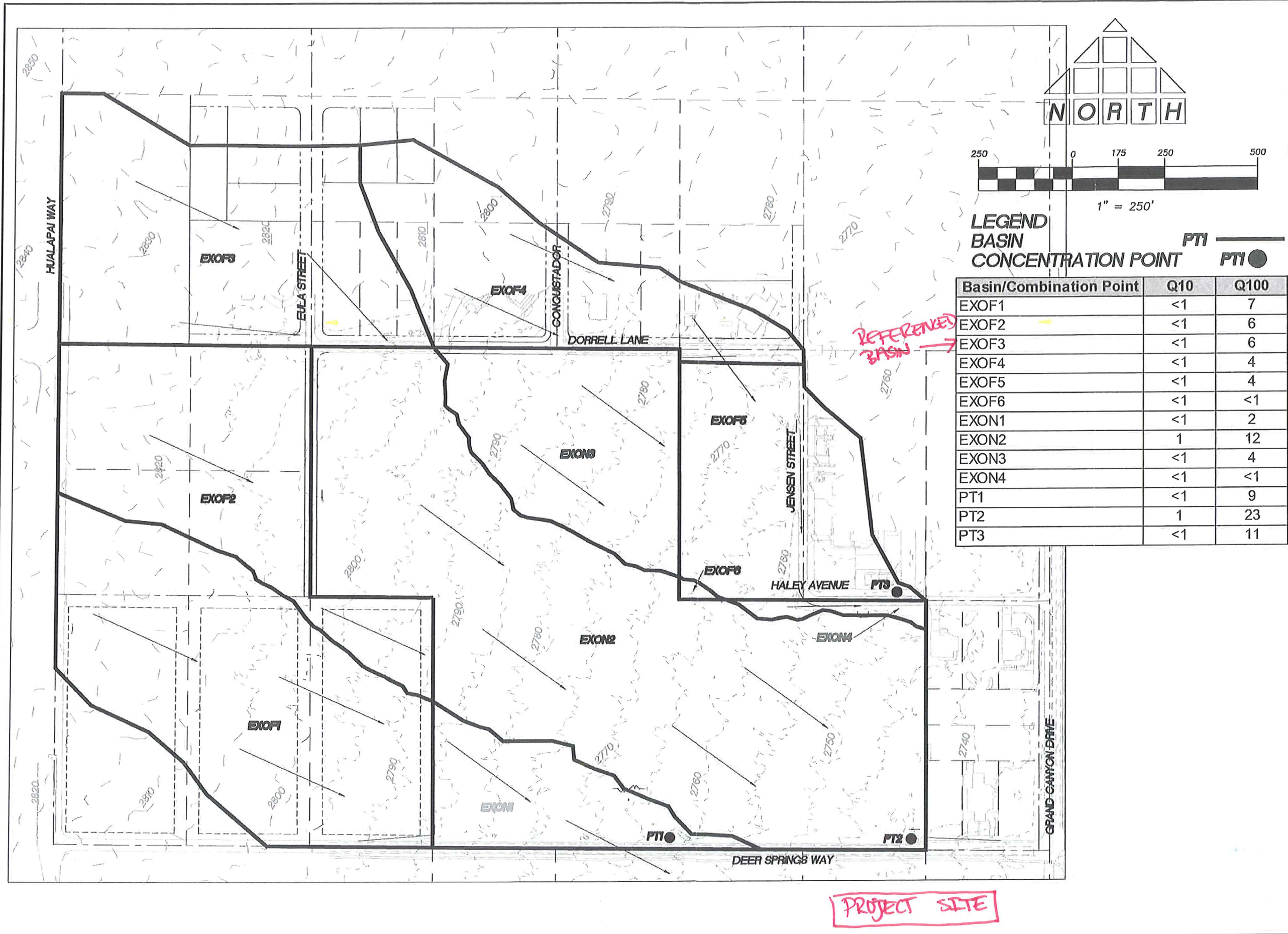
LEGEND
 BASIN
 CONCENTRATION POINT

Basin/Combination Point	Q10	Q100
DEON1	5	10
DEON2	2	4
DEON3	2	5
DEON4	6	11
DEON5	3	6
DOR	1	3
DOR-D	1	55
DRSP	4	8
EUL-D	1	2
FUTOF3	<1	6
FUTOF4	<1	5
FUTOF5	<1	3
FUTOF6	<1	4
HALE	1	2
HDE	<1	2
HDW	2	7
PT1	1	58
PT2	2	64
PT3	3	25
PT4	2	10
PT6	8	23
PT7	10	13
PT8	8	32
PT9	21	55

REFERENCED
 FLOWS

THOMASON
 CONSULTING
 ENGINEERS
 3277 E. WARM SPRINGS ROAD, SUITE 400
 LAS VEGAS, NEVADA 89120
 702-932-6125 FAX: 702-932-6129

RICHMOND AMERICAN
 DEER SPRINGS / GRAND CANYON
 FULLY DEVELOPED DRAINAGE CONDITIONS
 FIGURE 8



Basin/Combination Point	Q10	Q100
EXOF1	<1	7
EXOF2	<1	6
EXOF3	<1	6
EXOF4	<1	4
EXOF5	<1	4
EXOF6	<1	<1
EXON1	<1	2
EXON2	1	12
EXON3	<1	4
EXON4	<1	<1
PT1	<1	9
PT2	1	23
PT3	<1	11

T **THOMASON**
C **CONSULTING**
E **ENGINEERS**
3277 E. WARM SPRINGS ROAD, SUITE 400
LAS VEGAS, NEVADA 89120
702-932-6125 FAX: 702-932-6129

RICHMOND AMERICAN
DEER SPRINGS / GRAND CANYON
EXISTING DRAINAGE CONDITIONS
FIGURE 5

APPENDIX H

Reference Material

Technical Drainage Study for Town Center L-TC 60/75 No.5

Approval Letter(s)

05-55610
TDS
12-21-05

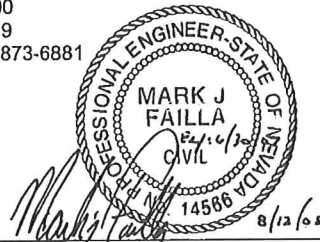
TECHNICAL DRAINAGE STUDY

Town Center L-TC 60/75 No. 5
City of Las Vegas, Clark County, Nevada

Job No.: PAR0302.007A
Date: August 2005

Prepared By:
Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
Las Vegas, Nevada 89118
Phone: 702-284-5300 • Fax: 702-284-5399

Prepared For:
Pardee Homes
650 White Drive, Suite 100
Las Vegas, Nevada 89119
Phone: 702-614-1400 • Fax: 702-873-6881



Mark J. Failla
NV Professional Engineer No. 14566

Assisted by: Justin Stoker, E.I.

05-55610 LTD

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		December 7, 2006
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Technical Drainage Study for: Town Center L-TC 60/75 No. 5 - Update #2		COPIES TO: Slater Hanifan Group
Cross Streets:	Grand Canyon Dr. & Deer Springs Way	Pardee Homes
File Number:	F:\Depot\DSMEMOS\DS3877E.doc	Bart Anderson, P.E., DevCo
Parcel Number:	125-19-501-009, -010; -601-001, 007	Darcy Hayes, Ward 4 Liaison
Zoning Action:	SDR-6315, ZON-6312, VAR-6328	CCDDS
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES X NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Trn. No.
1 st Submittal	8/12/2005	9/1/2005	Not Approved	\$400.00	27654: \$400
2 nd Submittal	10/27/2005	11/18/2005	Not Approved	\$400.00	32344: \$400
3 rd Submittal	12/6/2005	12/19/2005	Conditional Approval	\$400.00	34590: \$400
4 th Submittal	3/13/2006	3/27/2006	Approved	\$400.00	40420: \$400
5 th Submittal	11/22/2006	12/7/2006	See Comments Below	\$100.00	58310: \$100
TOTAL FEES (LDDRS):				\$1,700.00	

REMARKS:

5th Submittal: Update #2 to revise Common Lot D to have landscape rock in place of concrete

4th Submittal: Update to Re-align the main line storm drain in Grand Canyon Drive and Deer Springs Drive to accommodate for an existing gas line and Raise Finish Floor Elevation of Lots 41, 42, 48 & 49. The Raise varies from 0.2 ft to 0.5 ft.

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: Italicized comments are repeated comments).

- The engineer has provided 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.
- The drainage study assumes that the project will be constructed in one phase. If improvement plans are submitted to break the project into separate phases, a drainage study update will be required for each phase addressing the interim condition.
- 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.

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 OF REMARKS
B&H/cld/ays

T/R/S: T19S/R60E/19
AREA G-19



Department of Development Services Civil Engineering Division

500 S Grand Central Pky 1st Fl • PO Box 551799 • Las Vegas NV 89155-1799
(702) 455-4600 • Fax (702) 388-2550

Phil Rosenquist, Director



March 6, 2006

OS 55610
LTR

Slater Hanifan Group
5740 South Arville Street, Suite 216
Las Vegas, NV 89118

TECHNICAL DRAINAGE STUDY FOR TOWN CENTER 60/75 NO.5 - SEC. 19, T. 19 S., R. 60 E. - HTE 05 - 55610

The above-referenced site is located in the City of Las Vegas adjacent to Clark County unincorporated areas. The drainage study was submitted to the County for concurrence. The County has received the study with all addenda, and the approval letter dated December 19, 2005 from the City of Las Vegas.

The County concurs with the acceptance of this drainage study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

No liability is assumed by the County for information, data, and conclusions of the consulting engineer.

DEPARTMENT OF DEVELOPMENT SERVICES

BY:

Jeffery J. Jensen, P.E.
Senior Civil Engineer
Civil Engineering Division

JJJ: pts *PL*

cc: Greg McDermott, P.E., Flood Control Project Manager
City of Las Vegas Department of Public Works

BOARD OF COUNTY COMMISSIONERS
RORY REID, Chairman • MYRNA WILLIAMS, Vice Chair
TOM COLLINS • YVONNE ATKINSON GATES • CHIP MAXFIELD • LYNETTE BOGGS McDONALD • BRUCE L. WOODBURY
THOM REILLY, County Manager

HEC-1 Model

Drainage Exhibits

05-5500
ADDI
12-21-05

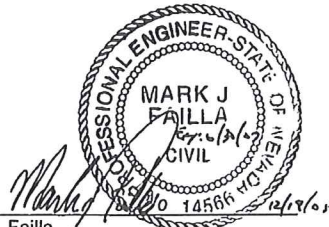
**TECHNICAL DRAINAGE STUDY
RESPONSE TO COMMENT NO.1**

Town Center L-TC 60/75 No. 5
City of Las Vegas, Clark County, Nevada

Job No.: PAR0302.007
Date: October 2005

Prepared By:
Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
Las Vegas, Nevada 89118
Phone: 702-284-5300 • Fax: 702-284-5399

Prepared For:
Pardee Homes
650 White Drive, Suite 100
Las Vegas, Nevada 89119
Phone: 702-614-1400 • Fax: 702-873-6881



Mark J. Failla
NV Professional Engineer No. 14566

Assisted By: Libby R. Howells

4. **Comment:** *The engineer must provide a table on the grading plans that show a quantity estimate of all drainage improvements within Public Drainage Easements. All drainage improvements within Public Drainage Easements must be bonded and inspected.*

Response: Acknowledged. A table has been placed on Sheet G-1 summarizing the flood control improvements for the project.

5. **Comment:** *The grading plan shows a screen/retaining wall proposed to an existing wall along the west boundary of the site adjacent to the existing Ridgeway development. Planning and Development Department approval is required for the double wall. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the double wall to the City Planning Department (229-6301). The engineer must provide Planning approval with the next submittal.*

Response: Acknowledged. A copy of email correspondence with the City of Las Vegas indicating approval of the double walls from the Planning Department is included in Appendix B.

6. **Comment:** *Additional detail must be provided for the 54-inch storm drain through the existing Ridgeway drainage easement. It is proposed to daylight the 54-inch pipe in the existing easement but no detail was given for the headwall or how the channel was to be reconstructed to accommodate the pipe. The engineer must also consider maintenance and access to this area when doing the design. Since the construction will affect the functionality of the common lot of the Ridgeway subdivision, the engineer must obtain an acknowledgement from the Ridgeway HOA of the work to be performed.*

Response: Additional information on the drainage easement has been provided in a detail and in the profile view. The additional details/profiles provide headwall and channel reconstruction details. Per conversations with Bill Maggiora with RS Development, he conveyed that the Ridgeway development does not have an HOA and that these facilities are all public and publically maintained. The portion of the drainage facility within Pardee's boundary is within Common Lot D which is to be owned by the HOA and privately maintained by the HOA.

7. **Comment:** *The drop inlet calculations for DI #4 at STA 15+35 on Grand Canyon must be revised. The calculation assumes that the entire 340 cfs is contained within 2% half street. The flow should be divided on both sides of the crown on Grand Canyon. The calculation must be reviewed and revised. Also, the City typically does not allow inlets longer than 20-feet in length. If needed the inlet should be split into two equal lengths.*

Response: The configuration for the previously proposed drop inlet #4 has been revised to comply with the CLV criteria. A half street capacity calculation is provided showing that Grand Canyon at 1.55% has a capacity for 23-cfs before overtopping the crown of the street. The total flow in the street at the questioned location is 340-cfs in the interim "worst case" condition. It is therefore assumed that the street flow equalizes across the crown following each drop inlet. In order to comply with CLV criteria, drop inlet #4 was downsized to 20 feet and a second, identical drop inlet (drop inlet #7) is proposed next to it. The total intercepted flow by the two drop inlets is 142-cfs. Note that the original design with one

drop inlet intercepted 152-cfs. This leaves an additional 10-cfs to that originally designed flowing through the Grand Canyon right-of-way. However, compared to the total flow in the right of way, 10-cfs is not deemed a significant increase. The two drop inlets are placed in series to collect the runoff and convey the storm flow to the existing concrete channel located along the Dorrell alignment. Note that while the WSPG analysis was revised for the storm drain system in question, in order to calculate the HGL for the second 20' drop inlet an inlet control calculation was performed and is included in Appendix D. Revised drop inlet calculations, revised WSPG analysis for the storm drain system and the half street capacity calculations have also been provided in Appendix C for reference. Note that interim and ultimate calculations for the drop inlets are included.

8. **Comment:** *All public drainage easements must be designed to conform to CLV standard drawing no. 421. Concrete bollards should be placed at the upstream side and a wrought iron gate at the downstream side of the easement. Common lots B, D and F be revised to reflect this standard drawing.*

Response: Acknowledged. The plans have been revised accordingly.

9. **Comment:** *Grading elevations and slopes must be shown on Common Lot L.*

Response: Acknowledged. The plans have been revised accordingly.

10. **Comment:** *Future/Proposed TC elevations must be shown for the Quencia Ridge development by Baughman & Turner on the west side of Grand Canyon Drive.*

Response: Acknowledged. The plans have been revised accordingly.

11. **Comment:** *The floodwall/retaining wall along Grand Canyon Drive must be designed to have a minimum of 18-inches of freeboard above the 100-year water surface elevation since the adjacent pads are below street elevation. Details P, R and Z must be revised to show a minimum of 18-inches of freeboard in the floodwall and use 8-inch CMU block solid grouted to the freeboard elevation.*

Response: A Flowmaster section hydraulic analysis has been performed in order to determine the worst-case flow depth in Grand Canyon. It is computed using the worst-case interim flow of 340-cfs from CP.2D across a developed street. The depth for this section is 1.0'. The details will be revised to call out a floodwall to 1.0' and a solid grouted wall utilizing 8-inch CMU blocks to 18-inches above the floodwall for freeboard protection. The hydraulic street section is found in Appendix D.

12. **Comment:** *Revised the north arrow to point to the correct direction on Exhibit F.*

Response: The orientation of the north arrow on Exhibit F has been corrected to properly depict north. Revised Exhibit F is found in Appendix E.

13. **Comment:** *The drainage study assumes that the project site will be constructed in one phase. If improvement plans are submitted to break the project into separate phases, a drainage study update will be required for each phase addressing the interim condition.*

Response: Acknowledged. The project is to be constructed in one phase.

J:\PAR0302-007\Drainage\Technical Study\Response to Comments\Report\RTC1-TOWN CENTER 6075 NO5.doc

APPENDIX C

Comment No.7

- Revised DI Calculations
 - Revised WSPG
- Half Street Capacity Calculations

DROP INLETS 4 & 7 (100YR) ULTIMATE - REVISED **Worksheet for Combination Inlet On Grade**

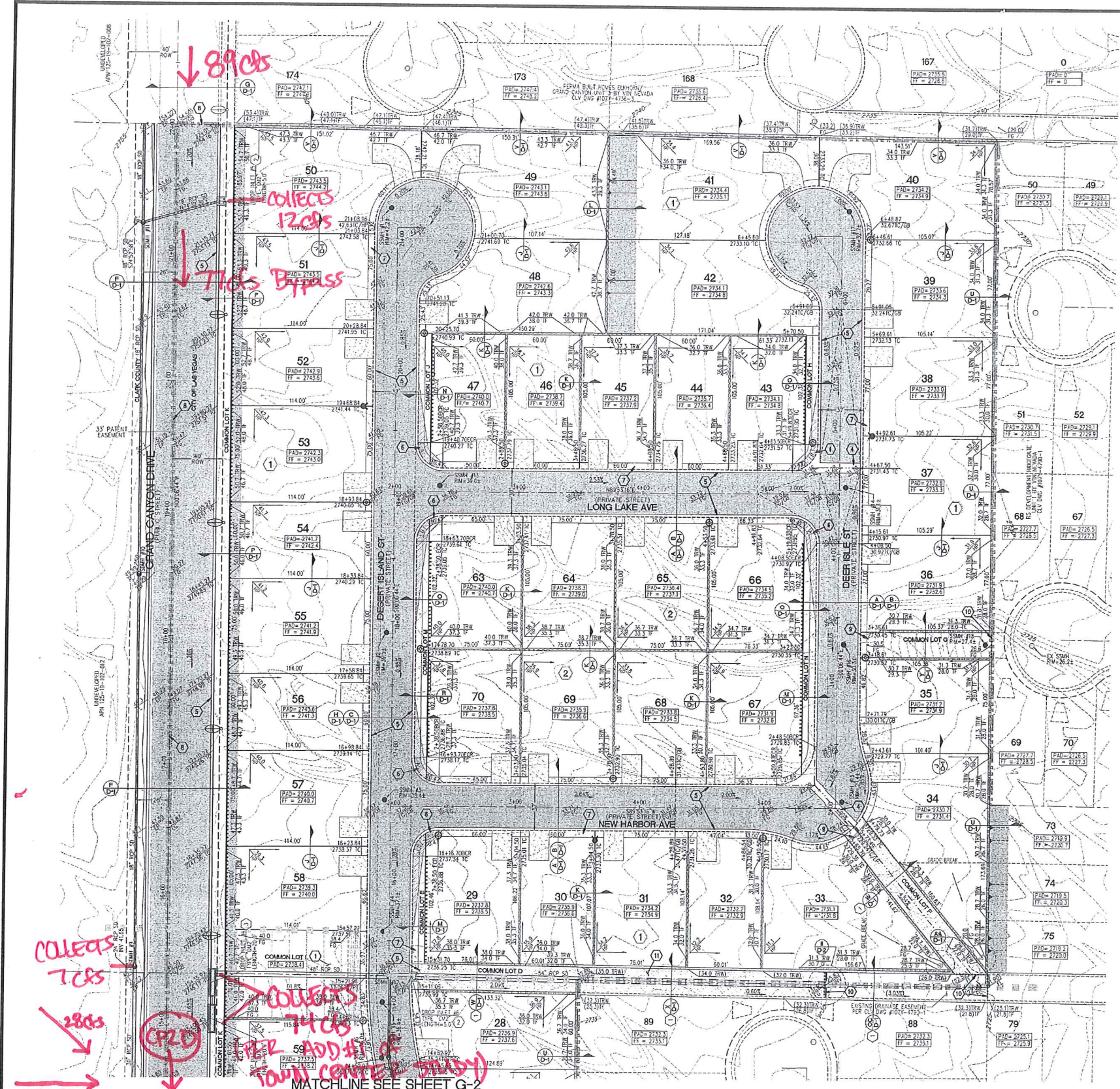
Project Description	
Worksheet	DROP INLETS 4 & 7 (100YR) ULTIMATE - REVISED
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	71 cfs
Local Depression	2.0 in
Local Depression Width	1.50 ft
Channel Slope	1.55 %
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Mannings Coefficient	0.015
Curb Opening Length	10.00 ft
Grate Width	1.50 ft
Grate Length	10.00 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	0.0 %

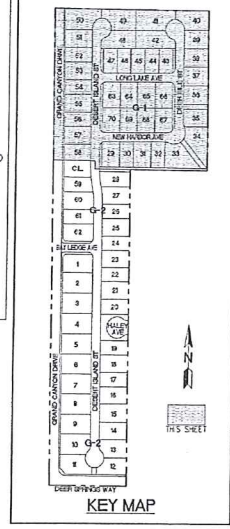
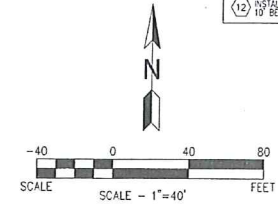
Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results	
Efficiency	0.52
Total Intercepted Flow	37 cfs
Bypass Flow	34 cfs
Spread	31.89 ft
Depth	0.73 ft
Flow Area	10.2 ft ²
Gutter Depression	1.1 in
Total Depression	3.1 in
Velocity	6.94 ft/s
Splash Over Velocity	33.20 ft/s
Frontal Flow Factor	1.00
Side Flow Factor	0.45
Grate Flow Ratio	0.13
Equivalent Cross Slope	3.62 %
Active Grate Length	10.00 ft
Length Factor	0.00
Total Interception Length	0.00 ft

Approved Grading Plans



- GRADING NOTES**
1. PUBLIC DRAINAGE AND PUBLIC UTILITY EASEMENTS TO BE PRIVATELY MAINTAINED BY THE HOA
 2. INSTALL TYPE "C" DROP INLET PER SHEET D-3
 3. INSTALL TYPE "C" DROP INLET PER SHEET D-3
 4. CONSTRUCT 8" CROSS CUTTER PER CAUSS NO. 228 AND DETAIL G SHEET D-2
 5. CONSTRUCT 12" TYPE CURB AND GUTTER PER CAUSS NO. 216
 6. CONSTRUCT SIDEWALK PER CAUSS NO. 224
 7. CONSTRUCT SIDEWALK PER CAUSS NO. 224
 8. SAW CUT AND TE INTO EXISTING ASPHALT
 9. INSTALL REMOVABLE BOLLARDS PER CAUSS NO. 228 AND DETAIL G SHEET D-2
 10. INSTALL WOODEN FENCE PER CAUSS NO. 216
 11. REMOVE AND REPLACE EXISTING CONCRETE PER CAUSS NO. 216
 12. INSTALL RIP RAP D50-3" THICKNESS 4" 10' BEHIND BACK OF SIDEWALK



NOTE:
-ALL PRIVATE STREETS ARE P.A.L.E. PUBLIC SEWER EASEMENTS, L.V.I.D. EASEMENTS AND PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY HOA.
-ALL PUBLIC DRAINAGE EASEMENTS ARE COMMON LOTS TO BE PRIVATELY MAINTAINED BY THE HOA.

FEMA FLOOD ZONE DESIGNATION
THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE X (AREA OUTSIDE THE 500-YEAR FLOOD PLAIN). PER FIRM PANEL 32003C1745 C, DATED SEPTEMBER 27, 2002.

FLOOD CERTIFICATION
I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED FLOOD STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THE SUBJECT PROJECT.
Todd Steadham DATE: 11/01/05
TODD STEADHAM, P.E. 15292

STORM DRAIN SYSTEM		PRIVATE	PUBLIC
1. 18" I.D. RCP STORM DRAIN	LF	-	759
2. 24" I.D. RCP STORM DRAIN	LF	-	66
3. 30" I.D. RCP STORM DRAIN	LF	-	379
4. 36" I.D. RCP STORM DRAIN	LF	-	1,354
5. 48" I.D. RCP STORM DRAIN	LF	-	144
6. 54" I.D. RCP STORM DRAIN	LF	-	352
7. 24" TYPE "C" DROP INLET	EA	-	1
8. 30" TYPE "C" DROP INLET	EA	-	4
9. 36" TYPE "C" DROP INLET	EA	-	1
10. 20" TYPE "C" DROP INLET	EA	-	2
11. 48" TYPE I STORM DRAIN MANHOLE	EA	-	5
12. 48" TYPE II STORM DRAIN MANHOLE	EA	-	7
13. 60" TYPE II STORM DRAIN MANHOLE	EA	-	3
14. SIDEWALK UNDERDRAIN	EA	-	4

NOTE: ALL DRAINAGE QUANTITIES ARE TO BE BONDED FOR AND INSPECTED.

BLOCK WALLS		LF	
1. RETAINING 1-2 FT HIGH	LF	810	-
2. RETAINING 2-4 FT HIGH	LF	3,770	-
3. RETAINING 4-6 FT HIGH	LF	750	-
4. PERIMETER RETAINING 1-2 FT HIGH	LF	220	-
5. PERIMETER RETAINING 2-4 FT HIGH	LF	470	-
6. PERIMETER RETAINING 4-6 FT HIGH	LF	1,910	-
7. WROUGHT IRON FENCE	LF	130	-
8. 12" FLOODBALL	LF	900	-
9. 18" FLOODBALL	LF	960	-
10. 1 COURSE SOLID GROUT WALL	LF	275	-

- LEGEND**
- PROPERTY LINE
 - MATCHLINE
 - SIGHT VISIBILITY ZONE
 - LOT NUMBER
 - BLOCK NUMBER
 - PAD ELEVATION
 - FINISH FLOOR ELEVATION
 - EXISTING CONTOUR (5' INTERVAL)
 - EXISTING CONTOUR (1' INTERVAL)
 - CUT/FILL TRANSITION LOT
 - PROPOSED ELEVATION
 - EXISTING ELEVATION
 - FUTURE ELEVATION
 - 8" DECORATIVE PERIMETER BLOCK WALL W/RETAINING
 - 6" DECORATIVE PERIMETER BLOCK WALL
 - RETAINING WALL W/ R/W SCREEN WALL
 - KNEE WALL (RETAINING)
 - FLOOD WALL
 - TOP OF CURB
 - FINISHED GRADE
 - FLOW LINE
 - GRADE BREAK
 - EXISTING GROUND
 - PROPERTY LINE
 - RIGHT OF WAY
 - TOP OF RETAINING WALL
 - TOP OF FOOTING
 - COMMON LOT
 - LOW POINT
 - EXISTING MANHOLE
 - PROPOSED MANHOLE

BASIS OF BEARINGS
NORTH 91°42' EAST, BEING THE LINE BETWEEN THE COGS MONUMENTS 830 TO COGS MONUMENT 872, USING THE NAD 83 NEVADA EAST ZONE, PUBLISHED VALUES PER R.O.S. IN THE FILE 83 PG 53 OF SURVEYS, RECORDS IN THE CLARK COUNTY, NEVADA.

