

DS #:

4961

APN:

125-24.602.001

PROJECT:

Decatur Donald III (Unicorn)

SUBMITTAL:

1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 14, 2018
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:	COPIES TO:
	Decatur Donald III (Unicorn)	Actus
Cross Streets:	SEC of Dorrell Lane & Unicorn Street	Beazer Homes
File Number:	F:\Depot\DSMemos\DS4961A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	125-24-602-001	
Zoning Action:	TMP-63589	
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	3/6/2018	3/14/2018	See Comments Below	\$400.00	493854: \$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.

- Provide a copy of the zoning/planning conditions associated with this site (**TMP-63589**) 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.
- The values for the onsite basin areas on the figure for EON1 and EON2 do not match the values shown in for the table in Figure 7 Existing Condition Basin Map. For example, EON1 shows 0.90 acre and the table lists the drainage area as 1.05 acres.
- Sheet C3:** The slopes along the cul-de-sac at the end of *Street A* need to be shown on the grading plan. The minimum allowable slope in a cul-de-sac bulb is 1%. Review and revise accordingly.
- There does not appear to be a curb along the north half of *Dorrell Lane*. However, TC values were shown on the north side. Revise to provide the flow line elevations along the north half of *Dorrell Lane* as opposed to the TC values shown.
- Provide plan and profiles of *Unicorn Street* and *Dorrell Lane* to confirm that the existing highpoints and elevations will not be changed.
- Point out the high point on Unicorn Street to show where the direction of flow changes on the grading plan.

7. Figure 7, 8, and 9 legend and labeling do not match, specifically for the basin and combination point labels. Please update the legend to represent the label type/style used.
8. Annotate the existing contour lines on the grading plan to determine how much fill is proposed to the site.
9. Show and identify an existing 24"-storm drain system in *Dorrell Lane* with *City of Las Vegas* recorded drawing number on the grading plan. Show all existing laterals, inlets if any.
10. Label existing finished floor elevations of houses adjacent to the north of *Dorrell Lane* on the grading plan.
11. Private streets must be public drainage easements. Provide a note on the grading plan "Note: All private streets are P.U.E., Public Sewer Easements and Public Drainage Easements to be privately maintained by HOA".

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/24
AREA G-24

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Decatur Donald III (Unicorn) Date: 3/2/2018
Location of Development: a) Descriptive (Cross Streets) North/South: Unicorn Street
East/West: Dorrell Lane
b) Section: 24 Township: 19S Range: 60E
c) APN : 125-24-602-001

Name of Owner: Beazer Homes Holdings LLC
Telephone No.: 702-802-4428 Fax No.: N/A E-Mail Address: jeff.lesnick@beazer.com
Address: 2470 Paseo Verde Parkway Suite 135, Henderson, NV 89074

Contact Person-Name: Darryl Lattimore Telephone No.: (702) 586-9296
* E-Mail Address: darryl.lattimore@actus-nv.com Fax No.: N/A
Firm: Actus
Address: 3203 E. Warm Springs Road Suite 400, Las Vegas, NV 89120

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	☐	Completion of ROW

1. Total Owned Land Area: At Site: 2.1+/- Being Developed/Disturbed: 2.1 +/-
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No
4. Proposed type of development (Residential, Commercial, Etc.): Residential
5. Approximate upstream land area which drains to the subject site: 0 +/-
6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: TDS for Paradise Meadows Encore
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: East of the site to Las Vegas Wash
8. Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal

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

***New Required Field**

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

	Revision	Date
Local Entity File No. _____		

REFERENCE:

STANDARD FORM 1

TECHNICAL DRAINAGE STUDY
For
DECATUR DONALD III (UNICORN)
(APN: 125-24-602-001)

W. Dorrell Lane and Unicorn Street

City of Las Vegas

Date: March 2, 2018

Prepared for:

Jeff Lesnick
jeff.lesnick@beazer.com
Beazer Homes Las Vegas
2470 Paseo Verde Parkway, Suite 135
Henderson, Nevada 89074
702-802-4428

Prepared by: Spencer McMillan

Reviewed by: Darryl Lattimore, PE



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Decatur Donald III (Unicorn)		Map ID:
Firm Name: Actus		Engineer: Darryl Lattimore
Address: 3203 E. Warm Springs Road, Suite 400		
City: Las Vegas	State: NV	Zip: 89120
Phone Number: (702) 586-9296	Fax Number: N/A	
Property Owner: Beazer Homes Holdings, LLC		
Address: 2470 Paseo Verde Parkway Suite 135,		
City: Henderson	State: NV	Zip: 89074
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	
<u> x </u>	<u> </u>	Design Manual Standard Form 1 with the engineer's seal and signature.
<u> x </u>	<u> </u>	Design Manual Standard Form 4 .
<u> x </u>	<u> </u>	2 copies of the 24" x 36" Drainage Plan.
<u> </u>	<u> N/A </u>	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

Yes	No	
<u> x </u>	<u> </u>	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
<u> x </u>	<u> </u>	A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

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

III. DRAINAGE PLAN

Yes	No	
<u> X </u>	<u> </u>	Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
<u> X </u>	<u> </u>	Minimum scale: 1" = 60'.
<u> X </u>	<u> </u>	Project name.
<u> X </u>	<u> </u>	Vicinity Map with local and major cross streets.
<u> X </u>	<u> </u>	Revision box.
<u> X </u>	<u> </u>	North arrow and bar scale.
<u> X </u>	<u> </u>	Engineer's/consultant's address and phone number.
<u> X </u>	<u> </u>	Elevation datum and benchmark.
<u> X </u>	<u> </u>	Legend for symbols and abbreviations.
<u> X </u>	<u> </u>	Cut/fill scarps, where applicable.
<u> X </u>	<u> </u>	Street names, grades, widths.
<u> X </u>	<u> </u>	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
<u> X </u>	<u> </u>	Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.
<u> X </u>	<u> </u>	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
<u> X </u>	<u> </u>	Proposed typical street sections.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
☐	☒ N/A	Streets with off-set crowns.
☒	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	Property lines.
☒	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	Existing improvements and their elevations.
☒	☐	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
☒	☐	Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☒	☐	Location and cross-section of street capacity calculations.
☐	☒ N/A	Cross-sectional detail for channels, including cutoff wall locations.
☐	☒ N/A	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.
☐	☒ N/A	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" x 48". 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.
☒	☐	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.
☒	☐	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.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

_____ N/A For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish 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.