BENCHMARK
PIVOT AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE 30.15.
BENCHMARK: CLARK COUNTY BM 0040 1716
NAVD 83 ELEVATION = 759.117 (M)
2621.770 (F) V 1994 INITIAL PROJECT BM.
CLARK COUNTY ELEVATION MINUS 817' EQUALS
CITY OF LAS VEGAS ELEV 2621.670 (F) - 759.087 (M) V 2003

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

Avoid hitting overhead power lines. It's costly.
Call before you Over-Head.
1-702-227-2929

Call before you UnderGround
1-702-455-7511
1-702-229-6611

05-55010
APPLANS

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

SECTION 19
TOWNSHIP 19 SOUTH
RANGE 60 EAST, M.D.M.

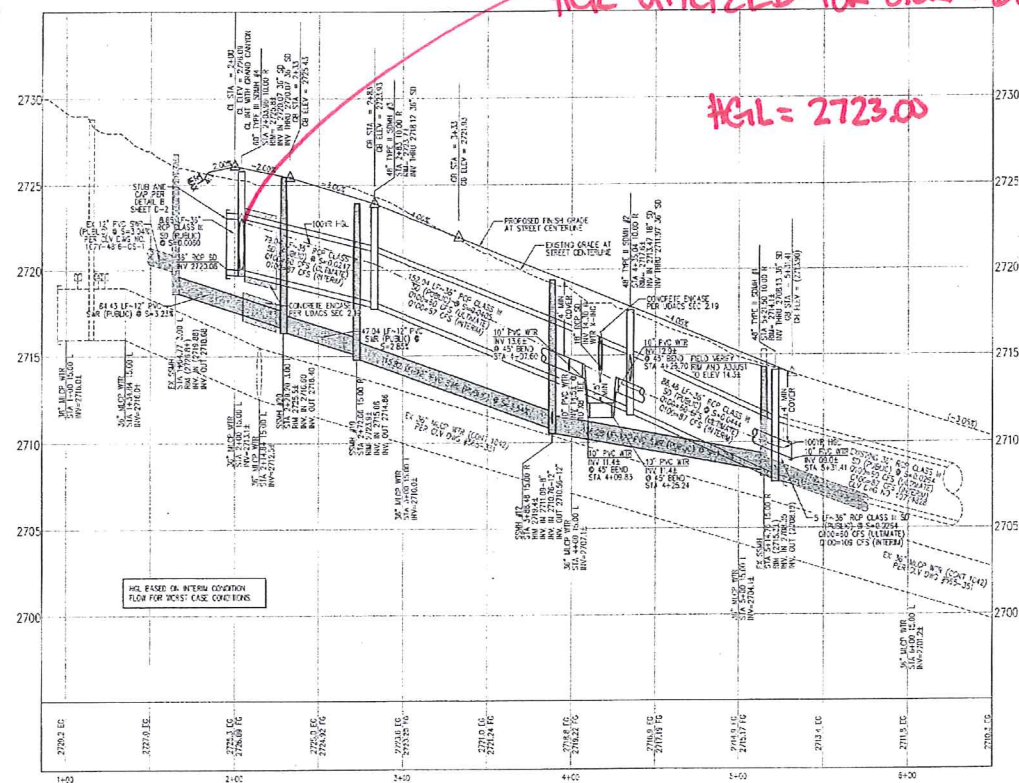
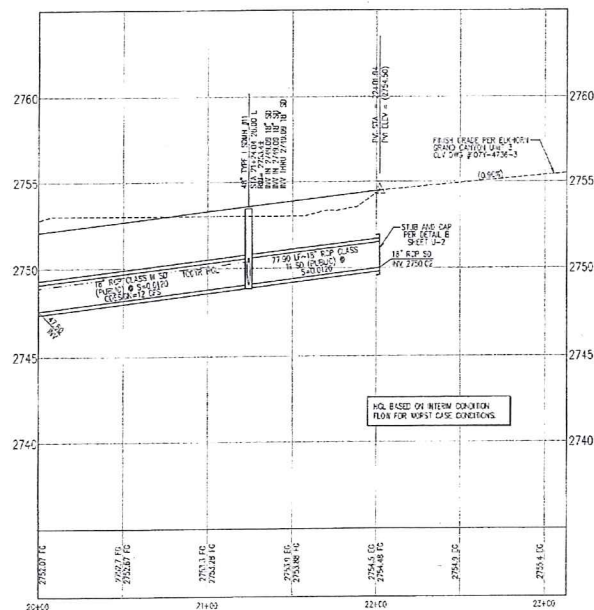
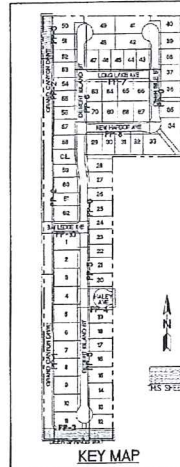
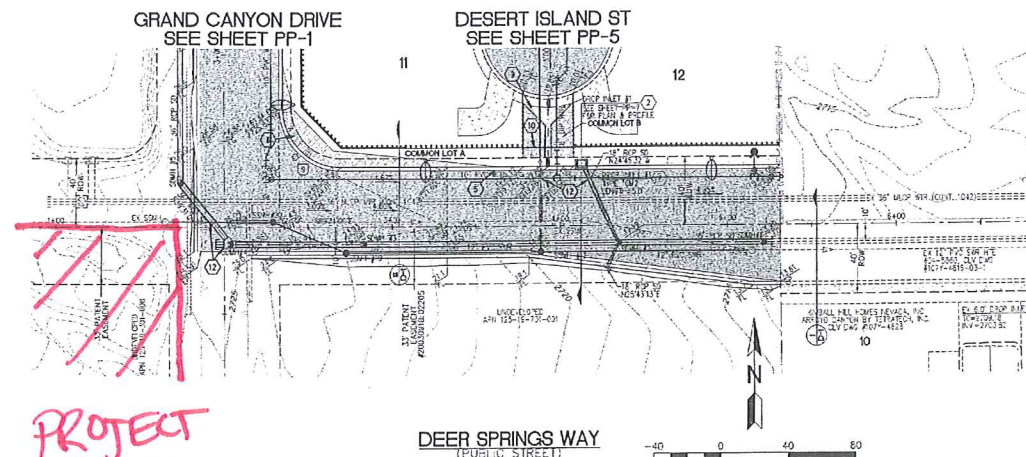
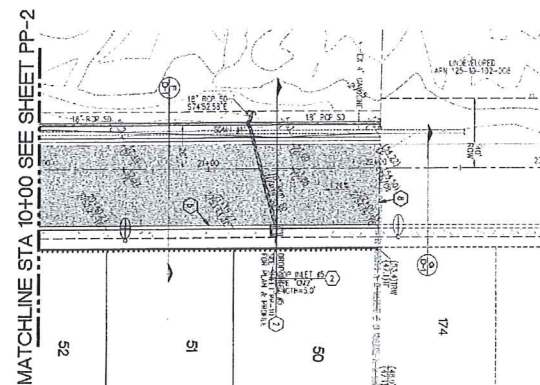
PARDEE HOMES OF NEVADA
TOWN CENTER 60175 NO. 5
GRADING PLAN 1

DATE: 10/6/05
DRAFTER: JDP
DESIGNER: JDP
CHECKED: TJS
PROJECT NO.: PAR0302-007

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. STEADHAM
Exp. 06/29/2008
CIVIL
No. 15792

G-1
SHEET 21 OF 22

APPLANS



PROFILE NOTES

1. PERK CHANNEL AND FURNISH EXISTING EXHAUST
PER 601000 MD 123 AND 601010 MD 218
2. INSTALL TYPE "D" DROPP "HET"
PER 601010 MD 218
3. INSTALL TYPE "D" DROPP "HET"
PER 601010 MD 218
4. CONSTRUCT 16" CROSS OUTLET
PER 601000 MD 123 AND 601010 MD 218
5. CONSTRUCT 16" THRU SUB AND OUTLET
PER 601000 MD 123
6. CONSTRUCT 16" SINKHOLE PUMPS USING 16" DRAIN
PER 601000 MD 123 AND 601010 MD 218
7. CONSTRUCT 16" SINKHOLE PER 601000 MD 123
8. SAW CUT AND RE-INFO EXISTING ASPHALT
9. INSTALL PERMISSIBLE EDWARDS
PER 601010 MD 218
10. INSTALL PERMISSIBLE RINK FENCE
PER 601010 MD 218
11. CONSTRUCT PERMISSIBLE EXISTING CONCRETE
PER 601000 MD 123
12. CONSTRUCT 16" DRAIN PER 601000 MD 218

CURVE TABLE				
NO.	LENGTH	RADIUS	DELTA	TANGENT
C1	54.64'	33.00'	69°27'13"	34.63'

RAMP IN.	GRADE %	"S" (T)	"S" (F)
	"0" "3"	UR.	M/N
①	-6 TO -5.0	4.5	21.5'
②	-5 TO -4.0	4.5	15.0'
③	-4 TO -3.0	4.5	12.0'
④	-3 TO -2.0	4.5	9.5
⑤	-2 TO 0	3.0*	3.0'
⑥	2.0 TO 3	2.5*	4.5'
⑦	3.0 TO 4	12.0*	4.5'
⑧	4.0 TO 5	15.0*	4.5'
⑨	5.0 TO 16	21.5*	4.5'

BASIS OF BEARINGS

BENCHMARK
PIVET AND SQUARE ALLUMINUM PLATE IN TOP CENTER OF HEADBALL ON THE
WEST SIDE OF U.S. 95 NEAR MILE 59.15.
BENCHMARK - CLARK COUNTY B.M. 0093 1745
NAVD 83 ELEVATION - 799.117 (M)
2621.770 (F) V 1994 RUTAL PROJECT B.M.
CLARK COUNTY ELEVATION MINUS 0.1' EQUALS
CLAY OF LAS VEGAS ELEV 2621.870 (F) - 799.347 (M) V 2003

NOT:
-ALL PRIVATE STREETS ARE P.U.E., PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENTS TO BE MAINTAINED BY HOA
-UTILITIES SHOWN MAY HAVE TO BE ADJUSTED TO FIT FIELD CONDITIONS.

NOTE: ALL PRIVATE STREETS ARE P.U.E., PUBLIC SEWER EASEMENTS, L.V.D.D. EASEMENTS, AND PUBLIC DRAINAGE EASEMENTS TO BE MAINTAINED BY THE HDA.

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before you
Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)



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 before you
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SLATER
HANFAN
GROUP
CONSULTING ENGINEERS & PLANNERS
37540 S. ARVILLE STREET #215, LAS VEGAS, NV 89118
PHONE (702) 284-5300
FAX (702) 284-5109

[illegible]

22+01.94
PROFILE

PARDEE HOMES OF NEVADA
TOWN CENTER 60175 NO. 5
BYRON DRIVE STA 20+00
SPRINGS WAY PLAN AN

SECTION 19
TOWNSHIP 19 SOUTH
RANGE 60 EAST, M.D.M.

DATE:	10/6/05
DRAFTER:	JDP
DESIGNER:	JDP
CHECKED:	TJS
PROJECT NO.	PAR0302-007

PP-3
SHEET 9 OF 22

APPENDIX I

Reference Material

Conceptual Drainage Study for Hualapai and 215

Approval Letter(s)



Department of Development Services

500 S Grand Central Pky 1st Fl • Box 551799 • Las Vegas NV 89155-1799

(702) 455-4600 • Fax (702) 388-2550

Ronald L. Lynn, Director/Building Official

Dean Friedli
Assistant Director
Administrative Division

Greg Franklin
Assistant Director
Building Division

Robert Thompson
Assistant Director
Civil Engineering Division



Conceptual Approval Letter

Date: November 6, 2007
Firm: Slater Hanifan Group
Engineer: Cindy J. Kinzer, P.E.
Address: 1555 South Rainbow Boulevard, Las Vegas, NV 89146
Phone: (702) 284-5300
Fax: (702) 284-5399
E-mail: ckinzer@shg-inc.com

LTV
007-43671

Subject: Conceptual Drainage Study for Hualapai and 215
Location: NEC of Hualapai and 215
APN: 125-19-301-001, 002, 003, 004, 005, 013
Sec, Township, Range: S04, T22S, R61E
Flood Zone & Panel: Zone X, 2560, Revised June 19, 2003
Application Tracking #: 07-43671 : City of Las Vegas DS4247A



HTE07-43671CDD

Submittals	Date Received	Date Returned	Clark Co. Reviewer	WILLDAN Reviewer	Misc.
CDS	10/25/07	11/06/07	rm	N/A	

Concurrence Required: (Must be obtained prior to permit issuance)	Reason Concurrence is required
City of Henderson	Adjacent to or Impacts Henderson
City of Las Vegas	Adjacent to or Impacts Las Vegas
City of North Las Vegas	Adjacent to or Impacts North Las Vegas
Nevada Department of Transportation	Impacts NDOT Facility
Clark County Public Works	Adjacent to or Impacts a CCPW Facility
US Army Corp of Engineers	Impacts a USACOE Facility
Clark County Regional Flood Control District	Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

BOARD OF COUNTY COMMISSIONERS
RORY REID, Chairman • CHIP MAXFIELD, Vice-Chairman
SUSAN BRAGER • TOM COLLINS • CHRIS GIUNCHIGLIANI • LAWRENCE WEEKLY • BRUCE L. WOODBURY
VIRGINIA VALENTINE, P.E., County Manager

Hualapai and 215
November 6, 2007
Page 2 of 2

07-43671

The above referenced **Conceptual Drainage Study** has been reviewed and is accepted as complying with the minimum improvement standards, subject to the following conditions and restrictions:

1. This Conceptual Drainage Study establishes existing hydrologic conditions impacting the site by defining onsite and offsite flows.
2. This approval does not allow any construction activity including grading, placement of fill or excavation of any kind.
3. An approved Technical Drainage Study is required prior to any construction activity. In addition the Technical Drainage Study must address any required drainage easements, establish FF elevations and provide hydraulic calculations for all required drainage facilities.
4. Section 1.1 statement appears to be in error, the property is not "located southeast of Hualapai/215 Beltway intersection." The site is located northeast of this intersection.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

DEPARTMENT OF DEVELOPMENT SERVICES

By 
Jeffery J. Jensen, P.E.
Senior Civil Engineer
Department of Development Services
Civil Engineering Division

cc: Greenstreet Properties, Inc
Development File

Ultimate Condition Drainage Map

APPENDIX J

Reference Material

Technical Drainage Study for Rome/Grand Canyon

Approval Letter (s)



Department of Development Services Civil Engineering Division

500 S Grand Central Pky 1st Fl • PO Box 551799 • Las Vegas NV 89155-1799
(702) 455-4600 • Fax (702) 388-2550

Phil Rosenquist, Director

April 13, 2006

06-14152
LTR

Nevada By Design
3515 E. Harmon Avenue
Las Vegas, Nevada 89121

**Re: Technical Drainage Study Concurrence for Rome/Grand Canyon
Middle School**
Dated: August 23, 2005
Addendum #1 Dated: October 25, 2005
Addendum #2 Dated: January 19, 2006
Supplement Dated: March 6, 2006
Location: SEC Bath Drive and Grand Canyon Drive
(Sec. 19, T19S, R60E)
CLV# DS3886C
HTE# 06-14152

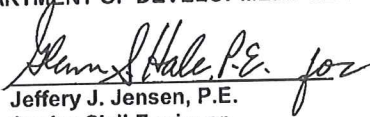
The above-referenced project is located within the **City of Las Vegas** adjacent to Clark County unincorporated areas. The drainage study was submitted to the County for concurrence on March 23, 2006. In addition, the County has received the City of Las Vegas acceptance letter dated March 22, 2006 for the Technical Drainage Study.

The County concurs with the acceptance of this Technical Drainage Study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

No liability is assumed by the County for information, data, and conclusions of the consulting engineer.

DEPARTMENT OF DEVELOPMENT SERVICES

By


Jeffery J. Jensen, P.E.
Senior Civil Engineer
Civil Engineering Division

cc: Development File
Albert Sung, P.E., City of Las Vegas

BOARD OF COUNTY COMMISSIONERS
RORY REID, Chairman • MYRNA WILLIAMS, Vice Chair
TOM COLLINS • YVONNE ATKINSON GATES • CHIP MAXFIELD • LYNETTE BOGGS McDONALD • BRUCE L. WOODBURY
THOM REILLY, County Manager

MAR-22-2006 WED 04:09 PM CITY OF LAS VEGAS

FAX NO. 7023828551

P. 02

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE

March 22, 2006

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
Romo / Grand Canyon Middle School

COPIES TO:

Nevada By Design

Cross Streets:

SEC of Bath Drive & Grand Canyon Road

Clark County School District

File Number:

F:\Dept\DS\Memo\DS3886C.doc

Bart Anderson, P.E., DevCo

Parcel Number:

125-10-701-011

Shella Lambert, Liaison Officer
Ward 6

Zoning Action:

ZON-7675 & SDR-7676

CCRFCO

FEMA Flood Zone

YES

NO

X

CCDDO

Proposed Storm Drain

YES

NO

X

CCPW

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1. Submittal	8/30/2005	9/13/2005	Not Approved	N/C	
2. Submittal	11/16/2005	11/29/2005	Not Approved	N/C	
3. Submittal	1/27/2006 & 3/7/2006	3/21/2006	See Comments Below	N/C	
TOTAL FEES (LDDRS):				N/C	

REMARKS:

The Drainage Study for the subject project has been reviewed and

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

- This drainage study is acceptable in concept; however, the City of Las Vegas will not formally accept the study until the Clark County Regional Flood Control District (CCRFCO) has issued a letter of concurrence. The Engineer should contact the CCRFCO to confirm that they have begun their review.
- It is noted that a "Signature Block" has been provided in the grading plans (Sheets C4.00 to C4.04) for Mr. Mike Hand, P.E. of Clark County Public Works Department to sign off. Mr. Hand's signature must be obtained prior to the final approval of the improvement plans.
- There are houses adjacent to the west of Grand Canyon Drive within the jurisdiction of the County of Clark. The engineer must obtain concurrence from the Clark County Department of Development Services for their potential concerns of the constituents prior to the final approval of the drainage study.

Flowmaster Calculations

ADDI —

06.14152. CONC.

3.23.06

3 6F4

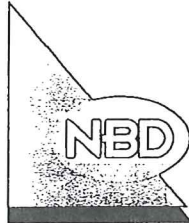
**ADDENDUM No. 1
TECHNICAL DRAINAGE STUDY
For
ROME/GRAND CANYON MIDDLE SCHOOL**

NBD Project No. CE02199

October 25, 2005

~~ADDI~~

**Prepared For
Welles Pugsley Architects
2480 East Tompkins Avenue
Las Vegas, NV 89121**



Prepared By

**Nevada By Design, LLC
3515 E. Harmon Avenue
Las Vegas, NV 89121**

**DI - GRAND CANYON SOUTH OF BATH 100-YEAR
Worksheet for Combination Inlet On Grade**

Project Description	
Worksheet	Combination Inlet - @ BATH
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	42.00 cfs
Local Depression	4.5 in
Local Depression λ	1.50 ft
Channel Slope	0.010000 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Mannings Coefficient	0.018
Curb Opening Length	4.00 ft
Grate Width	1.50 ft
Grate Length	3.00 ft
Grate Type	3 mm (P-1-7/8")
Clogging	50.0 %

Options	
Calculation Opt	Use Both
Grate Flow Opt	Include None

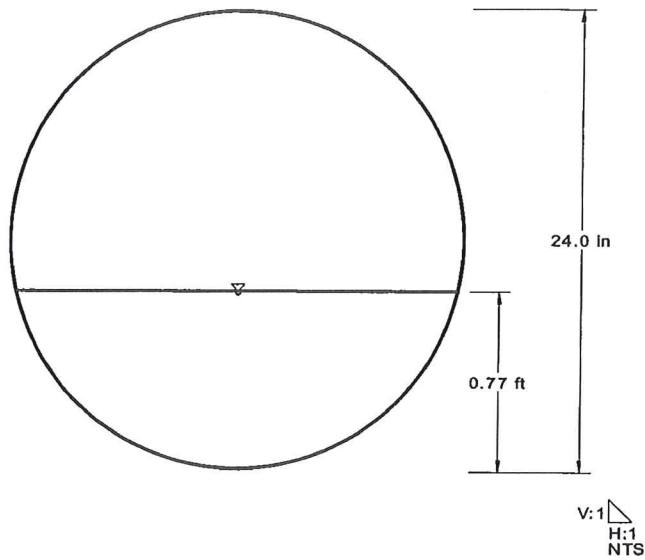
Results	
Efficiency	0.25
Total Intercepted Flow	10.65 cfs
Bypass Flow	31.35 cfs
Spread	29.09 ft
Depth	0.65 ft
Flow Area	7.9 ft ²
Gutter Depression	1.1 in
Total Depression	5.6 in
Velocity	4.80 ft/s
Splash Over Velocity	8.99 ft/s
Frontal Flow Factor	1.00
Side Flow Factor	0.02
Grate Flow Ratio	0.15
Equivalent Cross Slope	0.06294 ft/ft
Active Grate Length	1.50 ft
Length Factor	0.08
Total Interception Length	44.11 ft

REFERENCED

**24" RCP - GRAND CANYON @ BATH 100-YEAR
Cross Section for Circular Channel**

Project Description	
Worksheet	24"RCP-GRAND CANYON
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeff	0.012
Channel Slope	020000 ft/ft
Depth	0.77 ft
Diameter	24.0 in
Discharge	11.00 cfs



Approved Plans

COVER SHEET for THE IMPROVEMENT PLANS of
GRAND CANYON / ROME
MIDDLE SCHOOL
 A PORTION OF THE SOUTH HALF (S 1/2) OF THE NORTH HALF
 (N 1/2) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18,
 TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M.,
 CLARK COUNTY, NEVADA.
 A.P.N. 125-19-701-011

PROJECT AREA
 SEE VICINITY MAP

VICINITY MAP
 N.T.S.

NBD
NORTH

[illegible]

APPLANS

APPENDIX K

Reference Material

City of Las Vegas Northwest Neighborhood Study

Existing and Ultimate Condition Maps



NORTHWEST
NEIGHBORHOOD
STUDY

LEGEND

SUB-BASIN BOUNDARY

FLOW ARROW

250 10-YEAR STREET FLOW
500 100-YEAR STREET FLOW
300 10-YEAR FACILITY FLOW
800 100-YEAR FACILITY FLOW

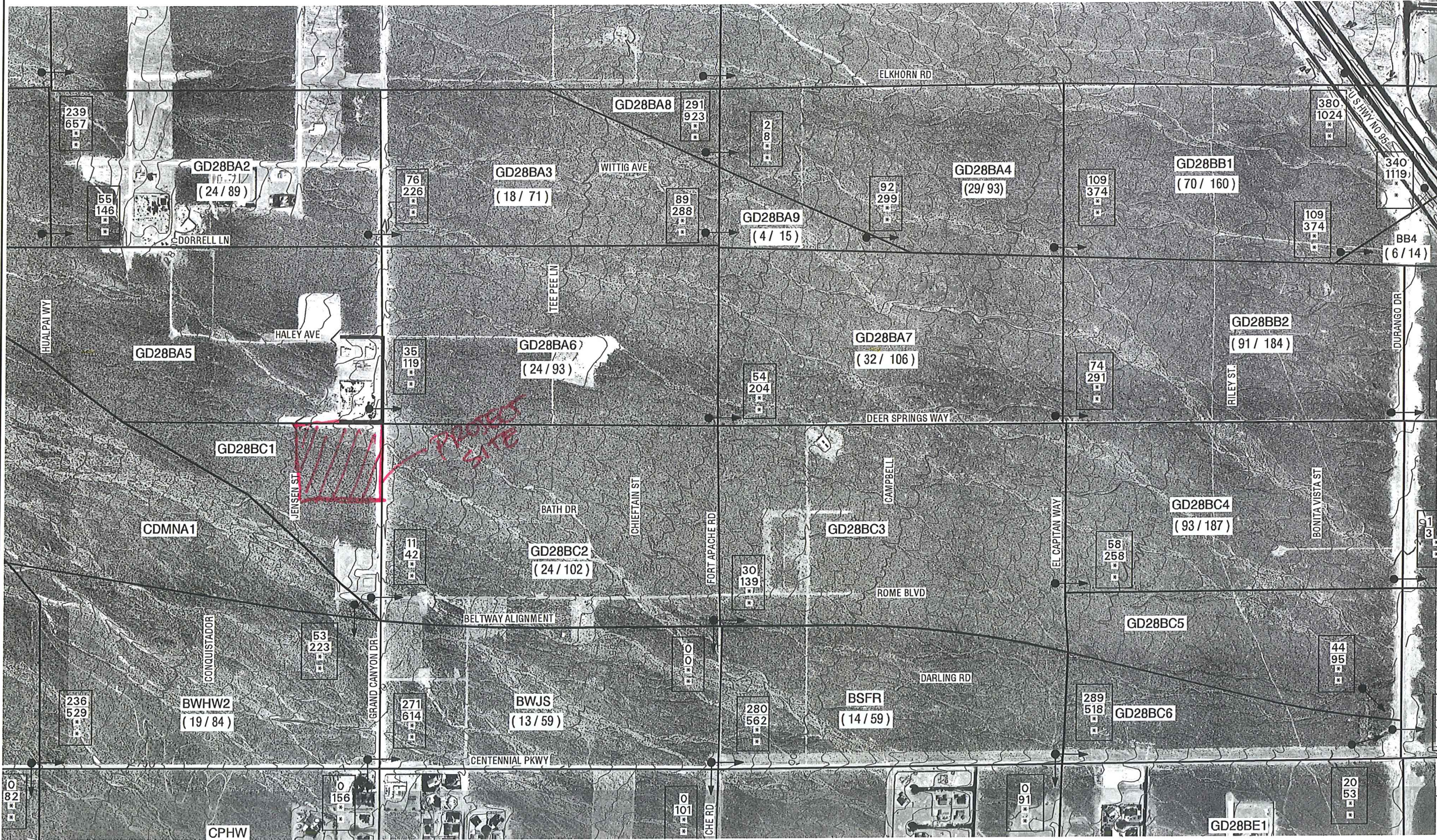
(FLOWS IN CFS)

BWJS ↔ Basin-ID

(13 / 59) ↔ Contributing flow
(10-Year / 100-Year)
from the basin (cfs)

PHOTO DATE: APRIL 1996

FIGURE E-1



EXISTING DRAINAGE CONDITIONS

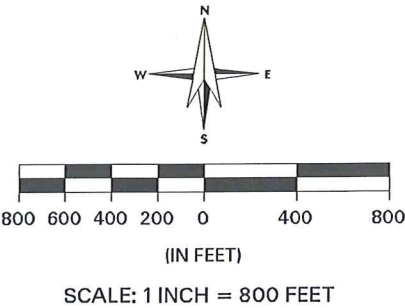
PBSJ POST,
BUCKLEY,
SCHUH &
JERNIGAN, INC.