_____ N/A Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes No

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

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

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

X _____ Use of correct precipitation values in and around the McCarran Airport rainfall area.

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

X _____ A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.

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

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

_____ N/A Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes No

- | | | |
|-------|------------|--|
| _____ | <u>N/A</u> | Flow split calculations and supporting documentation or reference for the method of flow split calculations used. |
| _____ | <u>x</u> | 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. |
| _____ | <u>x</u> | 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. |
| _____ | <u>N/A</u> | Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.) |
| _____ | <u>N/A</u> | 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. |
| _____ | <u>x</u> | 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, whichever is greater. |
| _____ | <u>N/A</u> | <p>A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones.</p> <ul style="list-style-type: none"> • 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. |
| _____ | <u>N/A</u> | Provide a 50 percent clogging factor in the capacity calculation for drop inlets. |
| _____ | <u>N/A</u> | 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. |
| _____ | <u>N/A</u> | The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed. |
| _____ | <u>N/A</u> | Provide BMP type, size and supporting calculations for parking lots and LIDs (if required). |

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 (CCRFCDD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCDD Hydrologic Criteria and Drainage Design Manual (Design Manual).

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

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

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

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

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
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.
	N/A	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
	N/A	Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
X		Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
	N/A	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.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

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

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

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

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I. INTRODUCTION

A. Study Overview and Purpose

This study is intended to serve as the technical drainage study for the Decatur Donald III (Unicorn) 2.1± acre project, located on the southeast corner of the intersection of W. Dorrell Lane and Unicorn Street. The project site is currently planned as a Residential Urban Village (RUD). The current entitlement for the project is shown in Figure 1, *Vicinity Map*. This study is a stand-alone document, which presents the findings of the contributory watershed area's detailed hydrologic analysis affecting this project. Please note that this study will provide hydrology summations for the existing, interim, and ultimate conditions to meet the mandated drainage study requirements.

B. Location

The project area is a portion of the Northwest Quarter (NW ¼) of the Northeast Quarter (NE ¼) of the Southwest Quarter (SW ¼) of the Northeast Quarter (NE ¼) of Section 24, Township 19 South, Range 60 East, M.D.M., City of Las Vegas, Nevada commonly known as APNs: 125-24-602-001. See Figure 2, *Assessor's Map*.

C. FEMA Flood Plain Information

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community-Panel Number 32003C 1765F, effective November 16, 2011. The site is located outside Zone 'X'. Zone 'X' is described as an area outside of the 500-year floodplain. Figure 3, *Flood Insurance Rate Map*, depict the FEMA flood zones within proximity of the site and is included in the appendix of this study.

D. CCRFCD Master Plan Information

As shown on Figure 14 from the *Flood Control Master Plan Update of the Las Vegas Valley* (Figures 4 and 5 of this report), the subject site is not adjacent to any existing or future master plan facilities. On Figure H-14 *Hydrologic Subareas* (Figure 6 of this report), the site is shown to be located within regional basin NW3C2-C.

E. Reference Studies

2 approved drainage study has been utilized in preparation of this study:

- *Northwest Neighborhood Study*. This study was provided as the basis for upstream flows in Dorrell Lane. This study will be further referred to as the *NNS*.
- *Technical Drainage Study for Paradise Meadows II (CLV DS 3157)*. This study was provided as the basis for the flow conditions for the offsite basins EOFF2 and DOFF2, located West of the project site. This study will be further referred to as the *Paradise Meadows II Study*.

The engineer has reviewed the referenced studies with addenda and concurs that the current conditions are the same as those from the referenced study.

II. DRAINAGE BASIN DESCRIPTIONS

A. Site Description

The site consists of approximately 2.1 ± acres, and is adjacent to residential property on its north, east, and south sides. The west side of the project site is adjacent to undeveloped residential property. The site has a crest from the northwest corner down to the southeast corner. Flows on the left side of the crest are conveyed southwesterly at approximately 1.0%. Flows on the right side of the crest are conveyed northeasterly at approximately 1.0%.

B. Existing Condition Drainage Description

The Existing Condition considers the currently undeveloped project site and contributory watershed in its current state (see Figure 7, *Existing Condition Basin Map* in the Appendix.) A description of the Existing Condition flows is as follows:

Flows from onsite basin EON1 (1/2 cfs) are conveyed southwesterly where it combines with the half street EOFF4 (<1/1 cfs) for a total of 1/3 cfs at concentration point CP2X. These flows continue to flow south towards the intersection of Deer Springs Way and Unicorn Street.

Flows from onsite basin EON2 (1/2 cfs) are conveyed northeasterly where it combines with *NNS (24/62 cfs) and EOFF1 (2/4 cfs) for a total of 27/68 cfs at concentration point CP1X. Note that there is an existing hump preventing the flows in Dorrell from entering and traveling south down Unicorn Street. All flows in Dorrell continue to flow easterly, passing the project site towards the intersection of Dorrell Lane and Thom Blvd.

The subbasin EOFF2 is a portion of basin **EOF1 from the *Paradise Meadows II Study*. The flows from EOFF2 (2/5 cfs) will combine with flows from the west half of Unicorn Street, EOFF3 (<1/1 cfs), at CP3X combining for a total of 2/5 cfs. These flows are conveyed south towards the intersection of Deer Springs Way and Unicorn Street.

C. Interim Condition Drainage Description

The interim condition considers the project site as developed along with the adjacent offsite street improvements for Dorrell Lane and Unicorn Street. The remaining offsite areas are in their existing states (see Figure 8, *Interim Condition Basin Map* in the Appendix). A description of the Interim Condition flows is as follows:

The project site is broken up into two subbasins. DON1 (1/2 cfs) will flow west into the improved east half of Unicorn Street, DOFF4 (<1/<1 cfs) that will combine to a total of 1/2 cfs at CP2I. These flows will be conveyed South towards the intersection of Deer Springs Way and Unicorn Street. The 10 and 100-year flows heading down Unicorn Street will be lower than the existing condition flows; and therefore, will not impact any downstream property.

Flow from onsite basin DON2 (1/3 cfs) will flow North in Street A, discharging into Dorrell Lane. Flows from DON3 will flow west into Unicorn Street where they will be conveyed North into Dorrell

Lane. These flows will combine with flows from *NNS (24/62 cfs) and DOFF1 (2/4 cfs) at CP1I for a total flow amount of 28/70 cfs. These combined flows will continue to travel West towards Dorrell Lane and Decatur Blvd.

The west side of Unicorn Street will also be developed to match the new street grading on the eastern side. Flows from EOFF2 (2/5 cfs) will flow into the west half of Unicorn street combining with DOFF3 (<1/<1 cfs) for a total of 2/5 cfs at CP3I. These flows will be conveyed South towards the intersection of Deer Springs Way and Unicorn Street.

D. Ultimate Condition Drainage Description

The Ultimate Condition considers the project site and the entire offsite drainage area as fully developed (see Figure 9, *Ultimate Condition Basin Map* in the Appendix). A description of the Ultimate Condition flows is as follows:

The future offsite basin FDOFF1 will have a flow amount of 2/4 cfs. This flow will combine with the flows from *NNS (24/62 cfs), DON2 (1/3 cfs), and DON3 (<1/1 cfs) at concentration point CP1U (28/70 cfs). These flows will continue to travel easterly towards Dorrell Lane and Decatur Blvd.

Flows from DON1 (1/2 cfs), DOFF2 (2/5 cfs), and DOFF5 (1/1 cfs) will all converge at concentration point CP2U in Unicorn Street totaling the flow amount of 3/8 cfs heading south down Unicorn Street towards the intersection of Deer Springs Way and Unicorn Street. The 10 and 100-year flows heading down Unicorn Street will be lower than the existing condition flows; and therefore, will not impact any downstream property.

Note that the Ultimate Condition is considered to be the worst case.

III. HYDROLOGIC CRITERIA

A. Method of Analysis

The U.S. Army Corps of Engineers HEC-1 flood hydrograph package was used to determine the peak runoff generated by the 100-year, 6-hour storm event. The HEC-1 computer model can simulate the surface runoff response of a given basin and smaller sub-basins to rainfall. The computed hydrographs from each sub-basin are then combined at the appropriate locations, from which a final discharge hydrograph is obtained. The HEC-1 analyses for the existing, interim, and ultimate conditions are included in the Appendix.

B. Precipitation

The project site is located inside of the McCarran Airport Rainfall Area. The rainfall depths for the 6-hour, 10-year and 100-year storm events were obtained per the *CCRFCD Hydrologic Criteria and Drainage Design Manual (1999)*, Section 500, Table 505 and are 1.58 inches and 2.77 inches, respectively. Since the site encompasses less than 10 square miles, a Storm Distribution Number three (SDN #3) was used for the HEC-1 model. HEC-1 parameters are included in the Appendix.

C. Hydrologic Abstractions

The SCS curve number method was used to determine the infiltration rates for the drainage basins. A site specific Custom Soil Resource Report from the Department of Agriculture for the project site (see Appendix). The entire site lies within soils type Las Vegas, DeStazo, and Minor Comp (Soils Type 305) according to the Custom Soil Resource Report and Hydrologic Soils Types C and D, Desert Shrub per Drainage Design Manual Table 602 page 1 of 4. Reference material for the soil characteristics for the onsite interim condition has been provided in the Appendix.

D. Basin Area

Basin areas for the offsite drainage basins were utilized in this study from the reference studies. The elevation topography is based on a project-specific field survey in conjunction with reference studies within proximity of the site to delineate watershed tributary to the project. Note that lag times below ten minutes for the undeveloped condition and five minutes for the developed condition were revised to concur with Sections 602 and 602.1 of the *Drainage Design Manual*. The HEC-1 parameter calculations for the existing, interim, and ultimate conditions can be found in the Appendix.

E. SCS Lag-Time with Time of Concentration

Lag-time, T_L , is defined as the time measured from the centroid of effective rainfall to the peak of the outflow hydrograph. Lag times for this study were estimated by calculating the drainage basins' time of concentration, T_C . 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. The equation for lag-time is: $T_L = 0.6T_C$. Standard Form 4 as included in the CCRFCD Manual was utilized to determine the lag times for subbasins modeled and can be found in the Appendix.