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

HUALPAI	FT. APACHE	DURANGO	BUFFALO	RAINBOW	JONES	DECATUR	ELKHORN
1	2	3					
4	5	6					CENTENNIAL
7	8	9					ANN
10	11	12					LOVE MOUNTAIN
			13	14			ALEXANDER
			15	16			CHEYENNE
			17	18			SMOKE RANCH

REVISED SEPTEMBER 1999

NOTE:
Existing conditions are based on future
CN values with only existing local and
CCRCD facilities in place



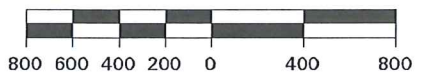
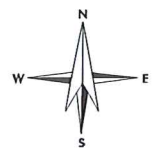
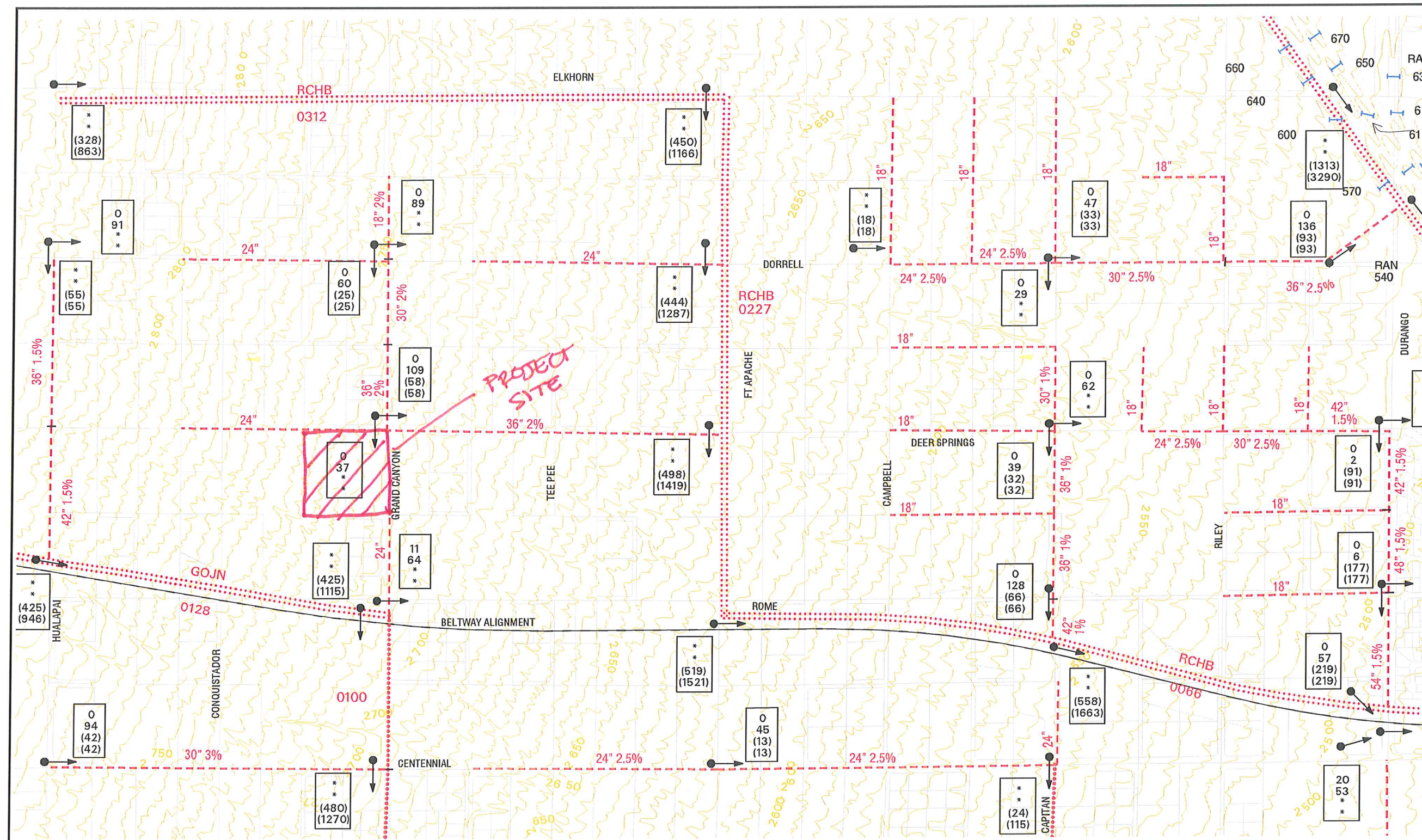


NORTHWEST NEIGHBORHOOD STUDY

LEGEND

- EXISTING REGIONAL DETENTION BASINS
- PROPOSED REGIONAL DETENTION BASINS
- EXISTING LOCAL DETENTION BASINS
- EXISTING REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES
- EXISTING LOCAL BRIDGES
- EXISTING REGIONAL CULVERT
- PROPOSED REGIONAL CULVERT
- EXISTING LOCAL CULVERT
- EXISTING REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE
- EXISTING LOCAL PIPELINE
- PROPOSED LOCAL PIPELINE
- EXISTING REGIONAL CHANNEL
- PROPOSED REGIONAL CHANNEL
- EXISTING LOCAL CHANNEL
- PROPOSED REGIONAL CHANNEL (Not included in 1995 MPU)
- PROPOSED REGIONAL CHANNEL (Not included in 1995 MPU)
- EXISTING REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE
- EXISTING LOCAL DIKE/LEVEE
- EXISTING STORM WATER PUMPING STATION
- PROPOSED BELTWAY ALIGNMENT

FIGURE F-1



SCALE: 1 INCH = 800 FEET

- FLOW ARROW
- 250 10-YEAR STREET FLOW
- 500 100-YEAR STREET FLOW
- 3000 10-YEAR FACILITY FLOW
- 8000 100-YEAR FACILITY FLOW
- (FLOWS IN CFS)

NOTE:
Ultimate drainage conditions are based on future CN values with all flood control facilities in place
See the "September 1999 City of Las Vegas Northwest Neighborhood Study Phase 2" for proposed facilities in and north of Elkhorn.

REVISED SEPTEMBER 1999

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

FUTURE DRAINAGE CONDITIONS



901 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-6139
Phone: 702/263-7275
Fax: 702/263-7200

ENGINEERING PLANNING GIS SURVEYING CONSTRUCTION SERVICES

APPENDIX L

NOFA Documentation



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

CORRECTED LETTER

May 15, 2014

G Spring, LLC
9315 West Sunset Road, Suite #100
Las Vegas, Nevada 89148

**RE: ABEYANCE - ZON-52117 [PRJ-52063] - REZONING RELATED TO GPA-52116,
ZON-52118, AND TMP-52119
PLANNING COMMISSION MEETING OF MAY 13, 2014**

Dear Applicant:

Your request for a Rezoning FROM: U (UNDEVELOPED) [RNP (RURAL NEIGHBORHOOD PRESERVATION) GENERAL PLAN DESIGNATION] TO: R-CL (SINGLE FAMILY COMPACT-LOT) on 10.18 acres at the southwest corner of Deer Springs Way and Grand Canyon Drive (APNs 125-19-301-007 and 008), Ward 6 (Ross) [PRJ-52063], was considered by the Planning Commission on May 13, 2014.

The Planning Commission voted to recommend **APPROVAL** of your request amending zoning designation to R-1 (SINGLE FAMILY RESIDENTIAL).

This item will be considered by the City Council on June 18, 2014, at 1:00 P.M. in the Council Chambers of City Hall, 495 South Main Street, Las Vegas, Nevada. *The Council requires that you or your representative be present at this meeting.* If you or your representative chooses not to attend, the City Council may act in your absence without your input.

Sincerely,

Peter Lowenstein, AICP
Planning Supervisor
Case Planning Division

PL:nl

cc:

Mr. Brian Walsh
Richmond American Homes
7770 South Dean Martin Drive, Suite #308
Las Vegas, Nevada 89139

Ms. Chelsea Peltier
Slater Hanifan Group
5740 South Arville Street, Suite #216
Las Vegas, Nevada 89118

CITY OF LAS VEGAS
DEPARTMENT OF PLANNING
DEVELOPMENT SERVICES CENTER
333 NORTH RANCHO DRIVE
3RD FLOOR
LAS VEGAS, NEVADA 89106

VOICE 702.229.6301

FAX 702.474.0352

TTY 702.386.9108

www.lasvegasnevada.gov



LAS VEGAS
CITY COUNCIL

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STAVROS S. ANTHONY
MAYOR PRO TEM

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

ELIZABETH N. FRETWELL
CITY MANAGER

CORRECTED LETTER

May 15, 2014

G Spring, LLC
9315 West Sunset Road, Suite #100
Las Vegas, Nevada 89148

**RE: ABEYANCE - GPA-52116 [PRJ-52063] GENERAL PLAN AMENDMENT RELATED
TO ZON-52117, WVR-52169, AND TMP-52119
PLANNING COMMISSION MEETING OF MAY 13, 2014**

Dear Applicant:

Your request for a General Plan Amendment FROM: RNP (RURAL NEIGHBORHOOD PRESERVATION) TO: ML (MEDIUM LOW DENSITY RESIDENTIAL) on 10.18 acres at the southwest corner of Deer Springs Way and Grand Canyon Drive (APNs 125-19-301-007 and 008), Ward 6 (Ross) [PRJ-52063], was considered by the Planning Commission on May 13, 2014.

The Planning Commission voted to recommend **APPROVAL** of your request amending density to L (LOW DENSITY RESIDENTIAL).

This item will be considered by the City Council on June 18, 2014, at 1:00 P.M. in the Council Chambers of City Hall, 495 South Main Street, Las Vegas, Nevada. *The Council requires that you or your representative be present at this meeting.* If you or your representative chooses not to attend, the City Council may act in your absence without your input.

Sincerely,

Peter Lowenstein, AICP
Planning Supervisor
Case Planning Division

PL:nl

cc:

Mr. Brian Walsh
Richmond American Homes
7770 South Dean Martin Drive, Suite #308
Las Vegas, Nevada 89139

Ms. Chelsea Peltier
Slater Hanifan Group
5740 South Arville Street, Suite #216
Las Vegas, Nevada 89118

CITY OF LAS VEGAS
DEPARTMENT OF PLANNING
DEVELOPMENT SERVICES CENTER
333 NORTH RANCHO DRIVE
3RD FLOOR
LAS VEGAS, NEVADA 89106

VOICE 702.229.6301

FAX 702.474.0352

TTY 702.386.9108

www.lasvegasnevada.gov





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

CORRECTED LETTER

May 15, 2014

G Spring, LLC
9315 West Sunset Road, Suite #100
Las Vegas, Nevada 89148

**RE: ABEYANCE - ZON-52117 [PRJ-52063] - REZONING RELATED TO GPA-52116,
ZON-52118, AND TMP-52119
PLANNING COMMISSION MEETING OF MAY 13, 2014**

Dear Applicant:

Your request for a Rezoning FROM: U (UNDEVELOPED) [RNP (RURAL NEIGHBORHOOD PRESERVATION) GENERAL PLAN DESIGNATION] TO: R-CL (SINGLE FAMILY COMPACT-LOT) on 10.18 acres at the southwest corner of Deer Springs Way and Grand Canyon Drive (APNs 125-19-301-007 and 008), Ward 6 (Ross) [PRJ-52063], was considered by the Planning Commission on May 13, 2014.

The Planning Commission voted to recommend **APPROVAL** of your request amending zoning designation to R-1 (SINGLE FAMILY RESIDENTIAL).

This item will be considered by the City Council on June 18, 2014, at 1:00 P.M. in the Council Chambers of City Hall, 495 South Main Street, Las Vegas, Nevada. *The Council requires that you or your representative be present at this meeting.* If you or your representative chooses not to attend, the City Council may act in your absence without your input.

Sincerely,

Peter Lowenstein, AICP
Planning Supervisor
Case Planning Division

PL:nl

cc:

Mr. Brian Walsh
Richmond American Homes
7770 South Dean Martin Drive, Suite #308
Las Vegas, Nevada 89139

Ms. Chelsea Peltier
Slater Hanifan Group
5740 South Arville Street, Suite #216
Las Vegas, Nevada 89118

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RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

May 14, 2014

G Spring, LLC
9315 West Sunset Road, Suite #100
Las Vegas, Nevada 89148

**RE: ABEYANCE - RENOTIFICATION - WVR-52169 [PRJ-52063] - WAIVER RELATED
TO GPA-52116, ZON-52117, AND TMP-52119
PLANNING COMMISSION MEETING OF MAY 13, 2014**

Dear Applicant:

Your request for a Waiver TO ALLOW TWO INTERSECTIONS TO BE OFFSET AT 183 FEET AND 194 FEET WHERE THE MINIMUM OFFSET ALLOWED IS 220 FEET on 10.18 acres at the southwest corner of Deer Springs Way and Grand Canyon Drive (APNs 125-19-301-007 and 008), U (Undeveloped) Zone [RNP (Rural Neighborhood Preservation) General Plan Designation] [PROPOSED: R-CL (Single Family Compact-Lot)], Ward 6 (Ross) [PRJ-52063], was considered by the Planning Commission on May 13, 2014.

The Planning Commission voted to recommend **APPROVAL** of your request, subject to the following:

Planning

1. Approval of and conformance to the Conditions of Approval for Tentative Map (TMP-52107) shall be required, if approved.
2. This approval shall be void four years from the date of final approval, unless a building permit has been issued for new construction. An Extension of Time may be filed for consideration by the City of Las Vegas.
3. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.
4. Vehicular movements at both residential streets intersecting Grand Canyon Drive may be limited in the future to right-in and right-out at the discretion of the City Traffic Engineer, if traffic patterns or accident histories develop that warrant the construction of a median island in Grand Canyon Drive.

This item will be considered by the City Council on June 18, 2014, at 1:00 P.M. in the Council Chambers of City Hall, 495 South Main Street, Las Vegas, Nevada. ***The Council requires that you or your representative be present at this meeting.*** If you or your representative chooses not to attend, the City Council may act in your absence without your input.

Sincerely,

Peter Lowenstein, AICP
Planning Supervisor
Case Planning Division

CITY OF LAS VEGAS
DEPARTMENT OF PLANNING
DEVELOPMENT SERVICES CENTER
333 NORTH RANCHO DRIVE
3RD FLOOR
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G Spring, LLC
WVR-52169 {PRJ-52063} - Page Two
May 14, 2014

PL:nl

cc:

Mr. Brian Walsh
Richmond American Homes
7770 South Dean Martin Drive, Suite #308
Las Vegas, Nevada 89139

Ms. Chelsea Peltier
Slater Hanifan Group
5740 South Arville Street, Suite #216
Las Vegas, Nevada 89118



LAS VEGAS
CITY COUNCIL

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May 14, 2014

G Spring, LLC
9315 West Sunset Road, Suite #100
Las Vegas, Nevada 89148

**RE: ABEYANCE - TMP-52119 [PRJ-52063] - TENTATIVE MAP RELATED TO GPA-52116, ZON-52117 AND WVR-52169
PLANNING COMMISSION MEETING OF MAY 13, 2014**

Dear Applicant:

Your request for a Tentative Map FOR A PROPOSED 63-LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION on 10.18 acres at the southwest corner of Deer Springs Way and Grand Canyon Drive (APNs 125-19-301-007 and 008), U (Undeveloped) Zone [RNP (Rural Neighborhood Preservation) General Plan Designation] [PROPOSED: R-CL (Single Family Compact-Lot)], Ward 6 (Ross) [PRJ-52063], was considered by the Planning Commission on May 13, 2014.

The Planning Commission voted to recommend **APPROVAL** of your request, subject to the following:

Planning

1. This approval shall be void four 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. Special Use Permits (SUP-46572 and SUP-46573) and Site Development Plan Review (SDR-46570) are hereby expunged.
5. A technical landscape plan, signed and sealed by a Registered Architect, Landscape Architect, Residential Designer or Civil Engineer, must be submitted prior to or at the same time as Final Map submittal. A permanent underground sprinkler system is required, and shall be permanently maintained in a satisfactory manner; the landscape plan shall include irrigation specifications.
6. Installed landscaping shall not impede visibility of any traffic control device.
7. No turf shall be permitted in the non-recreational common areas, such as medians and amenity zones in this development.
8. 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.



9. 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.
10. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

Public Works

11. Dedicate 40 feet of right-of-way adjacent to this site for Deer Springs Road, 40 feet for Grand Canyon Drive and 30 feet for Echelon Point Drive. Additionally, dedicate a 25 foot radius on the southwest corner of Deer Springs Road and Grand Canyon Drive and a 20 foot radius at the northwest corner of Grand Canyon Drive and Echelon Point Drive concurrent with the recordation of a Final Map for this site.
12. Construct half-street improvements on Deer Springs Road, Grand Canyon Drive and Echelon Point Drive, including appropriate transitions where legally able adjacent to this site concurrent with development of this site. In addition, If legally able, construct full width temporary pavement adjacent to the Grand Canyon Drive frontage of parcel 125-19-701-001 and the Deer Springs Way frontage of parcels 125-19-202-020, -021 and -022 unless already constructed
13. Unless otherwise allowed by the City Engineer, submit all required documentation and support materials to the Land Development Section of the Department of Building and Safety for a Bureau of Land Management (BLM) Grant application to obtain a grant (Sewer, Drainage, and Roadway) for the south side of Echelon Point Drive adjacent to this site on Assessor's Parcel # 125-19-301-006 prior to constructing improvements on the BLM parcel. Civil Plans may be approved without the grant being authorized; however no construction on Assessor's Parcel 125-19-301-006 may occur until the grant is authorized by BLM and recorded by the Right-of-Way section of the Department of Operations and Maintenance. If the BLM Grant will be in the City's name, the City will submit the application to the BLM. If the BLM Grant will be in the developer's name, the developer must submit the BLM application to the City for review prior to submitting to BLM for authorization. If the BLM Grant application is submitted, but no activity has occurred toward obtaining the grant within one year of the submittal of the BLM application, the City will make best efforts to contact the applicant and request a project status report; however if a project status cannot be determined, the City may withdraw the grant application. If the City withdraws the application, a brand new grant application will be required when it is determined that efforts are being made toward obtaining the grant

14. All landscaping and private improvements installed with this project shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections
15. Submit an Encroachment Agreement for landscaping and private improvements in the Deer Springs Way, Grand Canyon Drive, and Echelon Point Drive public rights-of-way prior to the issuance of permits for these improvements. The applicant must carry an insurance policy for the term of the Encroachment Agreement and add the City of Las Vegas as an additionally insured entity on this insurance policy. If requested by the City, the applicant shall remove property encroaching in the public right-of-way at the applicant's expense pursuant to the terms of the City's Encroachment Agreement. The installation and maintenance of all private improvements in the public right of way shall be the responsibility of the adjacent property owner(s) and shall be transferred with the sale of the property for the entire term of the Encroachment Agreement. Coordinate all requirements for the Encroachment Agreement with the Land Development Section of the Department of Building and Safety (229-4836).
16. 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, submittal of any construction drawings or the submittal of a Map subdividing this site, whichever may occur first. Provide and improve all drainage- ways 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.

This item will be considered by the City Council on June 18, 2014, at 1:00 P.M. in the Council Chambers of City Hall, 495 South Main Street, Las Vegas, Nevada. *The Council requires that you or your representative be present at this meeting.* If you or your representative chooses not to attend, the City Council may act in your absence without your input.

Sincerely,



Peter Lowenstein, AICP
Planning Supervisor
Case Planning Division

PL:nl

cc:

Mr. Brian Walsh
Richmond American Homes
7770 South Dean Martin Drive, Suite #308
Las Vegas, Nevada 89139

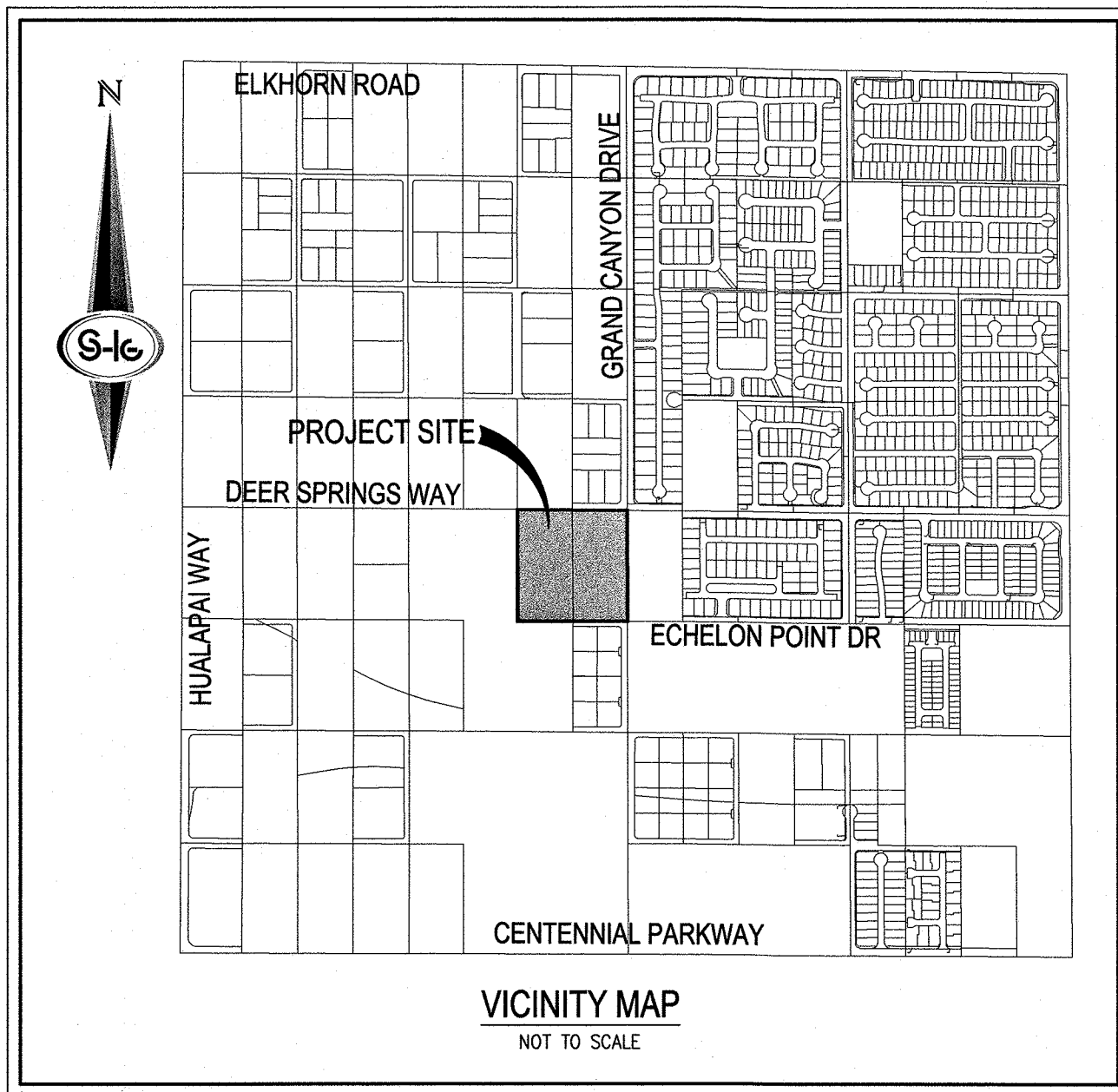
Ms. Chelsea Peltier
Slater Hanifan Group
5740 South Arville Street, Suite #216
Las Vegas, Nevada 89118

APPENDIX M

Improvement Plans



IMPROVEMENT PLANS
FOR
CONNOR HILLS
APN 125-19-301-007 AND 008



CITY ENGINEER-DAVID BOWERS PE, PTOE #16736		DATE
APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED OF RIGHT-OF-WAY, AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIALLY LISTED UNDER DEVIATIONS FORM STANDARDS. THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS, CLARK COUNTY AREA, NEVADA.		
LAS VEGAS FIRE AND RESCUE		DATE
CHRIS KNIGHT, DIRECTOR BUILDING AND SAFETY DEPARTMENT		DATE
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT.		
CENTRAL TELEPHONE COMPANY D/B/A CENTURYLINK		
THE AFFIRED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND / OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.		
APPROVED FOR CONSTRUCTION		
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER PROJECT NO. 122844 DATE: SHEETS: C-1, C-2, PP-1 THRU PP-5, AND U-1		
LVWMD APPROVED FIREFLOW: 1750 GPM AT 20 PSI RESIDUAL		
APPROVAL BY THE FIRE DEPARTMENT HAVING JURISDICTION IS REQUIRED PRIOR TO OBTAINING FINAL APPROVAL FROM THE LAS VEGAS VALLEY WATER DISTRICT.		
NV ENERGY		DATE
NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.		
SOUTHWEST GAS		DATE
COX COMMUNICATIONS LAS VEGAS, INC.		DATE

OWNER APN: 125-19-601-007 & 008 O SPRING LLC 9315 W SUNSET ROAD LAS VEGAS, NV 89148	PROJECT INFORMATION EXISTING ZONING: R-1 ACREAGE (GROSS): 10.13 AC ACREAGE (NET): 6.9 AC TOTAL DWELLING UNITS: 40 TYP. LOT SIZE: 60'x123' MIN. LOT WIDTH: 60' MIN. LOT SQFT: 6,628 SQFT MAX LOT SQFT: 8,933 SQFT DENSITY (NET ACREAGE): 3.95 DU/AC MAX. LOT COVERAGE: 52%
DEVELOPER RICHMOND AMERICAN HOMES 7770 S. DEAN MARTIN DR. SUITE 308 LAS VEGAS, NV 89139 PH (702) 617-8400 FX (702) 348-5964	
ENGINEER SLATER HANIFAN GROUP 5740 S. ARVILLE ST #216 LAS VEGAS, NV 89118 PH (702) 284-5300 FX (702) 284-5399	

LEGAL DESCRIPTION
THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M. CLARK COUNTY, NEVADA.

BASIS OF BEARING
NORTH 0°03'58" WEST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN BOOK 132, PAGE 11 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV9019C4
RIVET AND PLATE IN TOP OF CURB ON THE NORTHEAST CORNER OF DEER SPRINGS WAY AND GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, 2008 ADJUSTMENT
(UPDATED MAY 24, 2010)



SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300
FAX (702) 284-5399

CITY OF LAS VEGAS, NV

RICHMOND AMERICAN HOMES
CONNOR HILLS
COVER SHEET

7/11/14
DATE:
7/11/14
DRAFTER: CZ
DESIGNER: CZ
CHECKED: TJS
PROJECT NO.
RAH1310

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. STEADHAM
Exp. 06/30/2016
No. 15292
CIVIL

C-1
SHEET 1 OF ---
###

2.1 CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY, THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".

2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLY PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THESE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.

3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.

4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.

5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.

6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.

7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.

8. AC PAVEMENT TO BE ONE-HALF INCH (1/2") ABOVE ALL OF ALL GUTTERS AFTER CONSTRUCTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.

9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.

10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.

11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.

12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY ANGLE ENGINEERING, REPORT #28165-1, DECEMBER 6, 2013 APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.

13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.

14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.E.S. STATUTE NO. 326.380 & CITY OF LAS VEGAS TITLE 16, APPENDIX D.

15. UTILITY COMPANY WATER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER. ALL ABOVE GROUND UTILITY APPURTENANCES SHALL CONFORM TO THE REQUIREMENTS OF 19.12.040.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVEALING GRADING RELATIONSHIPS, FLOOD CONTROL, AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.

17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.

18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC., TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.

19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.

20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC., THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.

21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE OFFSITE INSPECTION AND TESTING SECTION PRIOR TO PROJECT ACCEPTANCE AND BOND RELEASE. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, AND THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXITS THE PUBLIC RIGHT-OF-WAY. THE LOCATION SHALL BE DESCRIBED BY STATE PLANE COORDINATES WHICH SHALL BE BASED ON THE "NEVADA COORDINATE SYSTEM OF 1983, EAST ZONE" AS DEFINED BY THE NEVADA REVISED STATUTES CHAPTER 327, AND TIED TO THE CITY OF LAS VEGAS VERTICAL CONTROL BENCHMARK NETWORK. COORDINATES MUST BE CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTANTIES OF +/- 0.1 METER (+/- 0.3 FEET). A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).

22. STORM DRAIN LATERALS REQUIRE THE INSTALLATION OF A MARKER BALL AT THE CONNECTION OF THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, AND THE STORM DRAIN LATERAL EXITS THE PUBLIC RIGHT-OF-WAY OR WHERE THE STORM DRAIN LATERAL CONNECTS TO A DROP INLET. THE MARKER BALL SHALL BE 3M 4" MARKER BALL 1404-XR OR APPROVED EQUAL.

23. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.

24. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

2.2 CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA," AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.

2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.

3. CHISEL "S" OR "C" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.

4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.

5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETIROP IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.

6. THE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" "S" SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.

7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.

8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.

9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.

10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

2.3 CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DEVIATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.

2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.

3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL ALSO INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.

4. WHEN A DESIGNATED "SAFE ROUTE TO SCHOOL" IS ENCLOSED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF DETERMINE A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF THE TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.

5. IF THE IMPROVEMENTS NECESSITATE THE OBSTRUCTION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL BE FABRICATED WITH DIAMOND GRADE VIF CLASS 6 REFLECTIVE SHEETING OR APPROVED EQUAL. ALL NEW TRAFFIC SIGNS, EXCEPT STREET NAME AND SCHOOL SPEED LIMIT SIGNS, SHALL HAVE 3M SERIES 1150 OR APPROVED EQUIVALENT ANTI-GRAFFITI PROTECTIVE OVERLAY FILM. SCHOOL ZONE SIGNS SHALL HAVE 3M SERIES 1150 ANTI-GRAFFITI PROTECTIVE OVERLAY FILM. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.

7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.

8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC INTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER. REGARDLESS OF THE STATUS OF CONSTRUCTION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.

10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED TRAFFIC CONTROL TECHNICIAN OR MSA WORK ZONE SAFETY SPECIALIST SET UP AND MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.

11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.

12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.

13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.

14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS OTHERWISE DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.

15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADJUSTING OR MODIFYING PAVEMENT MARKINGS AND SIGNAGE. ANY SUCH CHANGES SHALL BE IN ACCORDANCE WITH ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

2.4 CITY OF LAS VEGAS STREETLIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND ANY ADDED SPECIAL AREA STANDARDS.

2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF TRAFFIC ENGINEERING AND THE CITY ENGINEER.

3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.

4. ALL STREET LIGHTING CONDUITS STUB SHALL HAVE AT LEAST ONE GREEN #8 THW WIRE INSTALLED. AS TRAFFIC LIGHT CONDUITS ARE COMPLETELY COVERED BY THE ROAD FROM 18" TO 18", IT SHALL HAVE MINIMUM OF 2 #4 AND 1 #8 THW WIRE WITH THE ENDS TAPED OR "SAFE OFF" PRIOR TO FINAL INSPECTION.

5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN ACCORDANCE WITH THE UFO NO. 320A.

6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TEO PRIOR TO ANY FINAL-PRIME INSPECTION. THE ASBUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.

7. SERVICE POINT SHALL BE COORDINATED WITH NV ENERGY COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CURVE. SERVICE POINTS SHALL BE SHOWN ON THE CIVIL PLANS.

8. IT SHALL BE ASSUMED THAT IN THE ABSENCE OF AN EXISTING, WORKABLE CIRCUIT TO ATTACH TO, ALL INSTALLATIONS SHALL REQUIRE A NEW SERVICE FOR OPERATION OF THE CIRCUIT.

9. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREET LIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED, AT NO EXPENSE TO THE CITY OF LAS VEGAS, BEFORE STREETLIGHT BASES ARE INSTALLED.

10. THE CONTRACTOR SHALL FURNISH COMPLETE SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.

11. THE DEVELOPER/OWNER WILL BE REQUIRED TO SUPPLY POWER TO ALL NEW PUBLIC STREET LIGHTS INSTALLED UNDER THIS DESIGN PRIOR TO BOND RELEASE OR PROJECT COMPLETION. THE DEVELOPER/OWNER WILL BE RESPONSIBLE FOR ALL ITEMS ASSOCIATED WITH THE INSTALLATION, CONSTRUCTION, ENERGIZING, MAINTENANCE AND OPERATIONAL COST OF SAID STREET LIGHTS PRIOR TO PROJECT COMPLETION. REFER TO THE PLAN FOR ANY NEW SERVICE REQUIREMENTS. THE TRANSFER OF OWNERSHIP FROM THE DEVELOPER/OWNER TO THE CITY OF LAS VEGAS, ALL NEW PUBLIC STREET LIGHTS AND/OR SERVICE(S) INSTALLED UNDER THIS PLAN DESIGN WILL BE IN CONJUNCTION WITH THIS PROJECT COMPLETION. COORDINATE ALL MAINTENANCE AND OPERATIONAL TRANSFERS WITH THE CITY OF LAS VEGAS TRAFFIC ENGINEERING DEPARTMENT (TEO) AT (702) 229-6331.

2.5 CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.

2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SURFACES, FINISH GRADES AND SLOPES SHOWN.

3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION, ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.

4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS IS THE RESPONSIBILITY OF THE CONTRACTOR.

5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.

6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

A. PAVEMENT AREA SUBGRADE	0.1"	HORIZONTAL	VERTICAL COMPACTION	
B. ENGINEERED FILL	0.5"	+0.0 TO -0.1"	+0.0 TO -0.1"	SEE SOILS REPORT

COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE.

11. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.

8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.

9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC, SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.

10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

CITY OF LAS VEGAS FIRE AND RESCUE GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE # 6124 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS. AUTHORIZED FIRE HYDRANTS ARE AS FOLLOWS:

- KENNEDY – GUARDIAN MODELS K81A AND K81D
- MUELLER – SUPER CENTURION 250, MODEL 4-423
- CLOW – METALUM MODEL F-254SLVD
- U.S.IPE – METROFLOW/M-03

2. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPES SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK.

3. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. SNFC #0124, SECTION 1412.

4. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. SNFC #0124 SECTION 507.5.7.3

5. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TESTS WITH PRIOR FIRE PREVENTION APPROVAL.

6. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. SNFC 507.2.1, NFPA 24

7. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE. FIRE PREVENTION DIVISION IFC 507, SNFC 507.5.7

8. PRIVATE HYDRANTS SHALL BE PAINTED RED. SNFC 507.5.7.1

9. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. IFC 507, SNFC 507.7

10. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: SNFC C102

- RESIDENTIAL – 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.
- COMMERCIAL – 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.

11. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION IF THE STRUCTURES FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF THIRY (30) OR MORE PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACING AT 500 FT ON AN ALTERNATING BASIS. SNFC C102.14

12. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERMETER OF THE RADIUS OF THE CUL-DE-SAC.

13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. SNFC C102.12

14. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. SNFC 102.4

15. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. SNFC C1 02.7

16. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. SNFC 102.6

17. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE STREET SECTION. CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN.

18. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. SNFC 503.2.3

19. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12% ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. SNFC 503.2.7 / 503.2.8

20. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FT OUTSIDE AND 28 FT INSIDE TURNING RADIUS. SNFC 503.2.4

21. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13 FT 6 INS. SNFC 503.2.1.1 IFC 503

22. FIRE DEPARTMENT ACCESS ROADS IN ALL RESIDENTIAL DEVELOPMENTS (EXCEPT APARTMENT BUILDINGS) SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 36 FT FLOW LINE TO FLOW LINE (THIS WIDTH MAY BE REDUCED TO 24 FT IF ALL BUILDINGS FRONTING THE STREET ARE SPRINKLERED) FOR MAIN RESIDENTIAL STREETS, WITH PARKING PERMITTED ON BOTH SIDES OF THE STREET. PRIVATE DRIVE ASILES, MORE THAN 2 FEET WIDE SHALL BE REDUCED TO A MINIMUM WIDTH OF 24 FT FLOW LINE TO FLOW LINE WHEN SERVING NO MORE THE 6 RESIDENTS, AND WHEN ON STREET PARKING IS DISALLOWED. SNFC 503.2.1.1 503.2.11

23. ALL FIRE APPARATUS ACCESS ROADS IN COMMERCIAL, DEVELOPMENTS AND APARTMENT COMPLEXES SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 24 FT (FLOW LINE TO FLOW LINE), PROVIDED NO PARKING IS ALLOWED ON EITHER SIDE; 32 FT (FLOW LINE TO FLOW LINE), WITH PARALLEL PARKING ON ONE SIDE, AND 36 FT (FLOW LINE TO FLOW LINE), IF PARALLEL PARKING IS ALLOWED ON BOTH SIDES. THESE WIDTHS MAY BE REDUCED TO 24 FT IF SPRINKLERED. SNFC 503.2.1.1

24. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FT IF THE BUILDING IS SPRINKLERED. IFC 503.1.11 SNFC 503.1.1

25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT, AND FOR ALL COMMERCIAL, INDUSTRIAL, AND MULTI-FAMILY RESIDENTIAL DEVELOPMENTS. SNFC 503.1.2

26. ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. SNFC 503.2.5

27. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE ROAD AND THE END OF THE FIRE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF NO CURB IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. SNFC 503.3

28. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. SAID SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE CITY OF LAS VEGAS GUIDELINES FOR AUTOMATIC EMERGENCY VEHICLE ACCESS GATES. IFC 1 SNFC 503.6

STORMWATER RUNOFF MANAGEMENT

(REQUIRED FOR ALL SITES GREATER THAN 1 ACRE (43,560 SQ.FT.))

1. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATE IN, THE PUBLIC RIGHTS OF WAYS OF CLARK COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.

2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN ORDINANCE LC 14.18 AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES MANUAL.

3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY. SUCH AS: CLEAR OR CLEARANCE CONTROLLED LOW STRENGTH MATERIAL. CHANGING WORKERS RESPONSIBILITY OF THE CONTRACTOR. CONCRETE MASONRY UNIT. CONCRETE. CURB. YARD. DESIGN AND CONSTRUCTION FOR WASTEWATER COLLECTION SYSTEMS.

5. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS AND ALL BMPs WEEKLY, AND WITHIN 24 HOURS AFTER ANY ACTUAL RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY TO MAKE EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY. SUCH AS: SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NV1000000, SECTION II.A.2.

6. ACCUMULATED SEDIMENT IN BMPs SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

UTILITY LOCATION NOTE TO CONTRACTOR

EXISTING UTILITY LOCATIONS SHOWN HEREIN ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATIONS. CALL BEFORE YOU DIG: 1 (800) 227-2600

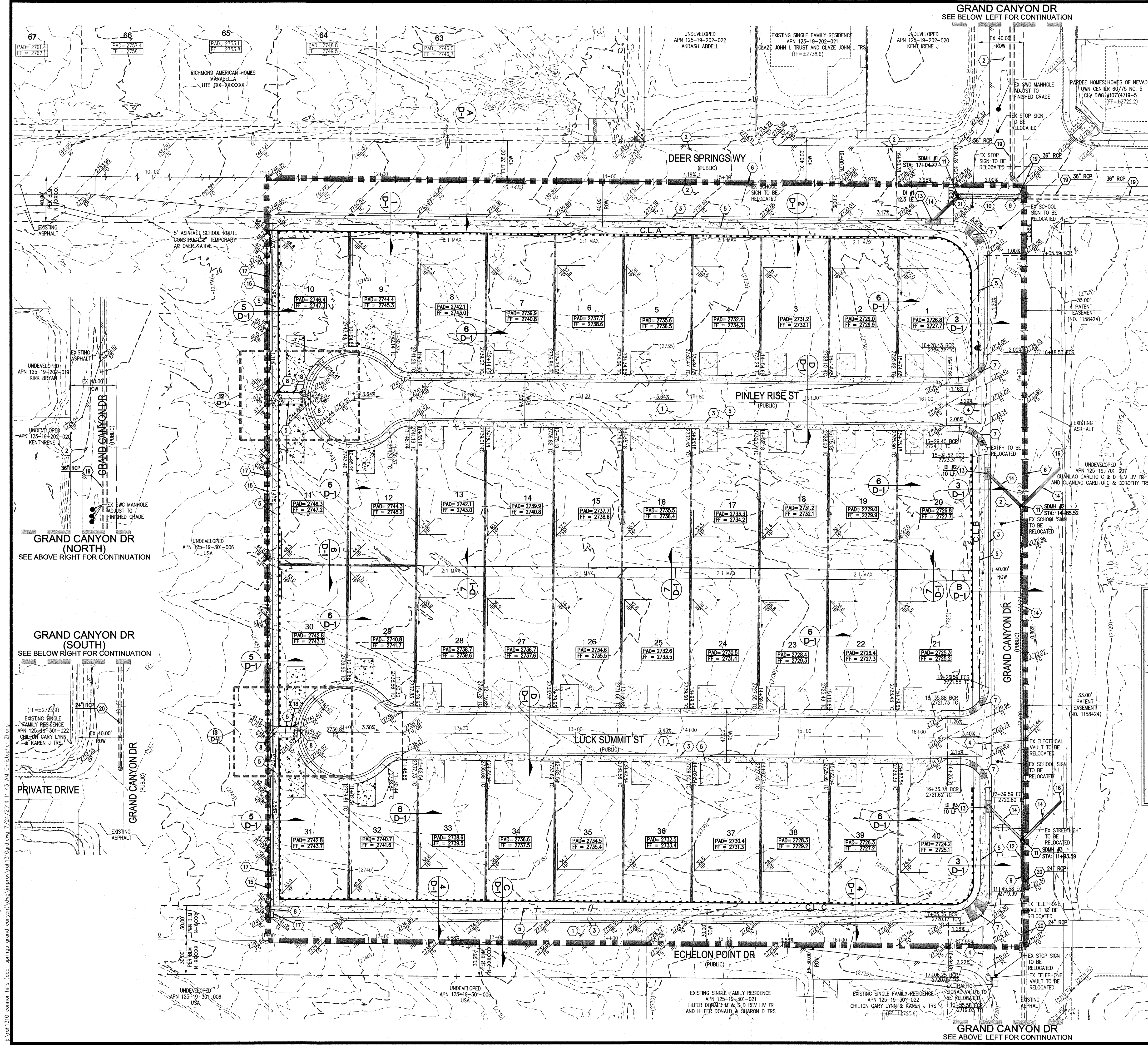
NOTE TO CONTRACTOR

QUANTITIES SHOWN ARE ESTIMATES ONLY AND ARE INTENDED TO ILLUSTRATE SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE EXACT QUANTITIES INVOLVED.

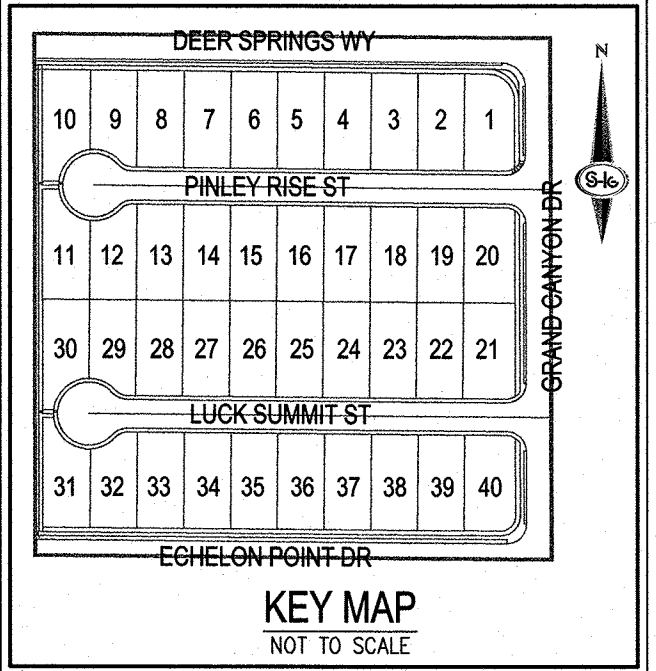
LAS VEGAS VALLEY WATER DISTRICT (LVWD) STANDARD NOTES

LVWD PROJECT # #####

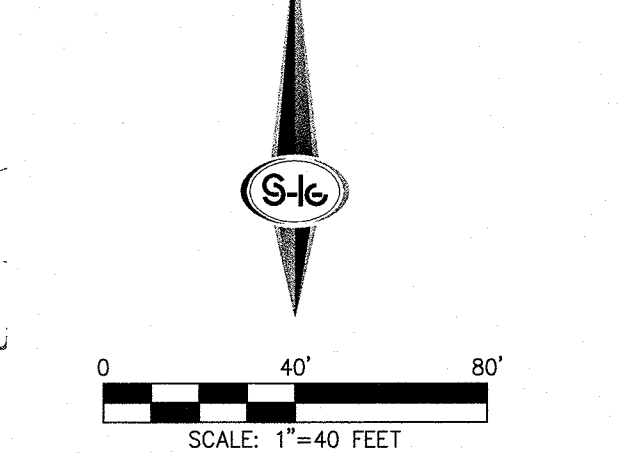
1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVWD.



- ### CONSTRUCTION NOTES
- CONSTRUCT 2.5" AC PAVEMENT WITH 6" TYPE I AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 3.5" AC PAVEMENT WITH 7" TYPE I AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD NO. 218.
 - CONSTRUCT 8" CROSS GUTTER PER CCAUSD NO. 228.
 - CONSTRUCT 5" WIDE SIDEWALK PER CCAUSD NO. 234.
 - SAWCUT AND MATCH EXISTING IMPROVEMENTS.
 - CONSTRUCT SIDEWALK RAMP USING ARMOR TILE TRUNCATED DOWNS OR EQUIVALENT PER CCAUSD NO. 236.
 - INSTALL SIDEWALK DRAIN PER CCAUSD NO. 236.
 - FIELD VERIFY, REMOVE EXISTING CAP AND CONNECT TO EXISTING STORM DRAIN SUB.
 - INSTALL 36" RCP CLASS III STORM DRAIN.
 - INSTALL 60" TYPE II STORM DRAIN MANHOLE PER CCAUSD NO. 401 & 405.
 - INSTALL 24" RCP CLASS III STORM DRAIN.
 - INSTALL TYPE C22 DRAIN INLET PER CCAUSD NO. 412.1 & 421. SEE PROFILE, SHEET PP-8.
 - INSTALL 18" RCP CLASS III STORM DRAIN.
 - INSTALL 6" HIGH WROUGHT IRON FENCE PER DETAIL 9 ON SHEET D-1.
 - INSTALL STUB AND CAP.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 8 ON SHEET D-1.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 11 ON SHEET D-1.
 - EXISTING STORM DRAIN PER TOWN CENTER 60/75 NO. 5, CLV DWG NO. 1074719-5.
 - EXISTING STORM DRAIN PER GRAND CANYON/ROME MIDDLE SCHOOL, CLV DWG NO. 715-163.
 - CONSTRUCT 5" STUB AND CAP.
- SEE SHEET C-2 FOR ABBREVIATIONS, LEGEND & QUANTITIES



- ### LEGEND
- BOUNDARY LINE
 - ROADWAY CENTERLINE
 - RIGHT-OF-WAY
 - PROPERTY LINE
 - CURB AND GUTTER
 - EXISTING CURB AND GUTTER
 - FLOWLINE
 - EDGE OF PAVEMENT (EP)
 - SAWCUT LINE PER CCAUSD NO. 503
 - PROPOSED ELEVATION
 - EXISTING ELEVATION
 - FUTURE ELEVATION
 - EXISTING CONTOUR (5'-FT)
 - EXISTING CONTOUR (1'-FT)
 - CUT/FILL TRANSITION LINE
 - FIRE HYDRANT ASSEMBLY
 - SIGHT VISIBILITY ZONE
 - WROUGHT IRON FENCE
 - PONY WALL
 - RETAINING WALL
 - DECORATIVE PERIMETER WALL
 - DECORATIVE PERIMETER RETAINING WALL
- SEE SHEET C-2 FOR ABBREVIATIONS AND QUANTITIES



DISCLAIMER NOTE

1. EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

2. FOR ROADWAY WIDENING AND HALF STREET IMPROVEMENTS THE CONTRACTOR SHALL VERIFY CROSS SLOPES FROM EXISTING PAVEMENT SAWCUT LINE TO PROPOSED EDGE OF PAVEMENT OR PROJECTED LIP OF CURB PRIOR TO SUBGRADE PREPARATION AND CONSTRUCTION OF PROPOSED CURB LINE. IF MINIMUM OR MAXIMUM CROSS SLOPES DO NOT MEET AGENCY STANDARDS THE CONTRACTOR SHALL NOTIFY THE ENGINEER.

SOILS REPORT BY: ANGLE ENGINEERING
PROJECT NO. 26164-1, DATED 12/06/13
EARTHWORK QUANTITIES (RAW):
CUT=19,307 CU YDS/FILL= 8,180 CU YDS

- ### GENERAL NOTES
- FINAL GRADES ADJACENT TO STRUCTURES SHALL BE IN CONFORMANCE WITH IBC 2009, SECTION 2304.11.2.2.
 - THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND REPORT ALL DISCREPANCIES TO THE ENGINEER.
 - ALL IMPROVEMENTS TO BE PROTECTED FROM EROSION BY SWP.
 - MAXIMUM MINIMUM SLOPES AND MINIMUM STREET SECTIONS NOT TO EXCEED THAT SHOWN ON GEOTECH REPORT.
 - ALL PUBLIC AND PRIVATE DRAINAGE IMPROVEMENTS TO BE BONDED FOR AND INSPECTED.
 - CONSTRUCTION OF BLOCK WALLS REQUIRES A SEPARATE BUILDING PERMIT AND APPROVAL BY THE CLARK COUNTY BUILDING DEPARTMENT.
 - CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING UTILITY STRUCTURES AND FACILITIES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. CONTRACTOR TO PROTECT IN PLACE DURING CONSTRUCTION. ENGINEER/OWNER SHALL BE NOTIFIED OF PRIOR DAMAGE TO EXISTING FACILITIES PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR REPAIR/REPLACING FACILITIES IF ENGINEER/OWNER IS NOT NOTIFIED OF EXISTING DAMAGE PRIOR TO CONSTRUCTION COMMENCING.
 - NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXIST) WITHIN THE SIGHT VISIBILITY ZONES.

FEMA FLOOD ZONE DESIGNATION

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE 'X' (OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD). PER FIRM PANEL 32003C1745E, DATED SEPTEMBER 27, 2002.

BASIS OF BEARING

NORTH 00°03'58" WEST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN BOOK 132, PAGE 11 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV9019C4
RIVET AND PLATE IN TOP OF CURB ON THE NORTHEAST CORNER OF DEER SPRINGS WAY AND GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, NA08 ADJUSTMENT (UPDATED MAY 24, 2010)

FLOOD CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED TECHNICAL DRAINAGE STUDY XXXXXX ON FILE AT CITY OF LAS VEGAS FOR THE SUBJECT PROJECT.