IV. MODEL RESULTS

A. Peak Flows

Existing Condition

TABLE 1				
HEC-1 SUMMARY (Existing Condition)				
BASIN ID/CONCENTRATION POINT	DRAINAGE AREA	Reference	Q10	Q100
	(acres)		cfs	cfs
EON1	1.05	HEC-1	1	2
EON2	1.05	HEC-1	1	2
EOFF1	1.35	HEC-1	2	4
EOFF2	2.01	HEC-1	2	5
EOFF3	0.20	HEC-1	< 1	1
EOFF4	0.20	HEC-1	< 1	1
*NNS	-	NNS	24	62
CP1X	-	EON2+EOFF1+*NNS	27	68
CP2X	-	EON1+EOFF4	1	3
CP3X	-	EOFF2+EOFF3	2	5
*Referenced from the NNS				

Interim Condition

TABLE 2				
HEC-1 SUMMARY (Interim Condition)				
BASIN ID/CONCENTRATION POINT	DRAINAGE AREA	Reference	Q ₁₀	Q ₁₀₀
	(acres)		cfs	cfs
DON1	0.50	HEC-1	1	2
DON2	1.32	HEC-1	1	3
DON3	0.28	HEC-1	<1	1
DOFF1	1.45	HEC-1	2	4
DOFF4	0.15	HEC-1	< 1	<1
EOFF2	2.01	HEC-1	2	5
DOFF3	0.15	HEC-1	< 1	<1
*NNS	-	NNS	24	62
CP1I	-	DON2+DOFF1+*NNS	28	70
CP2I	-	DON1+DOFF4	1	2
CP3I	-	EOFF2+EOFF3	2	5
*Referenced from the NNS				

Ultimate Condition

TABLE 3				
HEC-1 SUMMARY (Ultimate Condition)				
BASIN ID/CONCENTRATION POINT	DRAINAGE AREA	Reference	Q ₁₀	Q ₁₀₀
	(acres)		cfs	cfs
DON1	0.50	HEC-1	1	2
DON2	1.32	HEC-1	1	3
DON3	0.28	HEC-1	<1	1
FDOFF1	1.44	HEC-1	2	4
DOFF2	2.01	HEC-1	2	5
DOFF5	0.30	HEC-1	1	1
*NNS	-	NNS	24	62
CP1U	-	DON2+FDOFF1+*NNS	28	70
CP2U	-	DON1+DOFF2+DOFF5	3	8
*Referenced from the NNS				

B. Hydraulic Calculations

Street Flow Calculations

The 10-year event criteria for a right-of-way less than 80' is to have a depth of flow less than 1', and for the product of the product of the velocity and the flow depth to be less than 6. As seen in the street flow analysis below, these criteria have been met for Dorrell Lane, Unicorn Street, and Cinder Crow Court.

The 100-year event criteria for a right-of-way is for the product of the depth of flow and the velocity to be less than 8, the depth of flow to be less than 2'. As seen in the street flow analysis below, these criteria have been met for Dorrell Lane, Unicorn Street, and Cinder Crow Court.

Interim Condition

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (10-Year Interim Condition)						
Street	Section	Slope	Flow	Velocity	Flow Depth	VxD
		(%)	(100 year)	(ft/s)	(ft)	
Street A	A	0.50	1	1.16	0.26	0.30
Dorrell Lane	B	0.50	28	2.51	0.6	1.51
Unicorn Street	C	1.49	28	3.77	0.52	1.96
East Half of Unicorn Street	D	0.70	1	1.58	0.28	0.44
West Half of Unicorn Street	E	0.70	2	1.81	0.34	0.62

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (100-Year Interim Condition)						
Street	Section	Slope	Flow	Velocity	Flow Depth	VxD
		(%)	(100 year)	(ft/s)	(ft)	
Street A	A	0.50	3	1.47	0.34	0.50
Dorrell Lane	B	0.50	70	3.29	0.79	2.60
Unicorn Street	C	1.49	70	4.74	0.68	3.22
East Half of Unicorn Street	D	0.70	2	1.81	0.34	0.62
West Half of Unicorn Street	E	0.70	5	2.24	0.43	0.96

Ultimate Condition

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (10-Year Ultimate Condition)						
Street	Section	Slope	Flow	Velocity	Flow Depth	VxD
		(%)	(100 year)	(ft/s)	(ft)	
Street A	A	0.50	1	1.16	0.26	0.30
Dorrell Lane	B	0.50	28	2.51	0.60	1.51
Unicorn Street	C	0.70	3	1.71	0.31	0.53
Unicorn Street	F	1.49	28	3.77	0.52	1.96

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (100-Year Ultimate Condition)						
Street	Section	Slope	Flow	Velocity	Flow Depth	VxD
		(%)	(100 year)	(ft/s)	(ft)	
Street A	A	0.50	3	1.47	0.34	0.50
Dorrell Lane	B	0.50	70	3.29	0.79	2.60
Unicorn Street	C	0.70	8	2.12	0.40	0.85
Unicorn Street	F	1.49	70	4.74	0.68	3.22

Finished Floor Analysis and Easement Calculations

A finished floor analysis table depicting the proposed lot finished floor elevations, high side TCs, and correlating street flow depths has been included in the Appendix. The criteria for proposed lots is to be above 2 times the depth of flow and to be 18 inches above the centerline elevation in adjacent

streets. The ultimate condition flow depths were used as the worst-case conditions. Both criteria have been met for all onsite and offsite streets.