TODD J. STEADHAM, P.E. 15292 DATE



SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

RICHMOND AMERICAN HOMES
CONNOR HILLS
GRADING PLAN

CITY OF LAS VEGAS, NV

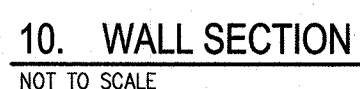
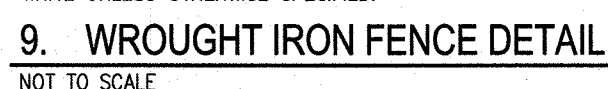
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7/11/14	CZ		
	CZ		
	TJS		

PROJECT NO. **RAH1310**

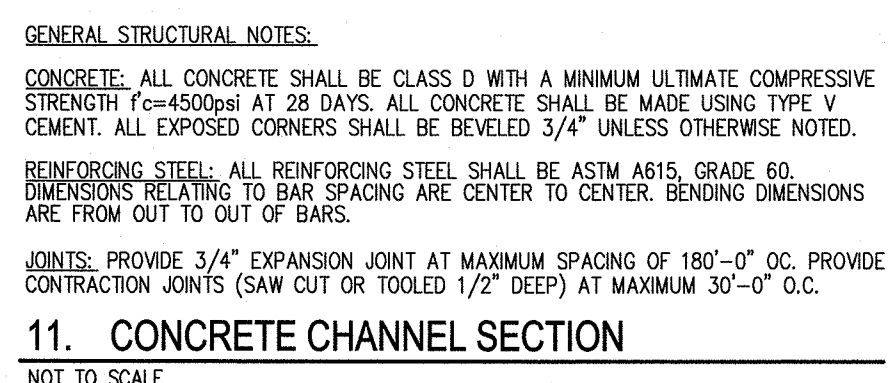
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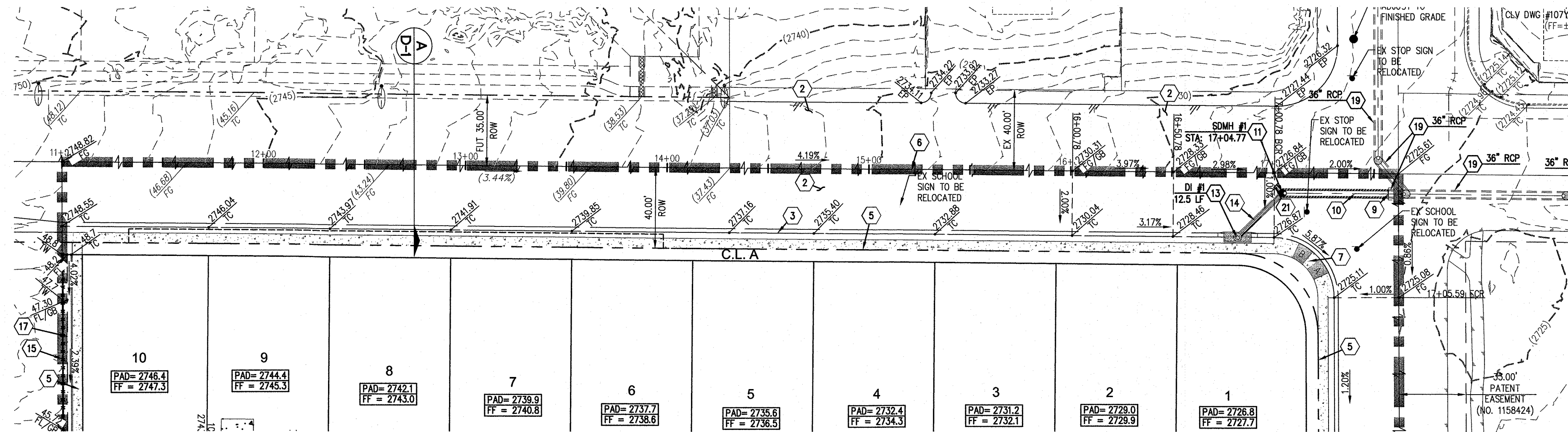
PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. STEADHAM
Exp. 08/30/2016
CIVIL
No. 15292

G-1
SHEET 3 OF



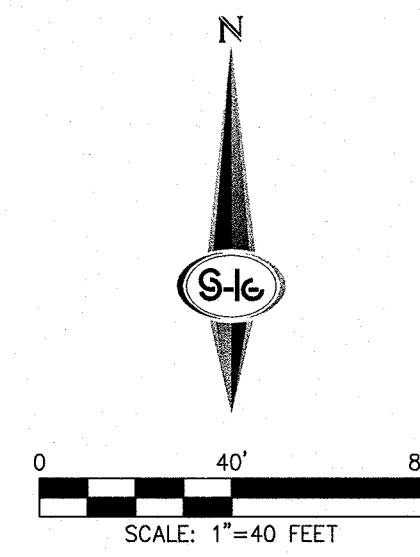
- ## CONSTRUCTION NOTES
- (1) CONSTRUCT 3" AS PAVEMENT WITH 5" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - (2) CONSTRUCT 3" AS PAVEMENT WITH 7" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - (3) CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD NO. 216.
 - (4) CONSTRUCT 6" CROSS GUTTER PER CCAUSD NO. 228.
 - (5) CONSTRUCT 5' WIDE SIDEWALK PER CCAUSD NO. 234.
 - (6) SAWCUT AND MATCH EXISTING IMPROVEMENTS.
 - (7) CONSTRUCT SIDEWALK RAMPS USING ARMOR TILE OR STONES OR EQUIVALENT PER CCAUSD NO. 235, CASE 1.
 - (8) INSTALL SIDEWALK DRAIN PER CCAUSD NO. 236.
 - (9) INSTALL 6" HIGH WROUGHT IRON FENCE PER DETAIL 9 ON SHEET D-1.
 - (10) INSTALL STUB AND CAP.
 - (11) CONSTRUCT 4" U-CHANNEL PER DETAIL 8 ON SHEET D-1.
 - (12) CONSTRUCT 4" U-CHANNEL PER DETAIL 11 ON SHEET D-1.
- SEE SHEET C-2 FOR ABBREVIATIONS, LEGEND & QUANTITIES



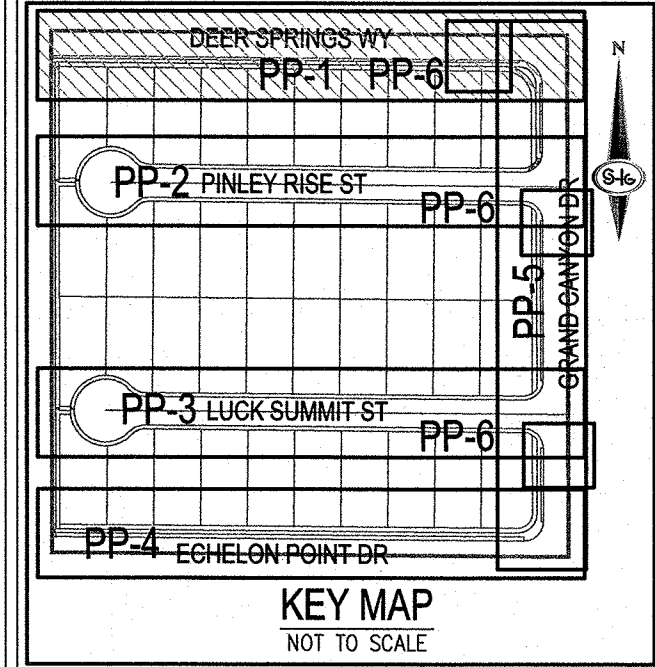


DEER SPRINGS WY (PUBLIC)

GRAND CANYON DR
SEE SHEET PP-4



- #### CONSTRUCTION NOTES
- CONSTRUCT 2.5" AC PAVEMENT WITH 6" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 3.5" AC PAVEMENT WITH 7" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 1" TYPE CURB AND GUTTER PER CCAUSD NO. 216.
 - CONSTRUCT 6" CROSS GUTTER PER CCAUSD NO. 228.
 - CONSTRUCT 5' WIDE SIDEWALK PER CCAUSD NO. 234.
 - SAWCUT AND MATCH EXISTING IMPROVEMENTS.
 - CONSTRUCT SIDEWALK RAMP USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD NO. 235, CASE 1.
 - INSTALL SIDEWALK DRAIN PER CCAUSD NO. 236.
 - FIELD VERIFY, REMOVE EXISTING CAP AND CONNECT TO EXISTING STORM DRAIN STUB.
 - INSTALL 36" RCP CLASS III STORM DRAIN.
 - INSTALL 60" TYPE II STORM DRAIN MANHOLE PER CCAUSD NO. 401 & 405.
 - INSTALL 24" RCP CLASS III STORM DRAIN.
 - INSTALL TYPE CM2 DROP INLET PER CCAUSD NO. 412.1 & 421. SEE PROFILE, SHEET PP-5.
 - INSTALL 18" RCP CLASS III STORM DRAIN.
 - INSTALL 6" HIGH WROUGHT IRON FENCE PER DETAIL 9 ON SHEET D-1.
 - INSTALL STUB AND CAP.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 8 ON SHEET D-1.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 11 ON SHEET D-1.
 - EXISTING STORM DRAIN PER TOWN CENTER 60/75 NO. 5, CLV DWG NO. 10774719-5.
 - EXISTING STORM DRAIN PER GRAND CANYON/ROME MIDDLE SCHOOL, CLV DWG NO. 715-163.
 - CONSTRUCT 5' STUB AND CAP.
- SEE SHEET C-2 FOR ABBREVIATIONS, LEGEND & QUANTITIES



- #### LEGEND
- BOUNDARY LINE
 - ROADWAY CENTERLINE
 - RIGHT-OF-WAY
 - PROPERTY LINE
 - CURB AND GUTTER
 - EXISTING CURB AND GUTTER
 - FLOWLINE
 - EDGE OF PAVEMENT (EP)
 - SAWCUT LINE PER CCAUSD NO. 303
 - PROPOSED ELEVATION
 - EXISTING ELEVATION
 - FUTURE ELEVATION
 - EXISTING CONTOUR (5'-FT)
 - EXISTING CONTOUR (1'-FT)
 - CUT/FILL TRANSITION LINE
 - FIRE HYDRANT ASSEMBLY
 - SIGHT VISIBILITY ZONE
 - WROUGHT IRON FENCE
 - PONY WALL
 - RETAINING WALL
 - DECORATIVE PERIMETER WALL
 - DECORATIVE PERIMETER RETAINING WALL
- SEE SHEET C-2 FOR ABBREVIATIONS AND QUANTITIES

DISCLAIMER NOTE

1. EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

2. FOR ROADWAY WIDENING AND HALF STREET IMPROVEMENTS THE CONTRACTOR SHALL VERIFY CROSS SLOPES FROM EXISTING PAVEMENT SAWCUT LINE TO PROPOSED EDGE OF PAVEMENT OR PROJECTED LIP OF CURB PRIOR TO SUBGRADE PREPARATION AND CONSTRUCTION OF PROPOSED CURB LINE. IF MINIMUM OR MAXIMUM CROSS SLOPES DO NOT MEET AGENCY STANDARDS THE CONTRACTOR SHALL NOTIFY THE ENGINEER.

SOILS REPORT BY: ANGLE ENGINEERING
PROJECT NO.: 26184-1, DATED: 12/06/13
EARTHWORK QUANTITIES (RAW):
OUT=19,307_CU YDS/FILL=8,160_CU YDS

- #### GENERAL NOTES
- FINAL GRADES ADJACENT TO STRUCTURES SHALL BE IN CONFORMANCE WITH IBC 2009, SECTION 2304.11.2.2.
 - THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND REPORT ALL DISCREPANCIES TO THE ENGINEER.
 - ALL IMPROVEMENTS TO BE PROTECTED FROM EROSION BY SWPPP.
 - MAXIMUM/MINIMUM SLOPES AND MINIMUM STREET SECTIONS NOT TO EXCEED THAT SHOWN ON GEOTECH REPORT.
 - ALL PUBLIC AND PRIVATE DRAINAGE IMPROVEMENTS TO BE BONDED FOR AND INSPECTED.
 - CONSTRUCTION OF BLOCK WALLS REQUIRES A SEPARATE BUILDING PERMIT AND APPROVAL BY THE CLARK COUNTY BUILDING DEPARTMENT.
 - CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING UTILITY STRUCTURES AND FACILITIES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. CONTRACTOR TO PROTECT IN PLACE DURING CONSTRUCTION. ENGINEER/OWNER SHALL BE NOTIFIED OF PRIOR DAMAGE TO EXISTING FACILITIES PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR REPAIR/REPAIRING FACILITIES IF ENGINEER/OWNER IS NOT NOTIFIED OF EXISTING DAMAGE PRIOR TO CONSTRUCTION COMMENCING.
 - NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

FEMA FLOOD ZONE DESIGNATION

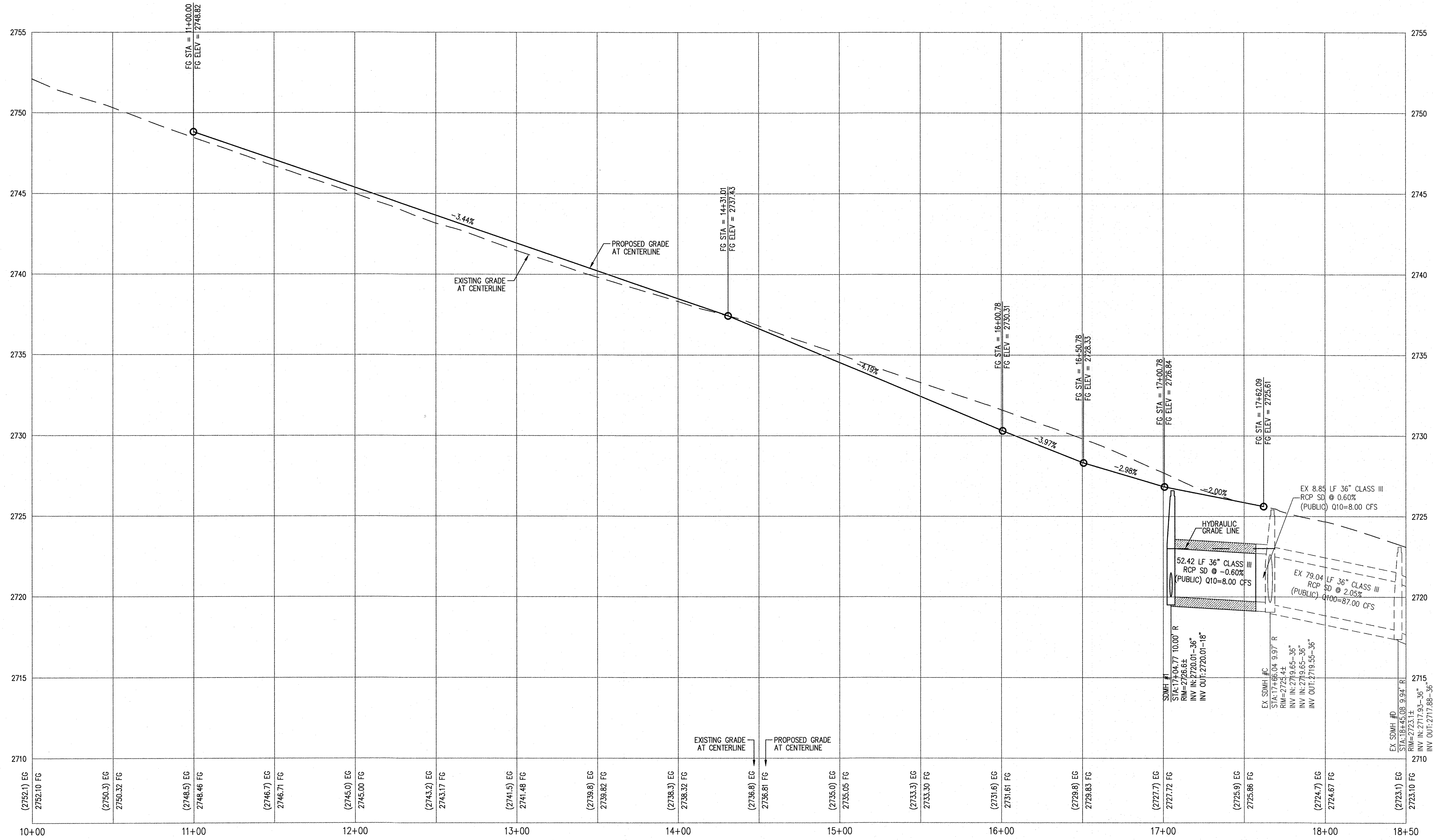
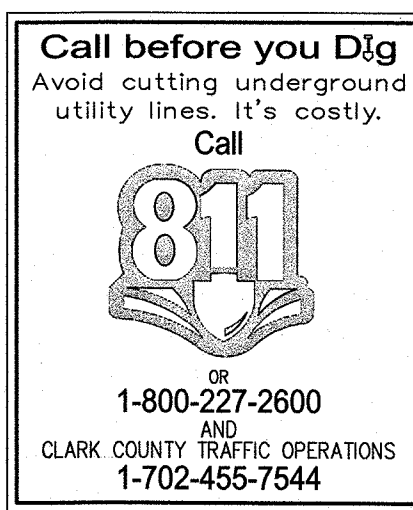
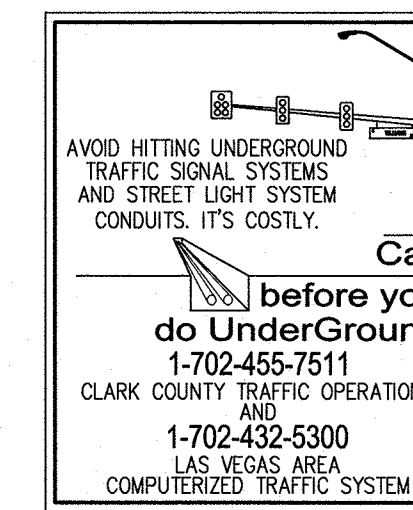
THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE 'X', (OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD), PER FIRM PANEL 32003C1745E, DATED SEPTEMBER 27, 2002.

BASIS OF BEARING

NORTH 0°03'58" WEST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN BOOK 132, PAGE 11 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV8019C4
Rivet and Plate in TOP of CURB on the NORTHEAST CORNER of DEER SPRINGS WAY and GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, 2008 ADJUSTMENT (UPDATED MAY 24, 2010)



PROFILE
HOR. : 1"=40'
VERT. : 1"=4'

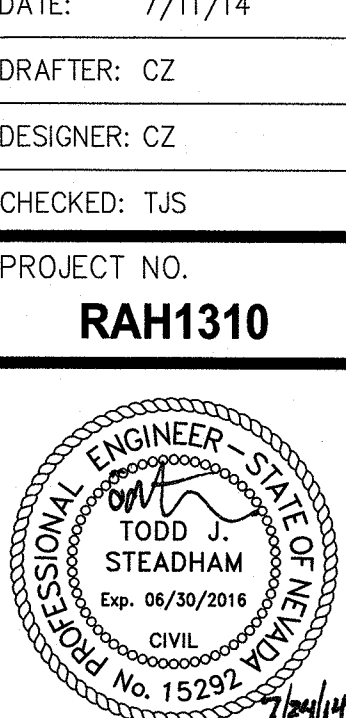
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DESCRIPTION	DATE	BY	APP.

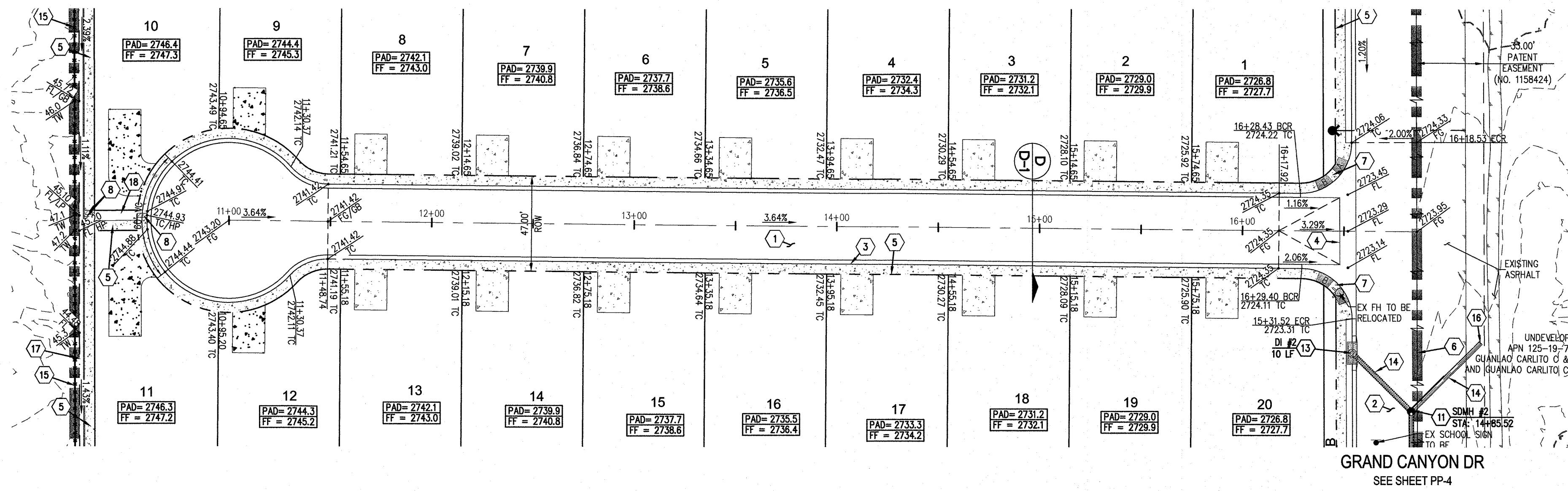
CITY OF LAS VEGAS, NV

RICHMOND
AMERICAN HOMES
CONNOR HILLS

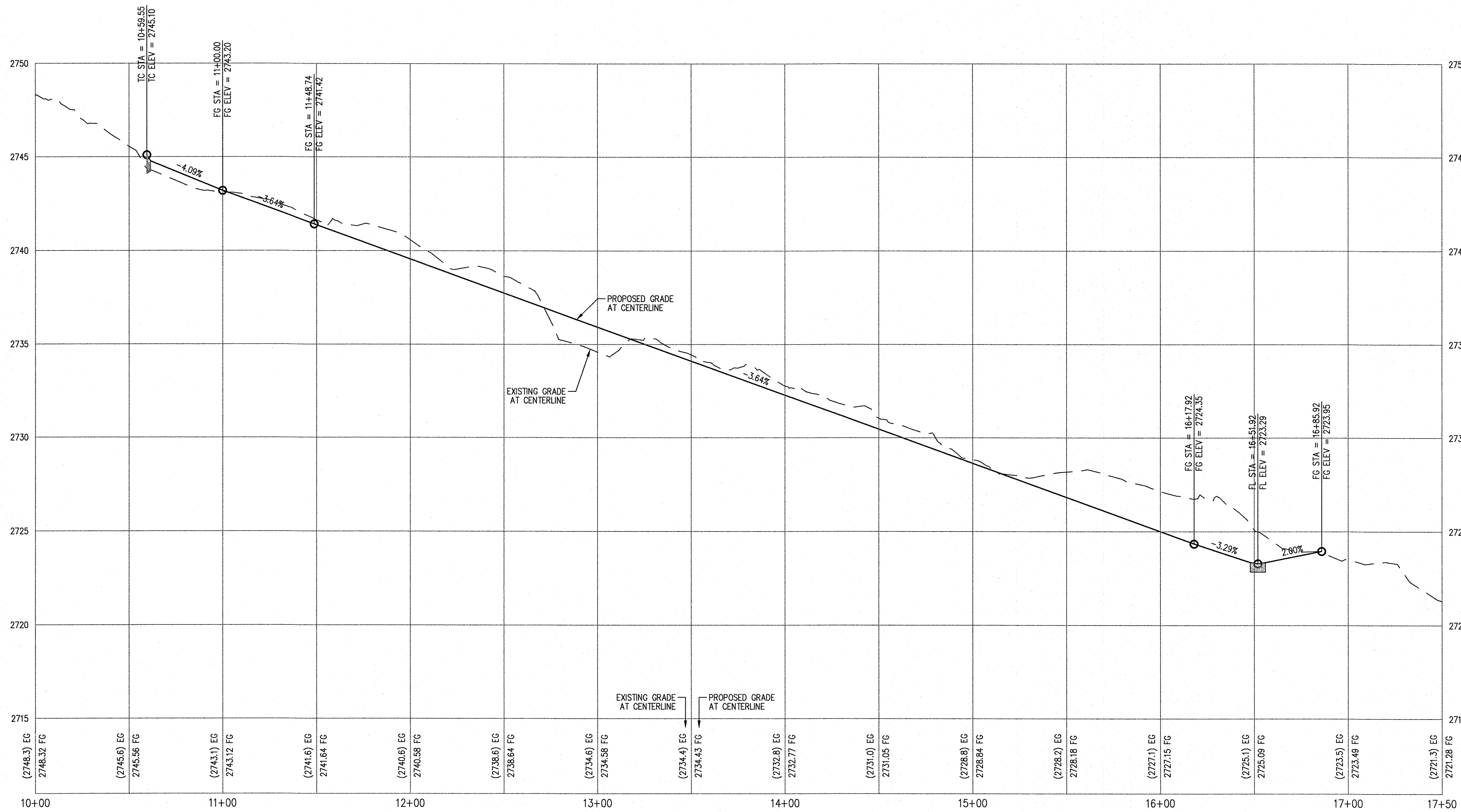
DATE: 7/11/14
DRAFTER: CZ
DESIGNER: CZ
CHECKED: TJS
PROJECT NO.
RAH1310



PP-1
SHEET 5 OF ----
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PINLEY RISE ST
(PUBLIC)

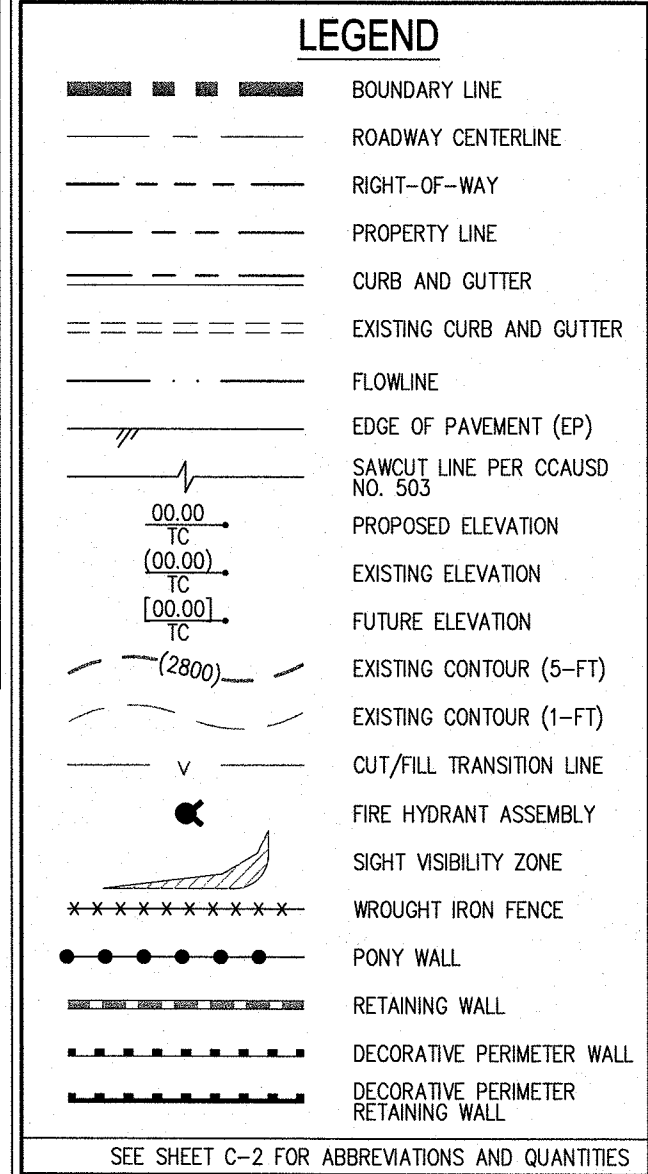
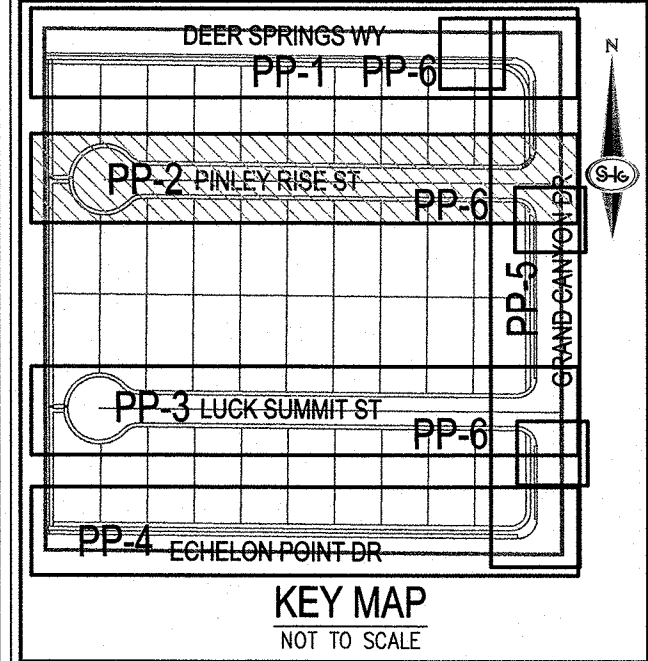


PROFILE
HOR. : 1"=40'
VERT. : 1"=4'

CONSTRUCTION NOTES

- CONSTRUCT 2.5" AC PAVEMENT WITH 6" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
- CONSTRUCT 3.5" AC PAVEMENT WITH 7" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
- CONSTRUCT 1" TYPE CURB AND GUTTER PER CCAUSD NO. 216.
- CONSTRUCT 8" CROSS GUTTER PER CCAUSD NO. 228.
- CONSTRUCT 5" WIDE SIDEWALK PER CCAUSD NO. 234.
- SAWCUT AND MATCH EXISTING IMPROVEMENTS.
- CONSTRUCT SIDEWALK RAMP USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD NO. 235, CASE 1.
- INSTALL SIDEWALK DRAIN PER CCAUSD NO. 236.
- FIELD VERIFY, REMOVE EXISTING CAP AND CONNECT TO EXISTING STORM DRAIN STUB.
- INSTALL 36" RCP CLASS III STORM DRAIN.
- INSTALL 60" TYPE II STORM DRAIN MANHOLE PER CCAUSD NO. 401 & 405.
- INSTALL 24" RCP CLASS III STORM DRAIN.
- INSTALL TYPE CM2 DROP INLET PER CCAUSD NO. 412.1 & 421. SEE PROFILE, SHEET PP-6.
- INSTALL 18" RCP CLASS III STORM DRAIN.
- INSTALL 6" HIGH WROUGHT IRON FENCE PER DETAIL 9 ON SHEET D-1.
- INSTALL STUB AND CAP.
- CONSTRUCT 4" U-CHANNEL PER DETAIL 8 ON SHEET D-1.
- CONSTRUCT 4" U-CHANNEL PER DETAIL 11 ON SHEET D-1.
- EXISTING STORM DRAIN PER TOWN CENTER 60/75 NO. 5, CLV DWG NO. 10774719-5.
- EXISTING STORM DRAIN PER GRAND CANYON/ROME MIDDLE SCHOOL, CLV DWG NO. 715-163.
- CONSTRUCT 5" STUB AND CAP.

SEE SHEET C-2 FOR ABBREVIATIONS, LEGEND & QUANTITIES



DISCLAIMER NOTE

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SOILS REPORT BY: ANGLE ENGINEERING
PROJECT NO. 26164-1, DATED 12/06/13
EARTHWORK QUANTITIES (RAW):
OUT= 19,307 CU YDS/FILL= 8,160 CU YDS

GENERAL NOTES

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- NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXIST) WITHIN THE SIGHT VISIBILITY ZONES.

FEMA FLOOD ZONE DESIGNATION

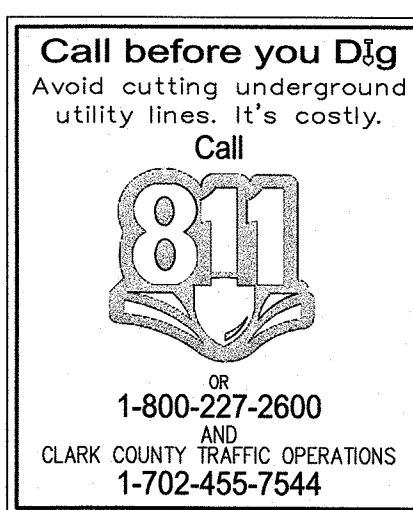
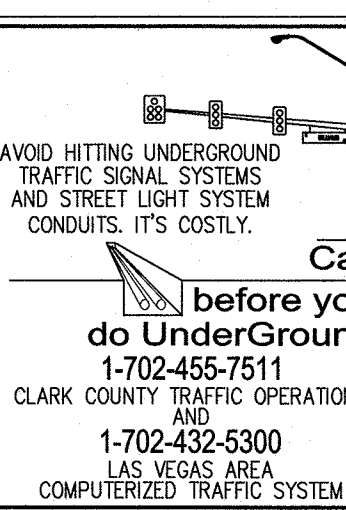
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BASIS OF BEARING

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BENCHMARK

CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV9019C4
RIVET AND PLATE IN TOP OF CURB ON THE NORTHEAST CORNER OF DEER SPRINGS WAY AND GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, 2008 ADJUSTMENT (UPDATED MAY 24, 2010)



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PHONE (702) 284-5300 FAX (702) 284-5399

CITY OF LAS VEGAS, NV

RICHMOND AMERICAN HOMES

CONNOR HILLS

PLAN AND PROFILE - PINLEY RISE ST

DATE: 7/11/14

DRAFTER: CZ

DESIGNER: CZ

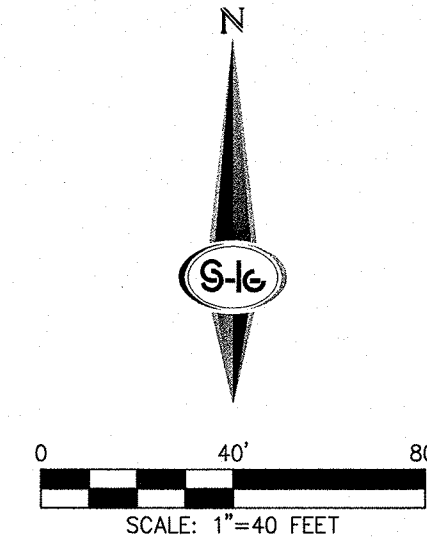
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PROJECT NO. RAH1310

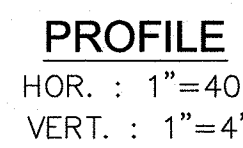
PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. STEADHAM
Exp. 06/30/2016
CIVIL
No. 15292

PP-2

SHEET 6 OF ----



GRAND CANYON DP
SEE SHEET PP-5



-
- DEER SPRINGS WY
PP-1 PP-6
- PP-2 PINLEY RISE ST PP-6
- PP-3 LUCK SUMMIT ST PP-6
- PP-4 ECHELON POINT DR
- PP-5 GRAND CANYON
- N
- KEY MAP
NOT TO SCALE

- | LEGEND | | | |
|---------|------|------|-------------------------------------|
| SYMBOLS | TEXT | TEXT | SYMBOLS |
| ===== | | | BOUNDARY LINE |
| ===== | | | ROADWAY CENTERLINE |
| ===== | | | RIGHT-OF-WAY |
| ===== | | | PROPERTY LINE |
| ===== | | | CURB AND GUTTER |
| ===== | | | EXISTING CURB AND GUTTER |
| ===== | | | FLOWLINE |
| ===== | | | EDGE OF PAVEMENT (EP) |
| ===== | | | SAW CUT LINE PER CCAUSD NO. 503 |
| ===== | | | PROPOSED ELEVATION |
| ===== | | | EXISTING ELEVATION |
| ===== | | | FUTURE ELEVATION |
| ===== | | | EXISTING CONTOUR (5-FIT) |
| ===== | | | EXISTING CONTOUR (1-FIT) |
| ===== | | | CUT/FILL TRANSITION LINE |
| ===== | | | FIRE HYDRANT ASSEMBLY |
| ===== | | | SIGHT VISIBILITY ZONE |
| ===== | | | WROUGHT IRON FENCE |
| ===== | | | PONY WALL |
| ===== | | | RETAINING WALL |
| ===== | | | DECORATIVE PERIMETER WALL |
| ===== | | | DECORATIVE PERIMETER RETAINING WALL |
- SEE SHEET C-2 FOR ABBREVIATIONS AND QUANTITIES

1. EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN IN THEIR PROPOSED LOCATION.

2. FOR ALL HIGHWAY IMPROVEMENT AND MAINTENANCE IMPROVEMENTS THE CONTRACTOR SHALL VERIFY CROSS SLOPES FROM EXISTING PAVEMENT SAWCUT LINE TO PROPOSED EDGE OF PAVEMENT OR PROJECTED LINE OF CURB PRIOR TO SUBGRADE PREPARATION AND CONSTRUCTION OF PROPOSED CURB LINE. IF MINIMUM OR MAXIMUM CROSS SLOPES DO NOT MEET AGENCY STANDARDS THE CONTRACTOR SHALL NOTIFY THE ENGINEER.

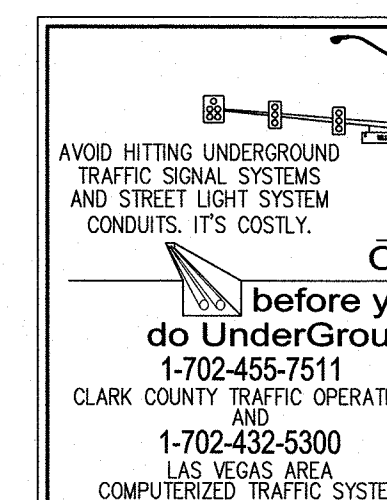
GENERAL NOTES

1. FINAL GRADES ADJACENT TO STRUCTURES SHALL BE IN CONFORMANCE WITH BC 209, SECTION 230.12.1.7.
2. THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND REPORT ALL DISCREPANCIES TO THE ENGINEER.
3. ALL IMPROVEMENTS TO BE PROTECTED FROM EROSION OR WASHING.
4. MAXIMUM MINIMUM SLOPES AND MINIMUM STREET SECTIONS NOT TO EXCEED THAT SHOWN ON GEOTECH REPORT.
5. ALL PUBLIC AND PRIVATE DRAINAGE IMPROVEMENTS TO BE BONDED FOR AND INSPECTED.
6. CONSTRUCTION OF BLOCK WALLS REQUIRES A SEPARATE BUILDING PERMIT AND APPROVAL BY THE CLARK COUNTY PLANNING DEPARTMENT.
7. CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING UTILITY STRUCTURES AND FACILITIES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. CONTRACTOR TO PROTECT IN PLACE UTILITIES FROM DAMAGE TO EXISTING FACILITIES. IF NOTIFIED OF PRIOR DAMAGE TO EXISTING FACILITIES PRIOR TO CONSTRUCTION, CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR/REPLACE. IF ENGINEER/OWNER IS NOT NOTIFIED OF EXISTING DAMAGE PRIOR TO CONSTRUCTION COMMENCING,
8. NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND SHALL BE WITHIN FOUR (4) FEET (4) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE 'X',
(OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD), PER FIRM PANEL
32003C1745E, DATED SEPTEMBER 27, 2002.

NORTH 00°03'58" WEST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW1/4) OF THE NORTHEAST QUARTER (NE1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN BOOK 132, PAGE 11 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV9019C4
RIVET AND PLATE IN TOP OF CURB ON THE NORTHEAST CORNER OF
DEER SPRINGS WAY AND GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, 2008 ADJUSTMENT
(UPDATED MAY 24, 2010)



Call before you Dig
Avoid cutting underground
utility lines. It's costly.

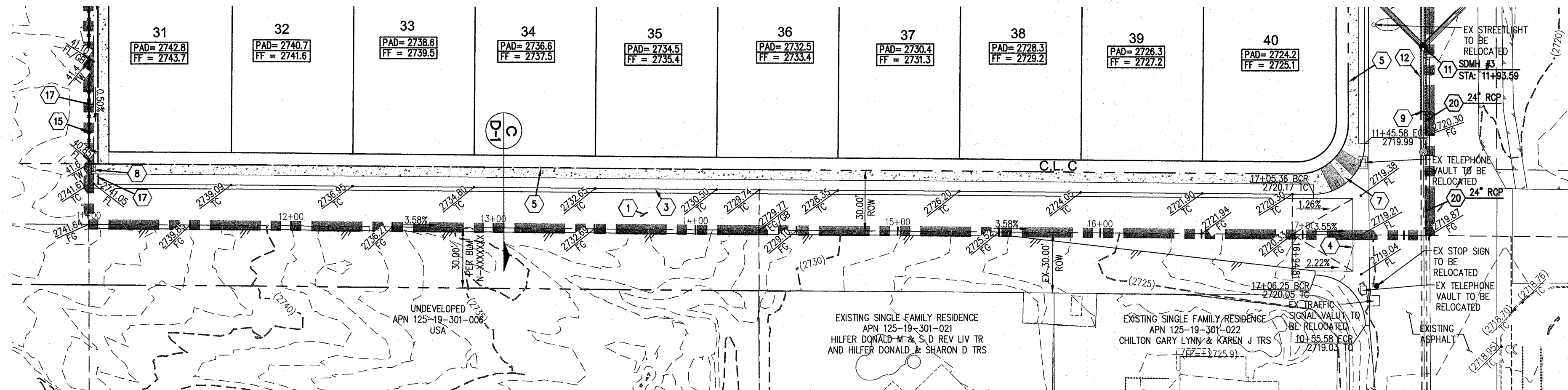
Call

811

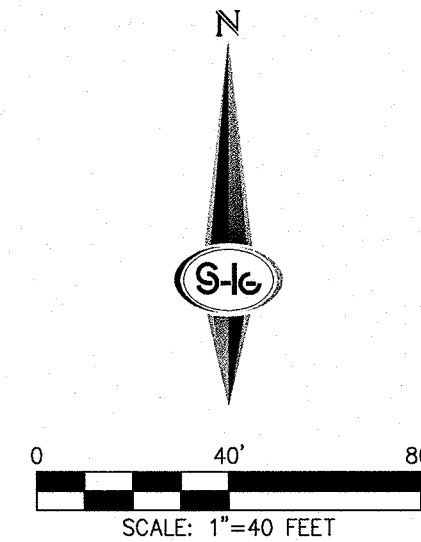
OR
1-800-227-2600
AND
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544

RAH1310

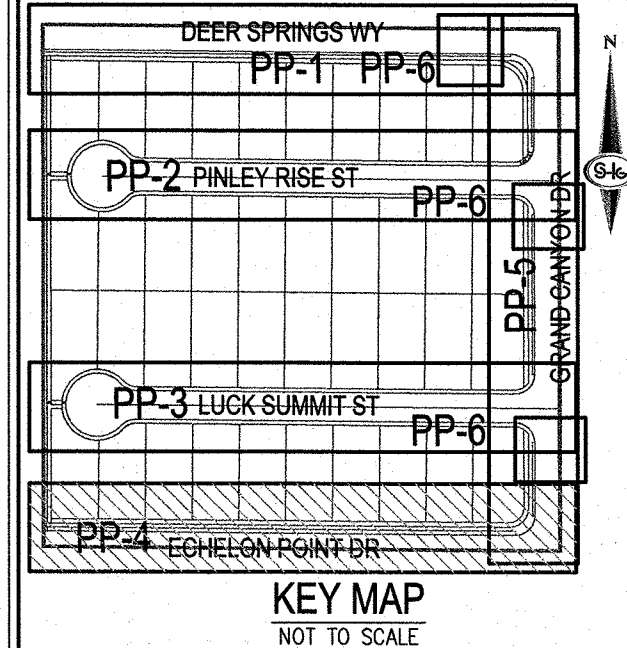




ECHELON POINT DR
(PUBLIC)



- CONSTRUCTION NOTES**
- CONSTRUCT 2.5" AC PAVEMENT WITH 6" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 3.5" AC PAVEMENT WITH 7" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD NO. 218.
 - CONSTRUCT 8" CROSS GUTTER PER CCAUSD NO. 228.
 - CONSTRUCT 5" WIDE SIDEWALK PER CCAUSD NO. 234.
 - SAWCUT AND MATCH EXISTING IMPROVEMENTS.
 - CONSTRUCT SIDEWALK RAMP USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD NO. 235, CASE 1.
 - INSTALL SIDEWALK DRAIN PER CCAUSD NO. 236.
 - FIELD VERIFY, REMOVE EXISTING CAP AND CONNECT TO EXISTING STORM DRAIN STUB.
 - INSTALL 36" RCP CLASS III STORM DRAIN.
 - INSTALL 60" TYPE II STORM DRAIN MANHOLE PER CCAUSD NO. 401 & 405.
 - INSTALL 24" RCP CLASS III STORM DRAIN.
 - INSTALL TYPE CM2 DROP INLET PER CCAUSD NO. 412.1 & 421. SEE PROFILE, SHEET PP-6.
 - INSTALL 18" RCP CLASS III STORM DRAIN.
 - INSTALL 6" HIGH WROUGHT IRON FENCE PER DETAIL 9 ON SHEET D-1.
 - INSTALL STUB AND CAP.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 8 ON SHEET D-1.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 11 ON SHEET D-1.
 - EXISTING STORM DRAIN PER TOWN CENTER 60/75 NO. 5, CLV DWG NO. 10714719-5.
 - EXISTING STORM DRAIN PER GRAND CANYON/ROME MIDDLE SCHOOL, CLV DWG NO. 715-163.
 - CONSTRUCT 5' STUB AND CAP.
- SEE SHEET C-2 FOR ABBREVIATIONS, LEGEND & QUANTITIES



LEGEND

---	BOUNDARY LINE
---	ROADWAY CENTERLINE
---	RIGHT-OF-WAY
---	PROPERTY LINE
---	CURB AND GUTTER
---	EXISTING CURB AND GUTTER
---	FLOWLINE
---	EDGE OF PAVEMENT (EP)
---	SAWCUT LINE PER CCAUSD NO. 503
---	PROPOSED ELEVATION
---	EXISTING ELEVATION
---	FUTURE ELEVATION
---	EXISTING CONTOUR (5'-FT)
---	EXISTING CONTOUR (1'-FT)
---	CUT/FILL TRANSITION LINE
---	FIRE HYDRANT ASSEMBLY
---	SIGHT VISIBILITY ZONE
---	WROUGHT IRON FENCE
---	PONY WALL
---	RETAINING WALL
---	DECORATIVE PERIMETER WALL
---	DECORATIVE PERIMETER RETAINING WALL

SEE SHEET C-2 FOR ABBREVIATIONS AND QUANTITIES

DISCLAIMER NOTE

1. EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

2. FOR ROADWAY WIDENING AND HALF STREET IMPROVEMENTS THE CONTRACTOR SHALL VERIFY CROSS SLOPES FROM EXISTING PAVEMENT SAWCUT LINE TO PROPOSED EDGE OF PAVEMENT OR PROJECTED LIP OF CURB PRIOR TO SUBGRADE PREPARATION AND CONSTRUCTION OF PROPOSED CURB LINE. IF MINIMUM OR MAXIMUM CROSS SLOPES DO NOT MEET AGENCY STANDARDS THE CONTRACTOR SHALL NOTIFY THE ENGINEER.

SOILS REPORT BY: ANGLE ENGINEERING
PROJECT NO. 28164-1, DATED 12/06/13
EARTHWORK QUANTITIES (RAW):
CUT=19,307 CU YDS/FILL=8,180 CU YDS

- GENERAL NOTES**
- FINAL GRADES ADJACENT TO STRUCTURES SHALL BE IN CONFORMANCE WITH IBC 2009, SECTION 2304.11.2.2.
 - THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND REPORT ALL DISCREPANCIES TO THE ENGINEER.
 - ALL IMPROVEMENTS TO BE PROTECTED FROM EROSION BY SWPPP.
 - MAXIMUM/MINIMUM SLOPES AND MINIMUM STREET SECTIONS NOT TO EXCEED THAT SHOWN ON GEOTECH REPORT.
 - ALL PUBLIC AND PRIVATE DRAINAGE IMPROVEMENTS TO BE BONDED FOR AND INSPECTED.
 - CONSTRUCTION OF BLOCK WALLS REQUIRES A SEPARATE BUILDING PERMIT AND APPROVAL BY THE CLARK COUNTY BUILDING DEPARTMENT.
 - CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING UTILITY STRUCTURES AND FACILITIES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. CONTRACTOR TO PROTECT IN PLACE DURING CONSTRUCTION. ENGINEER/OWNER SHALL BE NOTIFIED OF PRIOR DAMAGE TO EXISTING FACILITIES PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR REPAIR/REPAIRING FACILITIES IF ENGINEER/OWNER IS NOT NOTIFIED OF EXISTING FACILITIES PRIOR TO CONSTRUCTION COMMENCING.
 - NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

FEMA FLOOD ZONE DESIGNATION

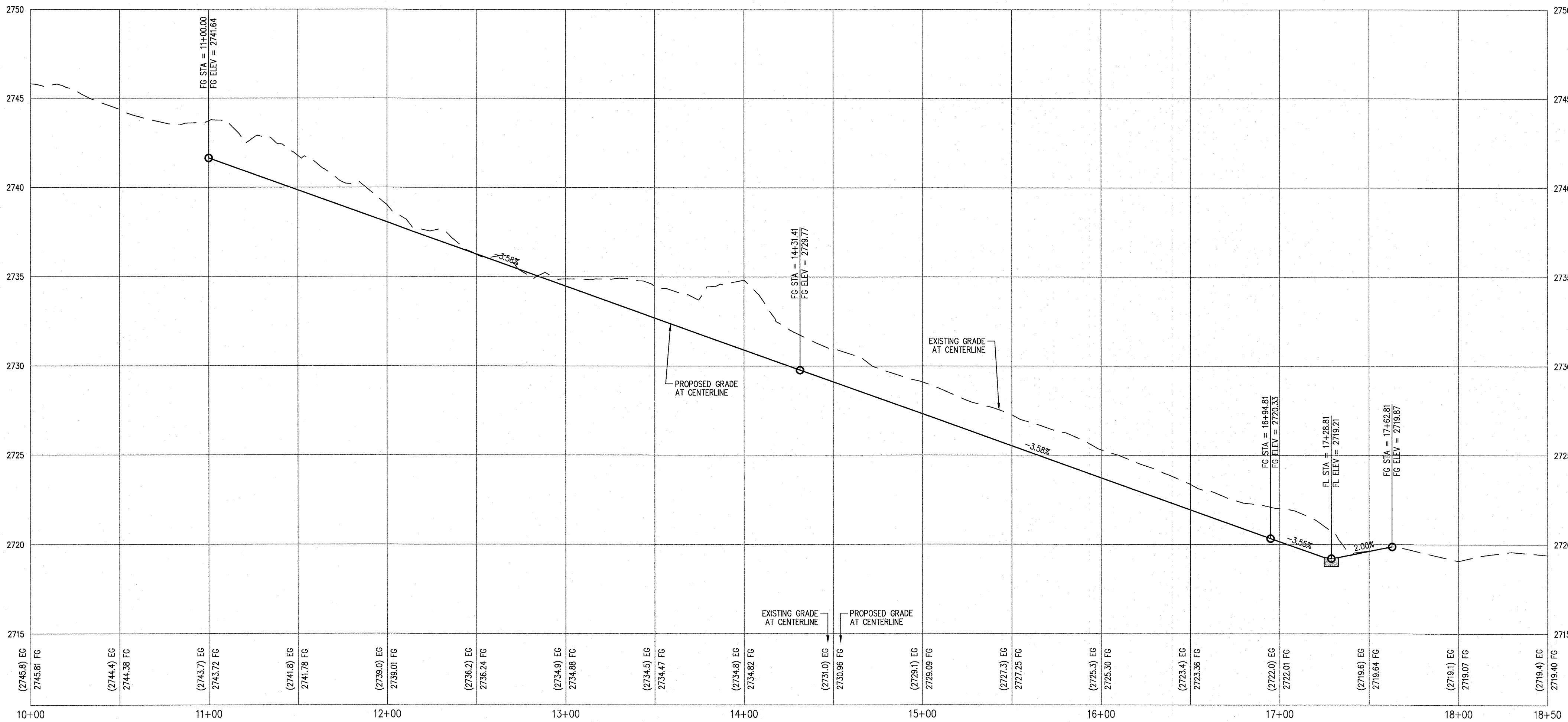
THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE 'X', (OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD), PER FIRM PANEL 32003C1745E, DATED SEPTEMBER 27, 2002.