V. CONCLUSIONS

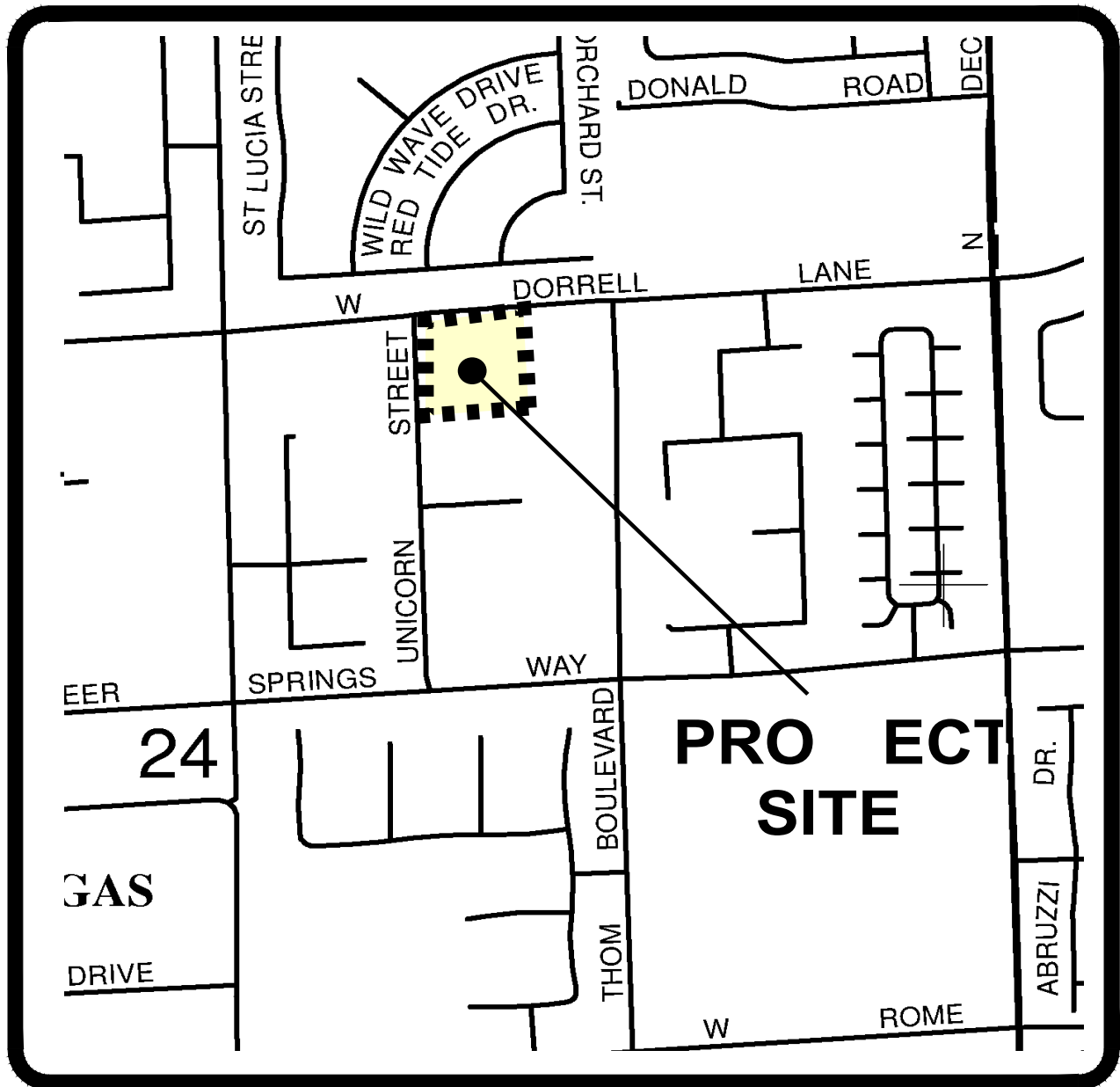
This Technical Drainage Study for Decatur Donald III (Unicorn) has been developed in accordance with Criteria established in the Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual. The proposed development does not adversely impact any proposed or existing Clark County Regional Flood Control District Master Plan Update facilities.

VI. REFERENCES

1. *CCRFCD Hydrologic Criteria and Drainage Design Manual and Addenda*, WRC Engineering, 1999.
2. *2008 and 2013 CCRFCD Flood Control Master Plan Update*, P.B.S. & J, Inc. and PB, 2008 and 2013.
3. *Flood Insurance Rate Map, Community Panel Number 32003C 1765F, Clark County, Nevada*, Federal Emergency Management Agency, November 16, 2011.
4. *Technical Drainage Study for NNS: Northwest Neighborhood Study*.
5. *Technical Drainage Study for the Paradise Meadows II (CLV DS 3157)*.