BASIS OF BEARING

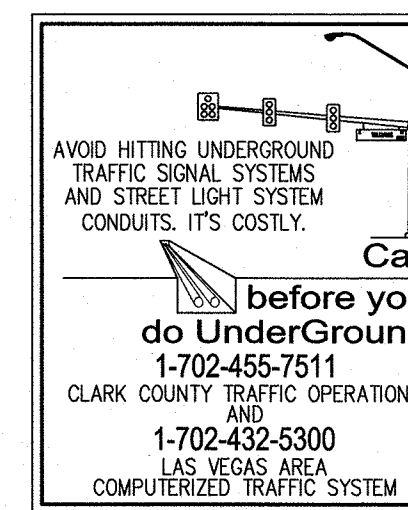
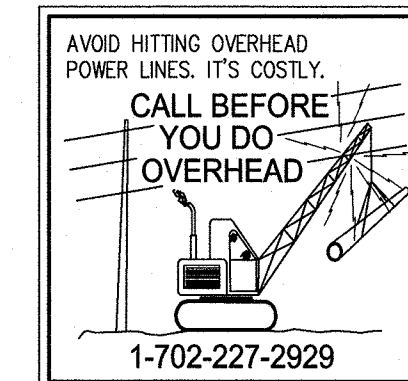
NORTH 00°03'58" WEST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW1/4) OF THE NORTHEAST QUARTER (NE1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN BOOK 132, PAGE 11 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

BENCHMARK

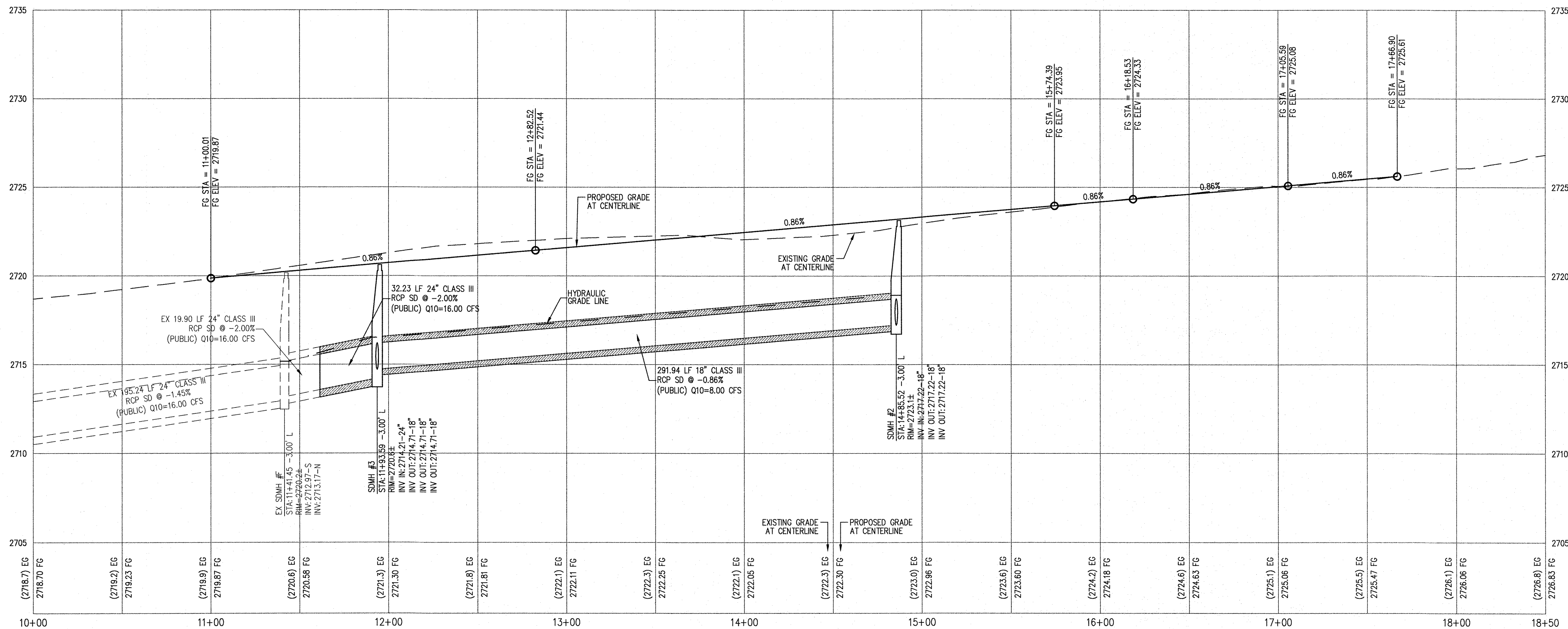
CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV801904
BUILT AND PLACED IN TOP OF CURB ON THE NORTHEAST CORNER OF DEER SPRINGS WAY AND GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, 2008 ADJUSTMENT (UPDATED MAY 24, 2010)



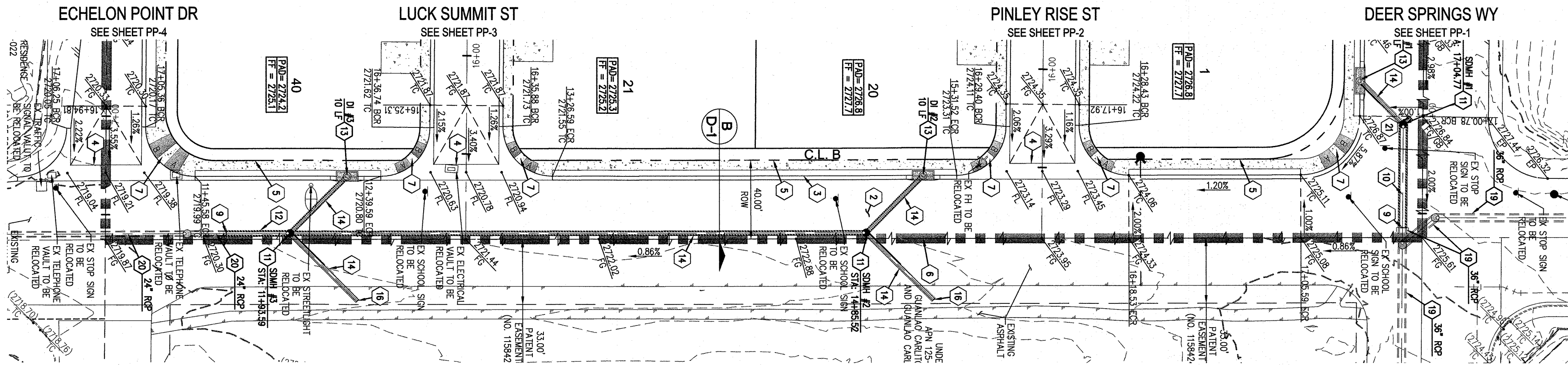
PROFILE
HOR. : 1"=40'
VERT. : 1"=4'



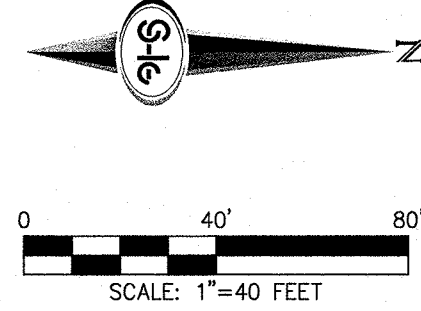
\\vnet1310\corridor hills (deer springs)\\vnet1310\pdp.dwg 7/24/2014 11:45 AM Christopher Zhang



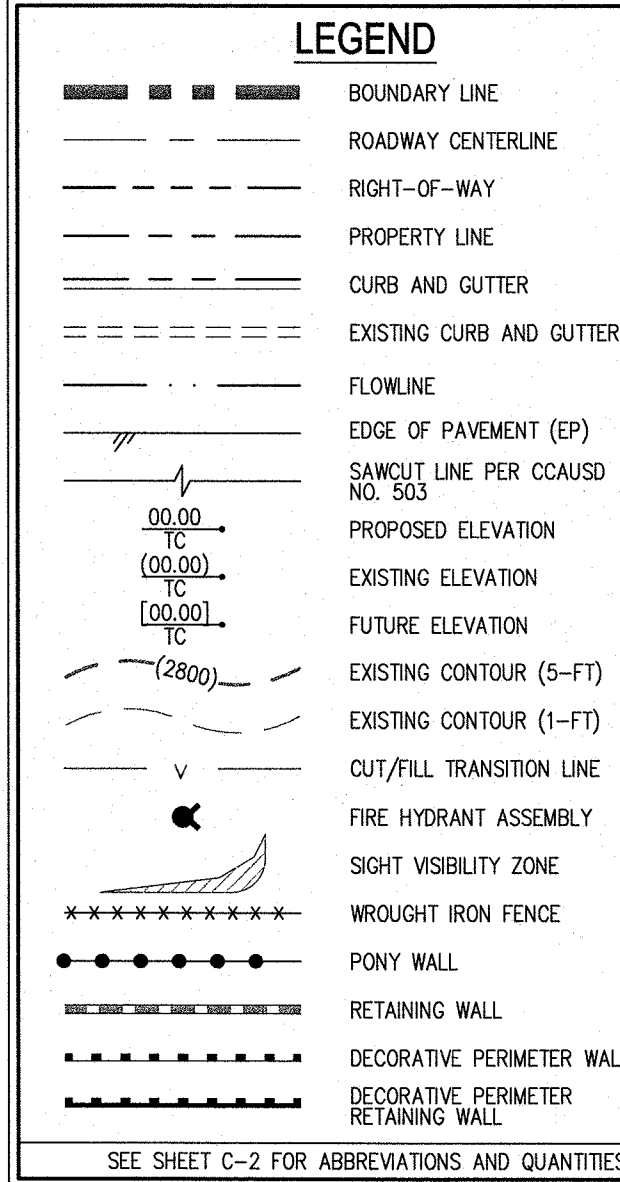
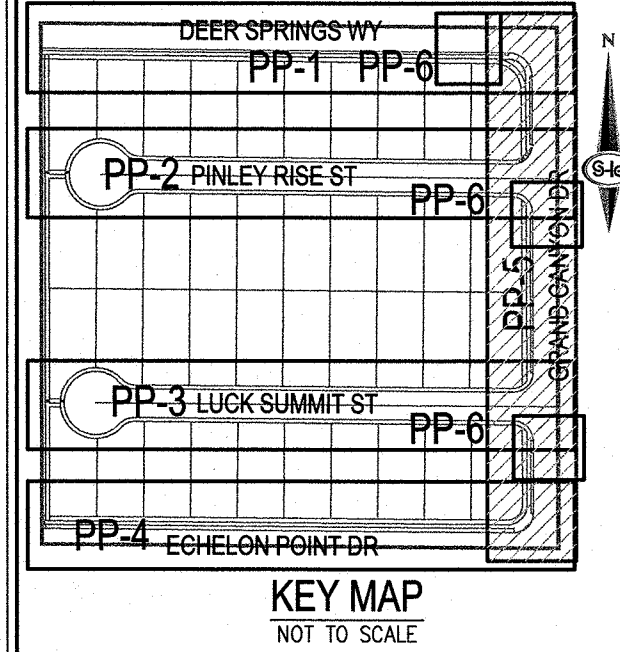
PROFILE
HOR. : 1"=40'
VERT. : 1"=4'



GRAND CANYON DR
(PUBLIC)



- ### CONSTRUCTION NOTES
- CONSTRUCT 2.5" AC PAVEMENT WITH 6" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 3.5" AC PAVEMENT WITH 7" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 1" TYPE CURE AND GUTTER PER CCAUSD NO. 218.
 - CONSTRUCT 8" CROSS GUTTER PER CCAUSD NO. 228.
 - CONSTRUCT 5" WIDE SIDEWALK PER CCAUSD NO. 234.
 - SAWCUT AND MATCH EXISTING IMPROVEMENTS.
 - CONSTRUCT SIDEWALK RAMP USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD NO. 235, CASE 1.
 - INSTALL SIDEWALK DRAIN PER CCAUSD NO. 236.
 - FIELD VERIFY, REMOVE EXISTING CAP AND CONNECT TO EXISTING STORM DRAIN STUB.
 - INSTALL 36" RCP CLASS III STORM DRAIN.
 - INSTALL 60" TYPE II STORM DRAIN MANHOLE PER CCAUSD NO. 401 & 405.
 - INSTALL 24" RCP CLASS III STORM DRAIN.
 - INSTALL TYPE CM2 DROP INLET PER CCAUSD NO. 412.1 & 421. SEE PROFILE, SHEET PP-6.
 - INSTALL 18" RCP CLASS III STORM DRAIN.
 - INSTALL 6" HIGH WROUGHT IRON FENCE PER DETAIL 9 ON SHEET D-1.
 - INSTALL STUB AND CAP.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 8 ON SHEET D-1.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 11 ON SHEET D-1.
 - EXISTING STORM DRAIN PER TOWN CENTER 60/75 NO. 5, CLV DWG NO. 10774719-5.
 - EXISTING STORM DRAIN PER GRAND CANYON/ROME MIDDLE SCHOOL, CLV DWG NO. 715-163.
 - CONSTRUCT 5' STUB AND CAP.
- SEE SHEET C-2 FOR ABBREVIATIONS, LEGEND & QUANTITIES.



DISCLAIMER NOTE

1. EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

2. FOR ROADWAY WIDENING AND HALF STREET IMPROVEMENTS THE CONTRACTOR SHALL VERIFY CROSS SLOPES FROM EXISTING PAVEMENT SAWCUT LINE TO PROPOSED EDGE OF PAVEMENT OR PROJECTED LIP OF CURB PRIOR TO SUBGRADE PREPARATION AND CONSTRUCTION OF PROPOSED CURB LINE. IF MINIMUM OR MAXIMUM CROSS SLOPES DO NOT MEET AGENCY STANDARDS THE CONTRACTOR SHALL NOTIFY THE ENGINEER.

SOILS REPORT BY: ANGLE ENGINEERING
PROJECT NO. 26164-1, DATED 12/06/13
EARTHWORK QUANTITIES (RAW):
CUT= 19,307 CU YDS/FILL= 8,160 CU YDS

- ### GENERAL NOTES
- FINAL GRADES ADJACENT TO STRUCTURES SHALL BE IN CONFORMANCE WITH IBC 2009, SECTION 2304.11.2.2.
 - THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND REPORT ALL DISCREPANCIES TO THE ENGINEER.
 - ALL IMPROVEMENTS TO BE PROTECTED FROM EROSION BY SWPPP.
 - MAXIMUM/MINIMUM SLOPES AND MINIMUM STREET SECTIONS NOT TO EXCEED THAT SHOWN ON GEOTECH REPORT.
 - ALL PUBLIC AND PRIVATE DRAINAGE IMPROVEMENTS TO BE BONDED FOR AND INSPECTED.
 - CONSTRUCTION OF BLOCK WALLS REQUIRES A SEPARATE BUILDING PERMIT AND APPROVAL BY THE CLARK COUNTY BUILDING DEPARTMENT.
 - CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING UTILITY STRUCTURES AND FACILITIES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. CONTRACTOR TO PROTECT IN PLACE DURING CONSTRUCTION. ENGINEER/OWNER SHALL BE NOTIFIED OF PRIOR DAMAGE TO EXISTING FACILITIES PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR REPAIR/REPLENISHING FACILITIES IF ENGINEER/OWNER IS NOT NOTIFIED OF EXISTING DAMAGE PRIOR TO CONSTRUCTION COMMENCING.
 - NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

FEMA FLOOD ZONE DESIGNATION

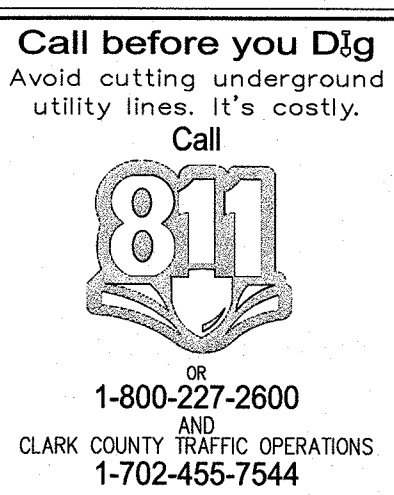
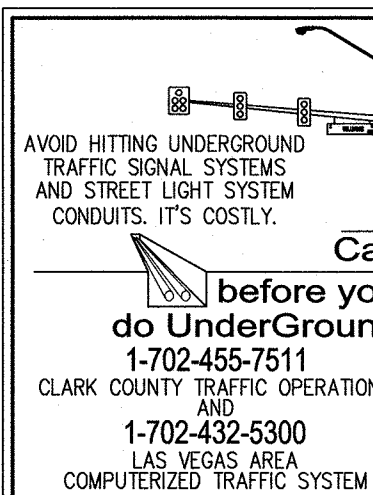
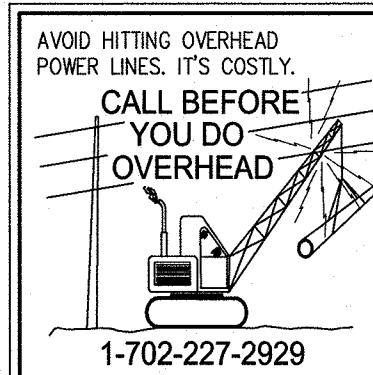
THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE 'X', (OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD), PER FIRM PANEL 32003C1745E, DATED SEPTEMBER 27, 2002.

BASIS OF BEARING

NORTH 0°03'58" WEST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW/4) OF THE NORTHEAST QUARTER (NE1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN BOOK 132, PAGE 11 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV901904
BUILT AND PLATE IN TOP OF CURB ON THE NORTHEAST CORNER OF DEER SPRINGS WAY AND GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, 2008 ADJUSTMENT (UPDATED MAY 24, 2010)



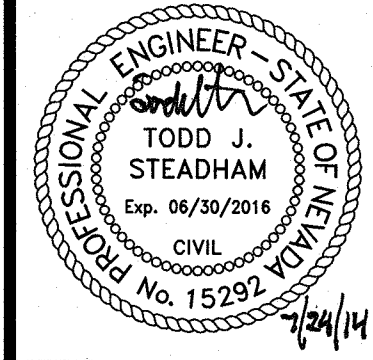
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

CITY OF LAS VEGAS, NV

RICHMOND
AMERICAN HOMES
CONNOR HILLS

PLAN AND PROFILE - GRAND CANYON DR

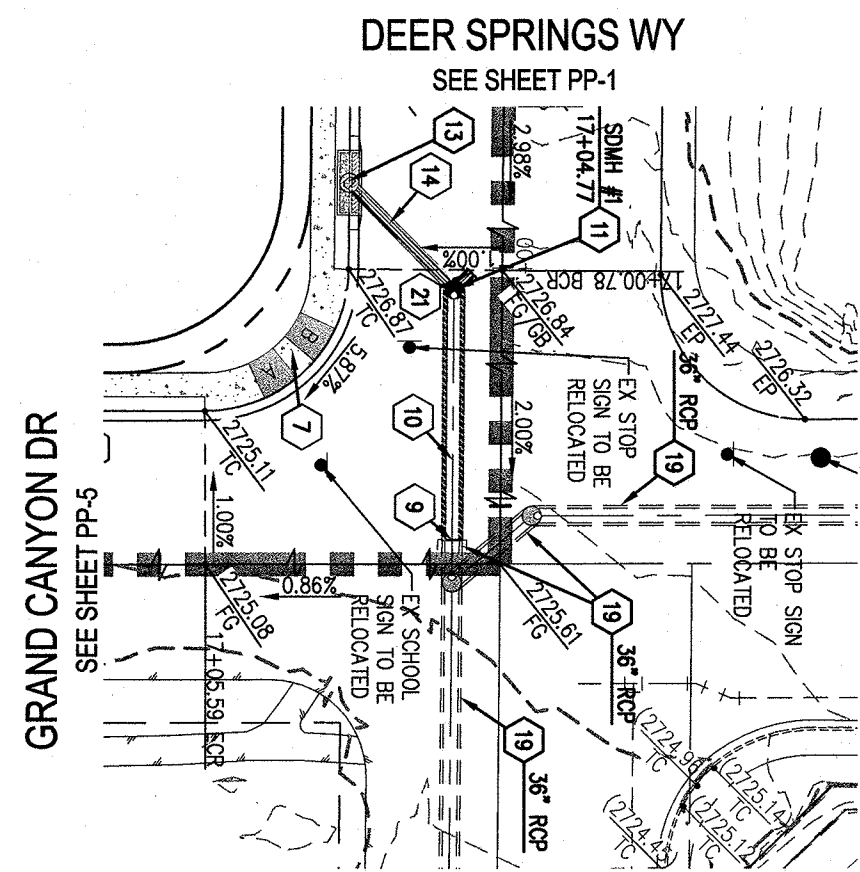
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DESIGNER: CZ
CHECKED: TJS
PROJECT NO. RAH1310



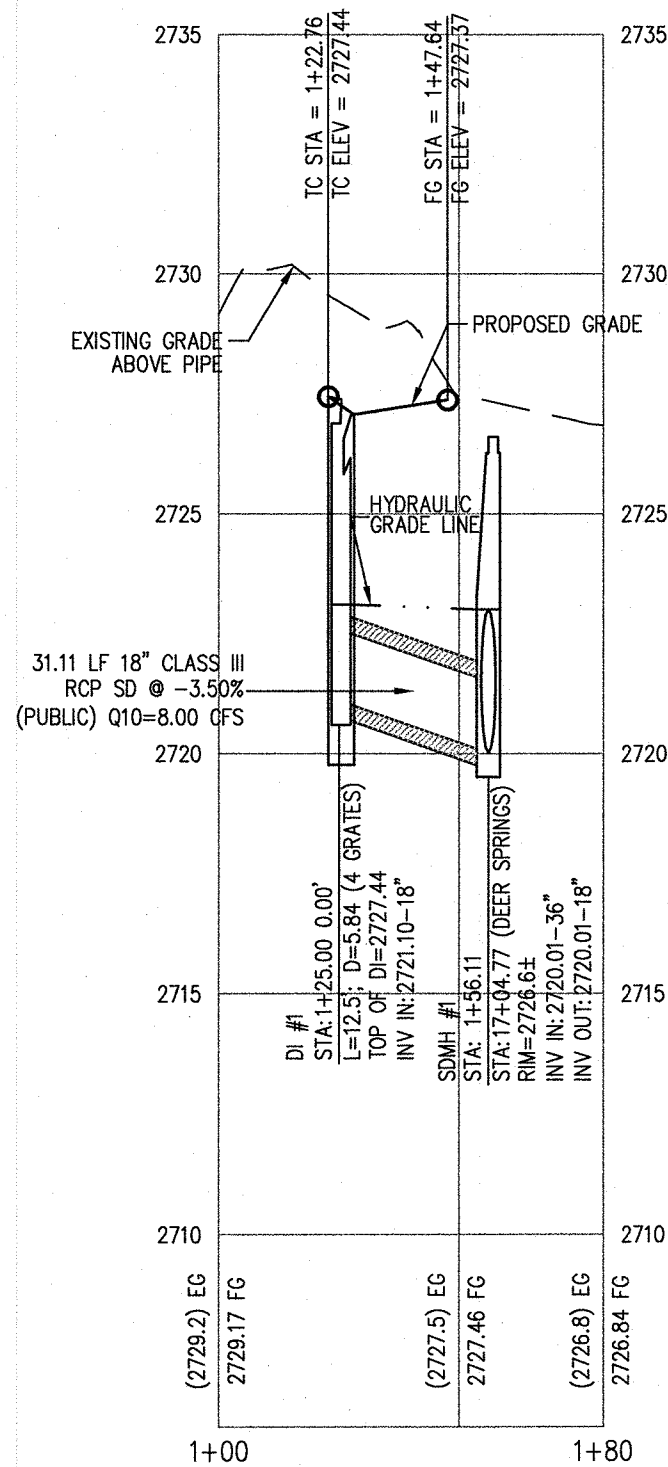
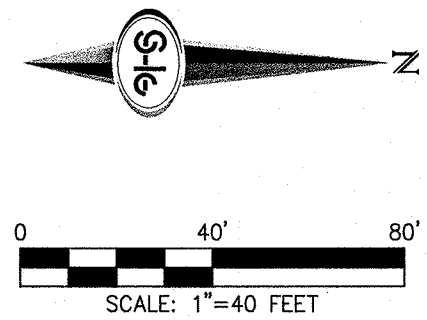
PP-5
SHEET 9 OF ---

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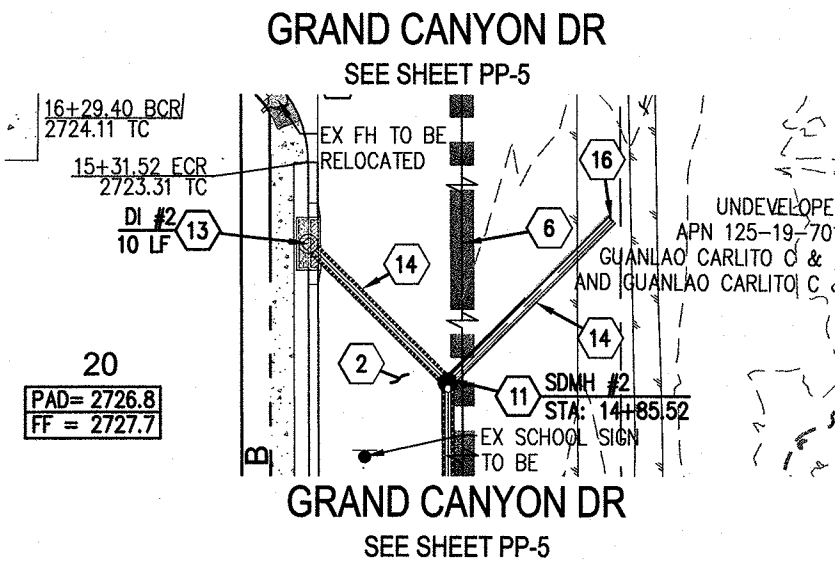
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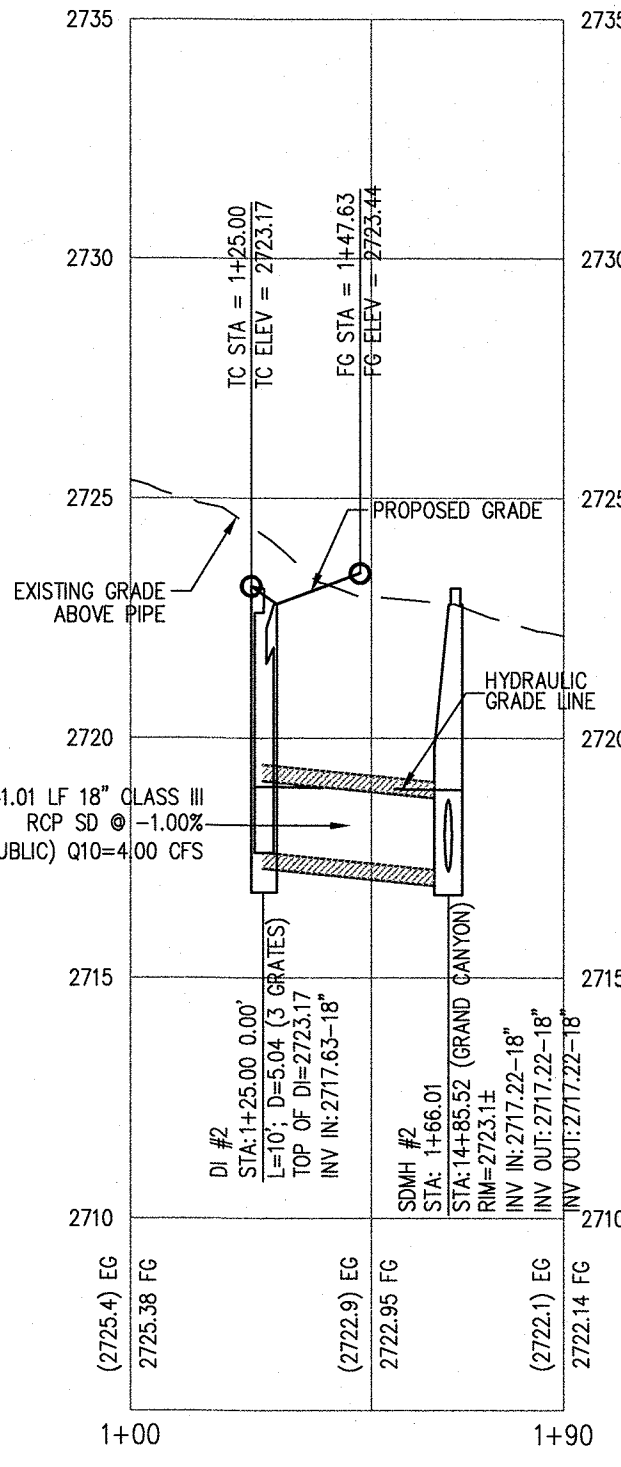
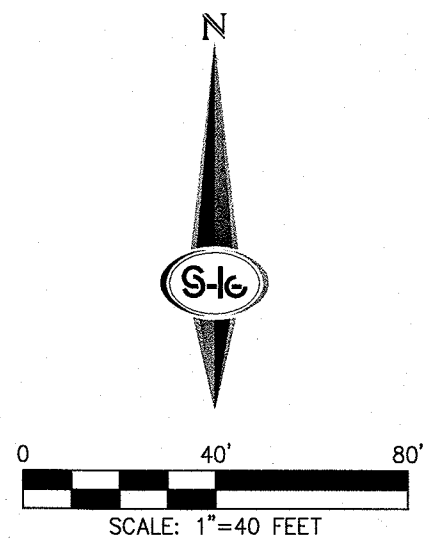
STORM DRAIN LATERAL #1