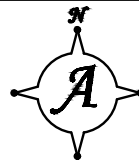
APPENDIX





VICINITY MAP

SCALE: NTS



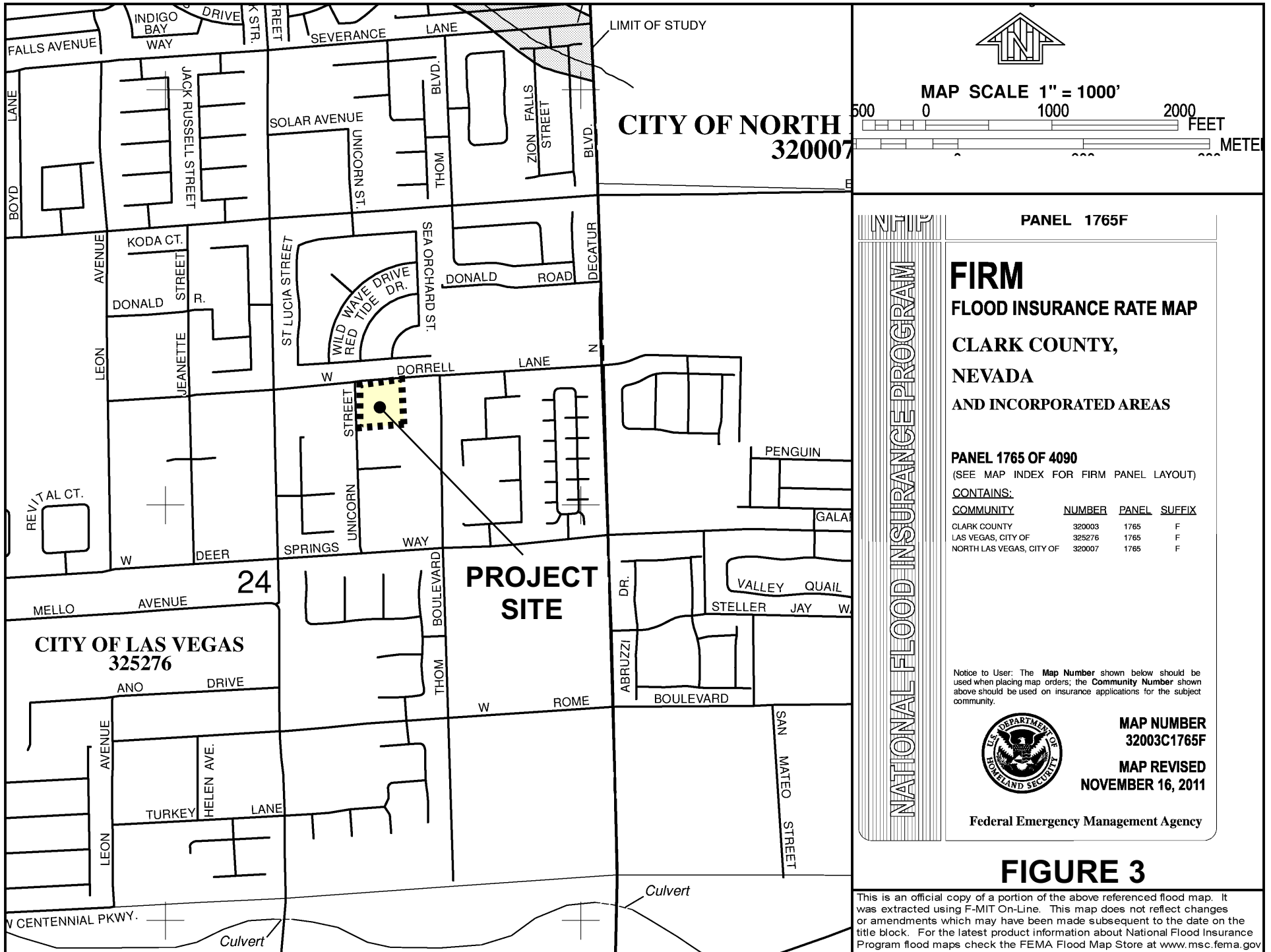
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Consulting- Planning-
Engineering - Surveying

DECATUR DONALD III (UNICORN) VICINITY MAP

DATE 1/10/18
DRAWN SHM
DESIGNED SHM
CHECKED DCL
PROJECT # BZR011703
SHEET NUMBER

FIGURE 1



ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
CNEA		CENTENNIAL PKWY CHANNEL EAST						
0123	E	14' X 6' RCB	1585	1457	CNN093-C	WEST3	1.67	0.92
0153	E	14' X 6' RCB	1125	1457	CNN093-C	WEST3	1.67	1.34
0175	E	15' X 6' RCB	125	1174	CNN078-C	WEST3	1.35	5.66
0176	E	Conc Chnl 15'W 6.5'D 0:1 SS	540	1174	CNN078-C	WEST3	1.35	0.70
CNWE		CENTENNIAL PKWY CHANNEL WEST						
0000	E	2: 27' X 10' RCB	309	4465	CNW3D3-C	WEST3	6.41	1.38
0005	E	4: 13.5' X 10' RCB	762	4465	CNW3D3-C	WEST3	6.41	1.10
0020	E	4: 13' X 10' RCB	310	4465	CNW3D3-C	WEST3	6.41	2.57
0026	E	4: 13.5' X 9' RCB	750	4465	CNW3D3-C	WEST3	6.41	0.61
0045	E	Conc Chnl 56'W 8'D 0:1 SS	1575	4465	CNW3D3-C	WEST3	6.41	0.61
0071	E	3: 18' X 8' RCBC @ Bradley	300	4465	CNW3D3-C	WEST3	6.41	0.61
0075	E	Conc Chnl 54'W 8'D 0:1 SS	775	4465	CNW3D3-C	WEST3	6.41	0.42
0110	E	Conc Chnl 54'W 9'D 0:1 SS	620	4382	2CW3B4-C	WEST3	6.15	0.42
0129	E	3: 18' X 8' RCB	300	4382	2CW3B4-C	WEST3	6.15	0.40
0150	E	Conc Chnl 40'W 9.5'D 0:1 SS	2279	4233	CNW3B3-C	WEST3	5.64	0.42
0173	E	3: 18' X 8' RCBC @ Torrey Pines	200	4233	CNW3B3-C	WEST3	5.64	0.42
0176	E	Conc Chnl 40'W 9'D 0:1 SS	150	4233	CNW3B3-C	WEST3	5.64	0.41
0189	E	Conc Chnl 36'W 10'D 0:1 SS	1200	4067	CNW2D4-C	WEST3	5.15	0.42
EKEA		ELKHORN ROAD CHANNEL EAST						
0056	P1	Conc Chnl 21'W 8.5'D 0:1 SS	2516	2961	CELK06G	WEST3	4.30	1.58
0104	P1	Conc Chnl 21'W 9.5'D 0:1 SS	971	2759	CCELK06E	WEST3	3.90	1.58
0119	P1	20' X 9' RCB	384	2759	CCELK06E	WEST3	3.90	0.66
0124	P1	Conc Chnl 20'W 10'D 0:1 SS	3659	2444	CELK06E	WEST3	3.48	0.66
0192	P1	20' X 9.5' RCBC @ Clayton	330	2444	CELK06E	WEST3	3.48	0.49
0198	P1	Conc Chnl 20'W 9.5'D 0:1 SS	1766	2152	CELK06D	WEST3	3.02	0.60
0231	P1	Conc Chnl 18'W 9.5'D 0:1 SS	182	2152	CELK06D	WEST3	3.02	1.82
0234	P1	30' X 7' RCBC	132	2152	CELK06D	WEST3	3.02	0.47
0237	E	Conc Chnl 16'W 7'D 0:1 SS	2012	1944	CC048-C	WEST3	2.64	0.51
0274	E	16' X 7' RCBC @ Aliante	439	1191	CNN035-C	WEST3	1.47	0.55
0282	E	16' X 7' RCB	89	1191	CNN035-C	WEST3	1.47	0.92
0284	E	Conc Chnl 15'W 9'D 0:1 SS	343	1191	CNN035-C	WEST3	1.47	0.46
0290	E	Conc Chnl 27'W 9'D 0:1 SS Confluence Structure	147	1191	CNN035-C	WEST3	1.47	0.47
0292	E	Conc Chnl 15'W 9'D 0:1 SS	779	1191	CNN035-C	WEST3	1.47	0.47
0307	E	Conc Chnl 15'W 6'D 0:1 SS	1625	1191	CNN035-C	WEST3	1.47	0.56
0338	E	60" RCP	1259	504	NN021-C	WEST3	0.57	0.76
GTEA		GRAND TETON DRIVE CHANNEL EAST						
0000	P0	12' X 8' RCAP	4927	1283	CGT03D	WEST3	2.79	1.30
0093	P0	12' X 8' RCAP	3600	1283	CGT03D	WEST3	2.79	0.71
0161	P0	12' X 8' RCAP	5385	1283	CGT03D	WEST3	2.79	0.66
0263	P0	12' X 8' RCAP	4435	1174	CGT03B	WEST3	2.55	0.50
0347	P0	12' X 8' RCAP	452	1009	CNW202-C	WEST3	2.00	1.87
0355	P0	14' X 6' RCB	274	1009	CNW202-C	WEST3	2.00	0.50
0360	P0	6' X 6' RCB	2650	291	CNW205-C	WEST3	0.68	0.40
LV03		CLAYTON STREET CHANNEL						
0082	E	Conc Chnl 7'W 7.1'D 1.5:1 SS	2444	757	CNN054-C	WEST3	0.81	2.80
0128	E	Conc Chnl 7'W 7.1'D 1.5:1 SS	167	257	1/2NN052-C	WEST3	0.55	2.80
0129	E	2: 10' X 6' RCB	801	257	1/2NN052-C	WEST3	0.55	1.60
0131	E	10' X 6' RCB	665	257	1/2NN052-C	WEST3	0.55	1.28
LVDE		LAS VEGAS WASH - DECATUR						
0000	E	7' X 6' RCB	128	547	CNW198-C	WEST3	0.69	0.78
0003	E	96" RCP	1250	547	CNW198-C	WEST3	0.69	0.46
0027	E	84" RCP	1320	547	CNW198-C	WEST3	0.69	0.50
LVIM		LAS VEGAS WASH AND IRON MOUNTAIN						
0000	P1	84" RCP	1235	465	CNW206-C	WEST3	1.16	1.10

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVMD		LAS VEGAS WASH - MIDDLE						
2308	E	Confluence Structure	480	5734	2C3D4-C	CLVMD4	11.98	1.50
2322	E	2: 15' X 9' RCB	1200	3317	CNW3D4-C	CWEST3	6.88	1.50
2324	E	2: 14' X 8' RCB	5485	3317	CNW3D4-C	CWEST3	6.88	0.40
2443	E	2: 13' X 7' RCB	5150	2574	CNW188-C	CWEST3	5.43	0.40
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
LVMJ		LAS VEGAS WASH - JONES						
0000	E	6' X 4' RCB	1365	296	CNW178-C	WEST3	0.50	0.40
0100	E	60" RCP	1175	296	CNW178-C	WEST3	0.50	0.30
LVSM		LAS VEGAS WASH-SIMMONS						
0109	E	48" RCP	2003	235	NN038-C	WEST3	0.24	1.91
LVUP		UPPER LAS VEGAS WASH						
0493	E	Floodway	24000	3333	ULWDB*	LOWER5	121.90	1.04
0908	E	182,000 cfs PMF Spillway		182000	ULWIN2	LOWER5	121.90	
0909	E	2: 8' X 8' RCB Outlet	260	3333	ULWDB	LOWER5	121.90	1.18
0910	E	1,836 ac-ft Upper Las Vegas Wash Detention Basin		15898	ULWIN2	LOWER5	121.90	
0911	P0	Upgrade to 3,247 ac-ft Upper LV Wash Detention Basin		15898	ULWIN2	LOWER5	121.90	
0976	E	Floodway	7000	14661	ULWIN	LOWER5	110.99	0.71

* 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.

** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.

^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).