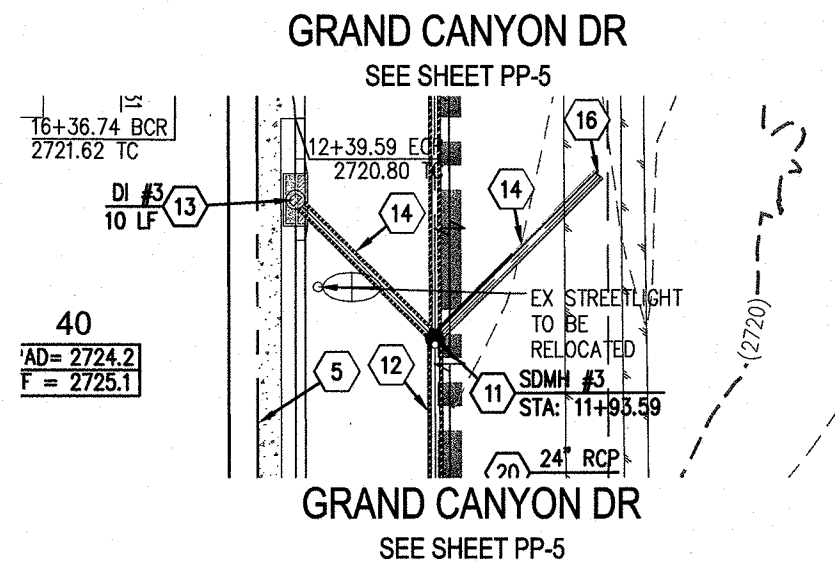
PROFILE
HOR. : 1"=40'
VERT. : 1"=4'



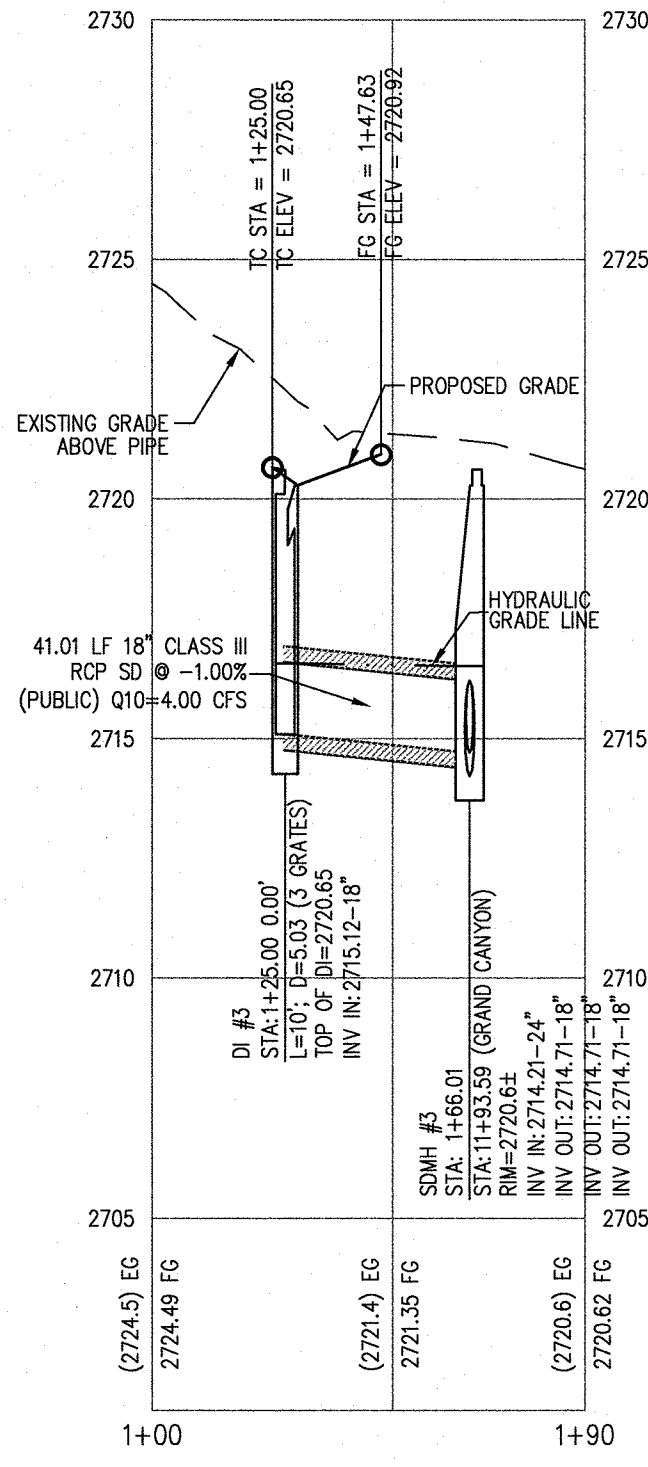
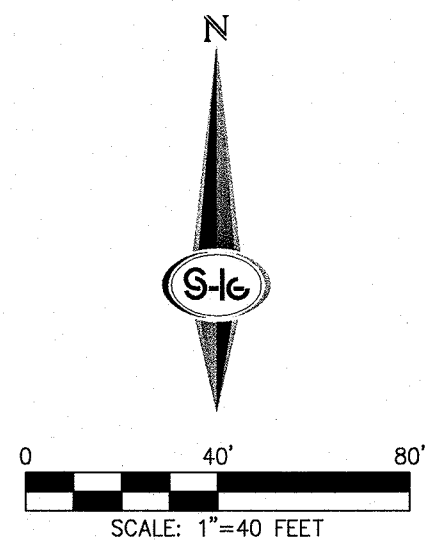
STORM DRAIN LATERAL #2



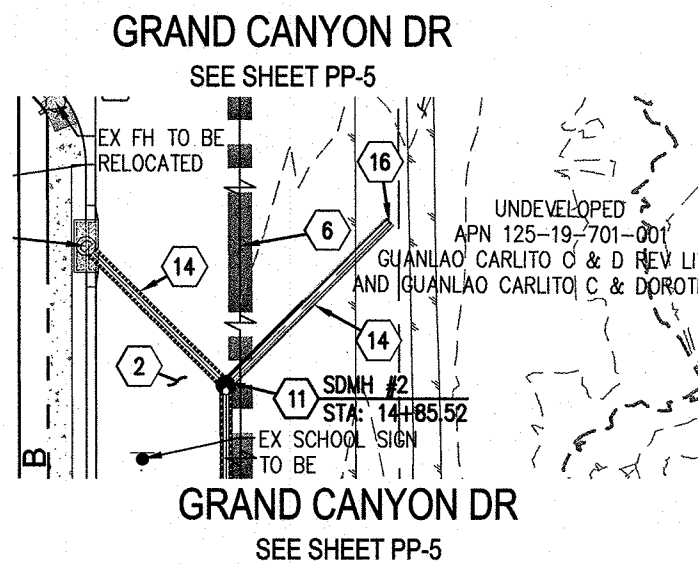
PROFILE
HOR. : 1"=40'
VERT. : 1"=4'



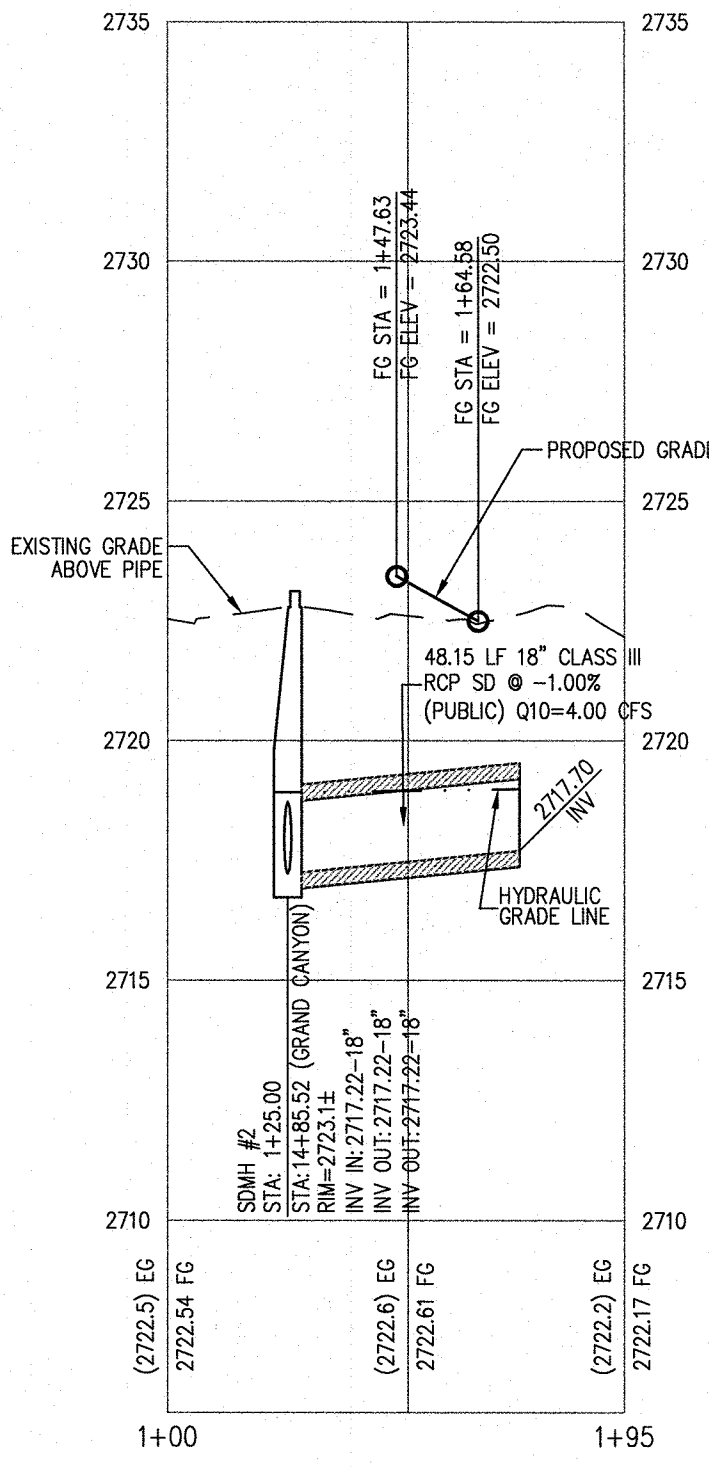
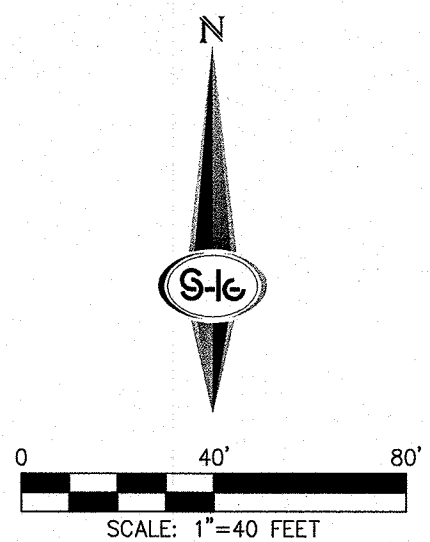
STORM DRAIN LATERAL #3



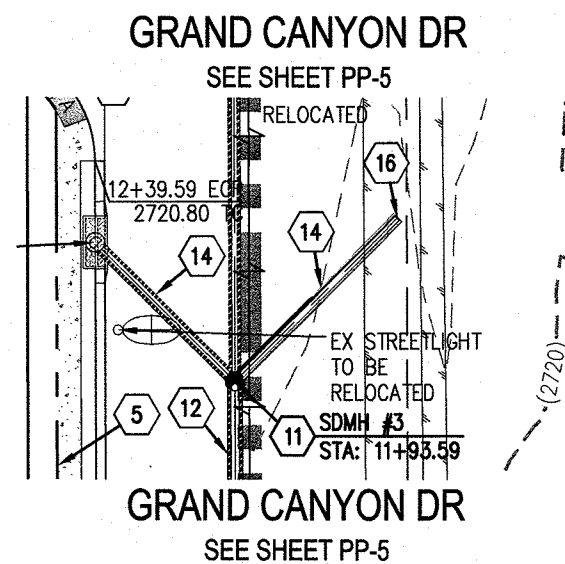
PROFILE
HOR. : 1"=40'
VERT. : 1"=4'



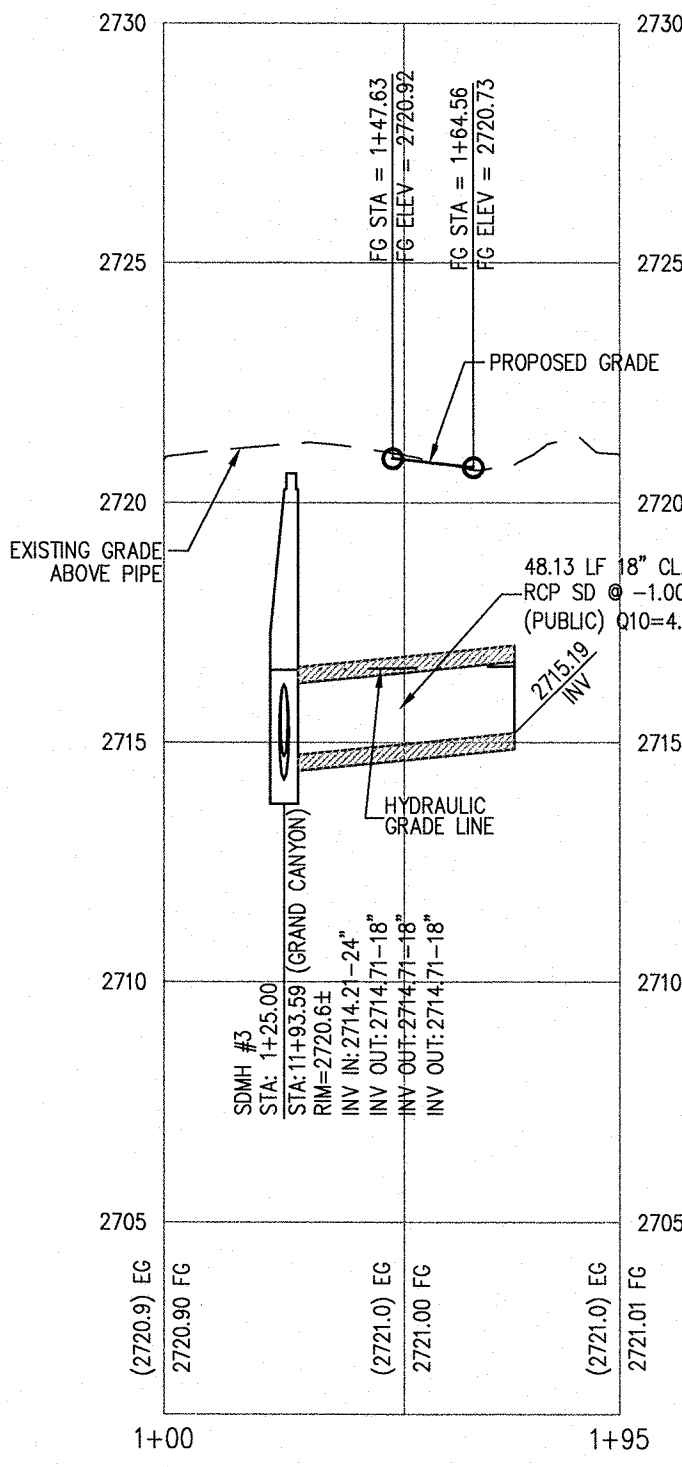
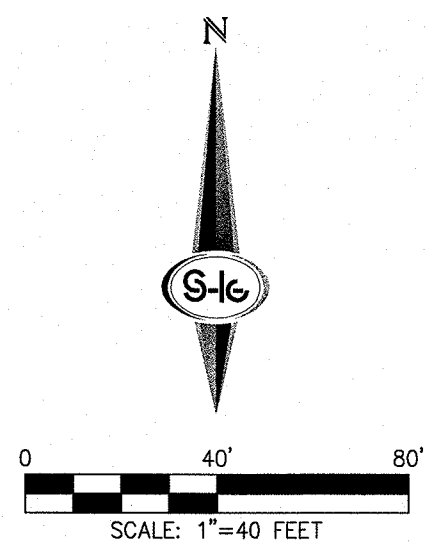
STORM DRAIN LATERAL #4



PROFILE
HOR. : 1"=40'
VERT. : 1"=4'

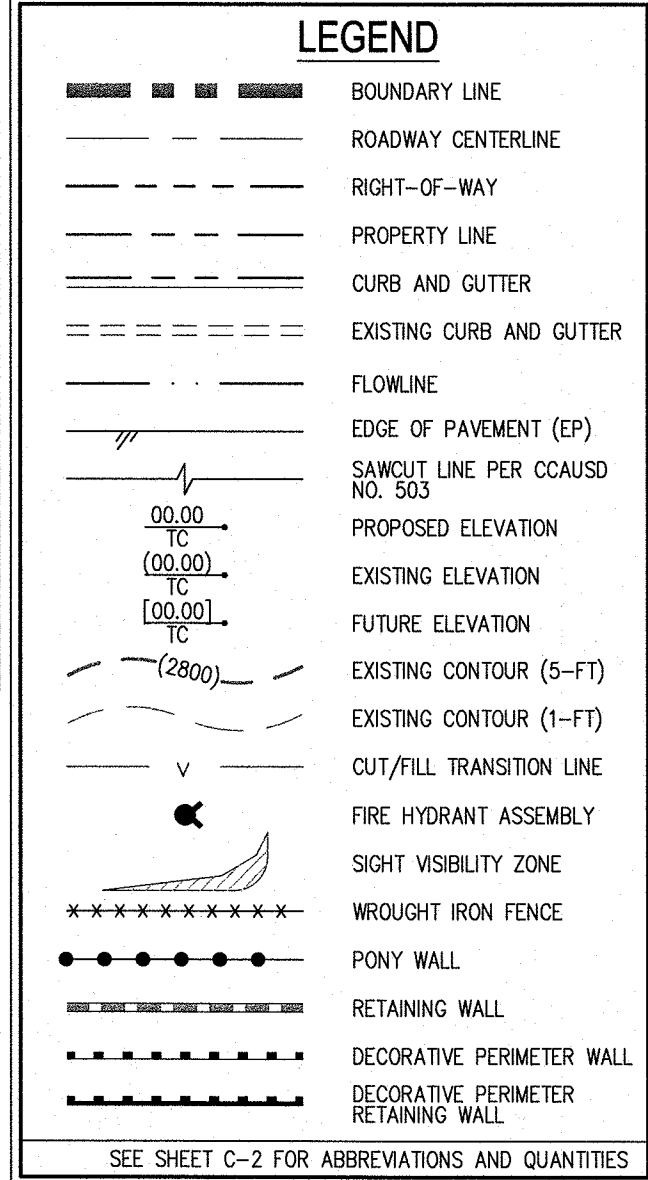
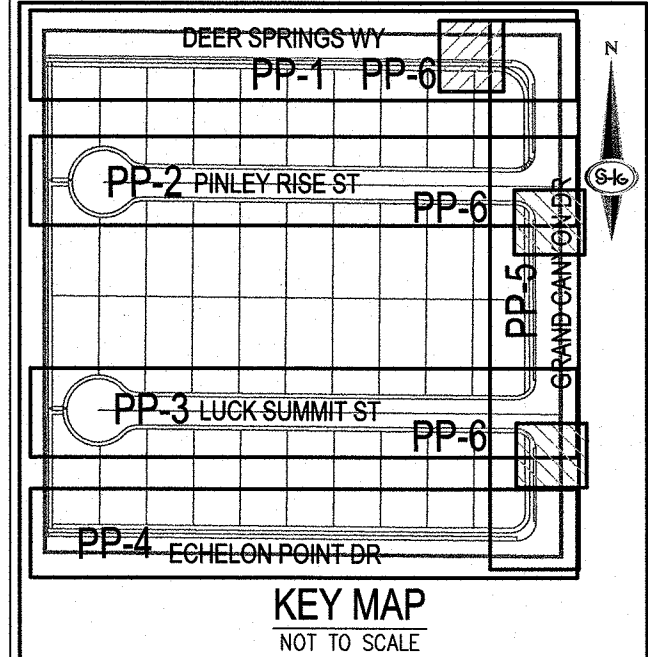


STORM DRAIN LATERAL #5



PROFILE
HOR. : 1"=40'
VERT. : 1"=4'

- CONSTRUCTION NOTES**
- CONSTRUCT 3" AC PAVEMENT WITH 6" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 3.5" AC PAVEMENT WITH 7" TYPE II AGGREGATE BASE OVER NATIVE MATERIAL PER SOILS REPORT.
 - CONSTRUCT 1" TYPE CURB AND GUTTER PER CCAUSD NO. 218.
 - CONSTRUCT 8" CROSS GUTTER PER CCAUSD NO. 228.
 - CONSTRUCT 5' WIDE SIDEWALK PER CCAUSD NO. 234.
 - SAWCUT AND MATCH EXISTING IMPROVEMENTS.
 - CONSTRUCT SIDEWALK RAMP USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD NO. 235, CASE 1.
 - INSTALL SIDEWALK DRAIN PER CCAUSD NO. 236.
 - FIELD VERIFY, REMOVE EXISTING CAP AND CONNECT TO EXISTING STORM DRAIN STUB.
 - INSTALL 36" RCP CLASS III STORM DRAIN.
 - INSTALL 60" TYPE II STORM DRAIN MANHOLE PER CCAUSD NO. 401 & 405.
 - INSTALL 24" RCP CLASS III STORM DRAIN.
 - INSTALL TYPE CM2 DROP INLET PER CCAUSD NO. 412.1 & 421. SEE PROFILE, SHEET PP-6.
 - INSTALL 18" RCP CLASS III STORM DRAIN.
 - INSTALL 6" HIGH WROUGHT IRON FENCE PER DETAIL 9 ON SHEET D-1.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 8 ON SHEET D-1.
 - CONSTRUCT 4" U-CHANNEL PER DETAIL 11 ON SHEET D-1.
 - EXISTING STORM DRAIN PER TOWN CENTER 60/75 NO. 5, CLV DWG NO. 10747419-5.
 - EXISTING STORM DRAIN PER GRAND CANYON/ROME MIDDLE SCHOOL, CLV DWG NO. 715-163.
 - CONSTRUCT 5' STUB AND CAP.
- SEE SHEET C-2 FOR ABBREVIATIONS, LEGEND, & QUANTITIES.



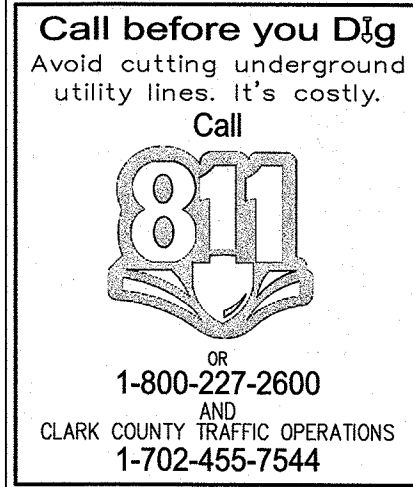
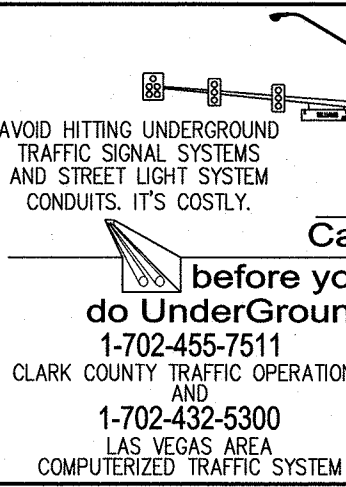
DISCLAIMER NOTE

1. EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

2. FOR ROADWAY WIDENING AND HALF STREET IMPROVEMENTS THE CONTRACTOR SHALL VERIFY CROSS SLOPES FROM EXISTING PAVEMENT SAWCUT LINE TO PROPOSED EDGE OF PAVEMENT OR PROJECTED LIP OF CURB PRIOR TO SUBGRADE PREPARATION AND CONSTRUCTION OF PROPOSED CURB LINE. IF MINIMUM OR MAXIMUM CROSS SLOPES DO NOT MEET AGENCY STANDARDS THE CONTRACTOR SHALL NOTIFY THE ENGINEER.

SOILS REPORT BY: ANGLE ENGINEERING
PROJECT NO. 26164-1, DATED 12/06/13
EARTHWORK QUANTITIES (RAW):
CUT=19,307 CU YDS/FILL=8,160 CU YDS

- GENERAL NOTES**
- FINAL GRADES ADJACENT TO STRUCTURES SHALL BE IN CONFORMANCE WITH IBC 2009, SECTION 2304.11.2.2.
 - THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND REPORT ALL DISCREPANCIES TO THE ENGINEER.
 - ALL IMPROVEMENTS TO BE PROTECTED FROM EROSION BY SWPPP.
 - MAXIMUM/MINIMUM SLOPES AND MINIMUM STREET SECTIONS NOT TO EXCEED THAT SHOWN ON GEOTECH REPORT.
 - ALL PUBLIC AND PRIVATE DRAINAGE IMPROVEMENTS TO BE BONDED FOR AND INSURED.
 - CONSTRUCTION OF BLOCK WALLS REQUIRES A SEPARATE BUILDING PERMIT AND APPROVAL BY THE CLARK COUNTY BUILDING DEPARTMENT.
 - CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING UTILITY STRUCTURES AND FACILITIES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. CONTRACTOR TO PROTECT IN PLACE DURING CONSTRUCTION. ENGINEER/OWNER SHALL BE NOTIFIED OF PRIOR DAMAGE TO EXISTING FACILITIES PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE FOR REPAIR/REPLENISHING FACILITIES IF ENGINEER/OWNER IS NOT NOTIFIED OF EXISTING DAMAGE PRIOR TO CONSTRUCTION COMMENCING.
 - NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.



FEMA FLOOD ZONE DESIGNATION

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE "X" (OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD). PER FIRM PANEL 32003C1745E, DATED SEPTEMBER 27, 2002.

BASIS OF BEARING

NORTH 0°03'58" WEST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW1/4) OF THE NORTHEAST QUARTER (NE1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN BOOK 132, PAGE 11 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK NUMBER: 6LV0019C4
RIVET AND PLATE IN TOP OF CURB ON THE NORTHEAST CORNER OF DEER SPRINGS WAY AND GRAND CANYON DRIVE.
ELEVATION: 2724.21 US SURVEY FEET (NAVD88)
830.340 METERS
PER CITY OF LAS VEGAS BENCHMARKS, 2008 ADJUSTMENT (UPDATED MAY 24, 2010)

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

CITY OF LAS VEGAS, NV

RICHMOND AMERICAN HOMES
CONNOR HILLS

1919 ROWE

DATE: 7/11/14

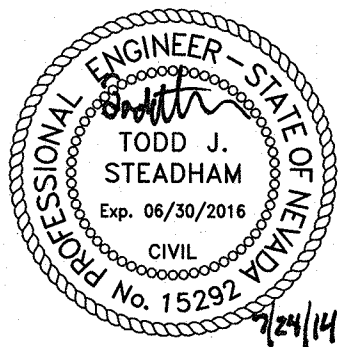
DRAFTER: CZ

DESIGNER: CZ

CHECKED: TJS

PROJECT NO.

RAH1310



PP-6

SHEET 10 OF ----

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