2013 LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FACILITY INVENTORY
FIGURE F - 14

L E G E N D	ID (Facility Identifier)	AABP	Existing Facility.....E		
	Parent Stream Name		Proposed or Modified Facility.....P	Bottom Width.....W	Construction Features
	Stream Name		Contingency Level		
	River Mile	0000	Category B.....P0	Depth.....D	
	Distance Above Confluence with Parent Stream (Miles)		Master Plan.....P1	Side Slope, H:V.....SS	
	Miles in Hundredths		Preliminary Design.....P2		
			Design.....P3		

Cast in Place Concrete Pipe.....	CIPCP	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

FIGURE 4



2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 14
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin

- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

- | Category A | Category B |
|------------|------------|
| Channel | Channel |
| Stormdrain | Stormdrain |

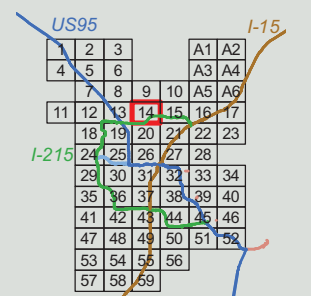
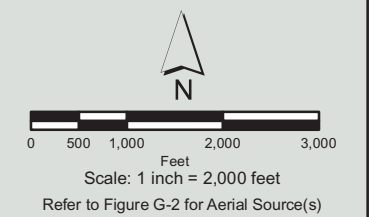
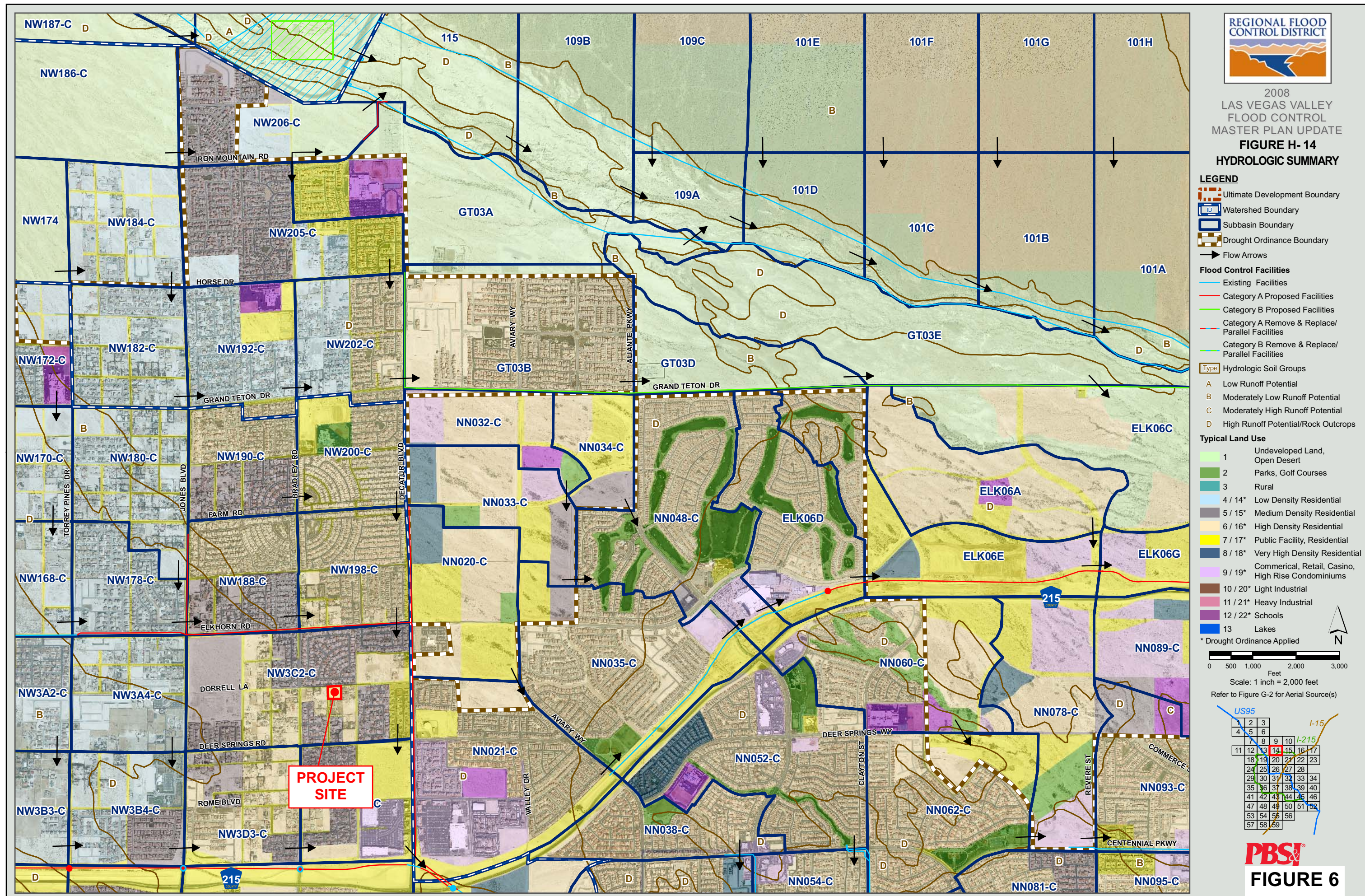
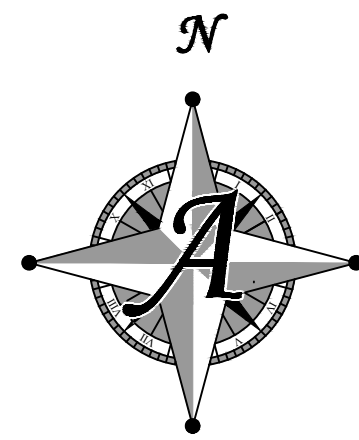
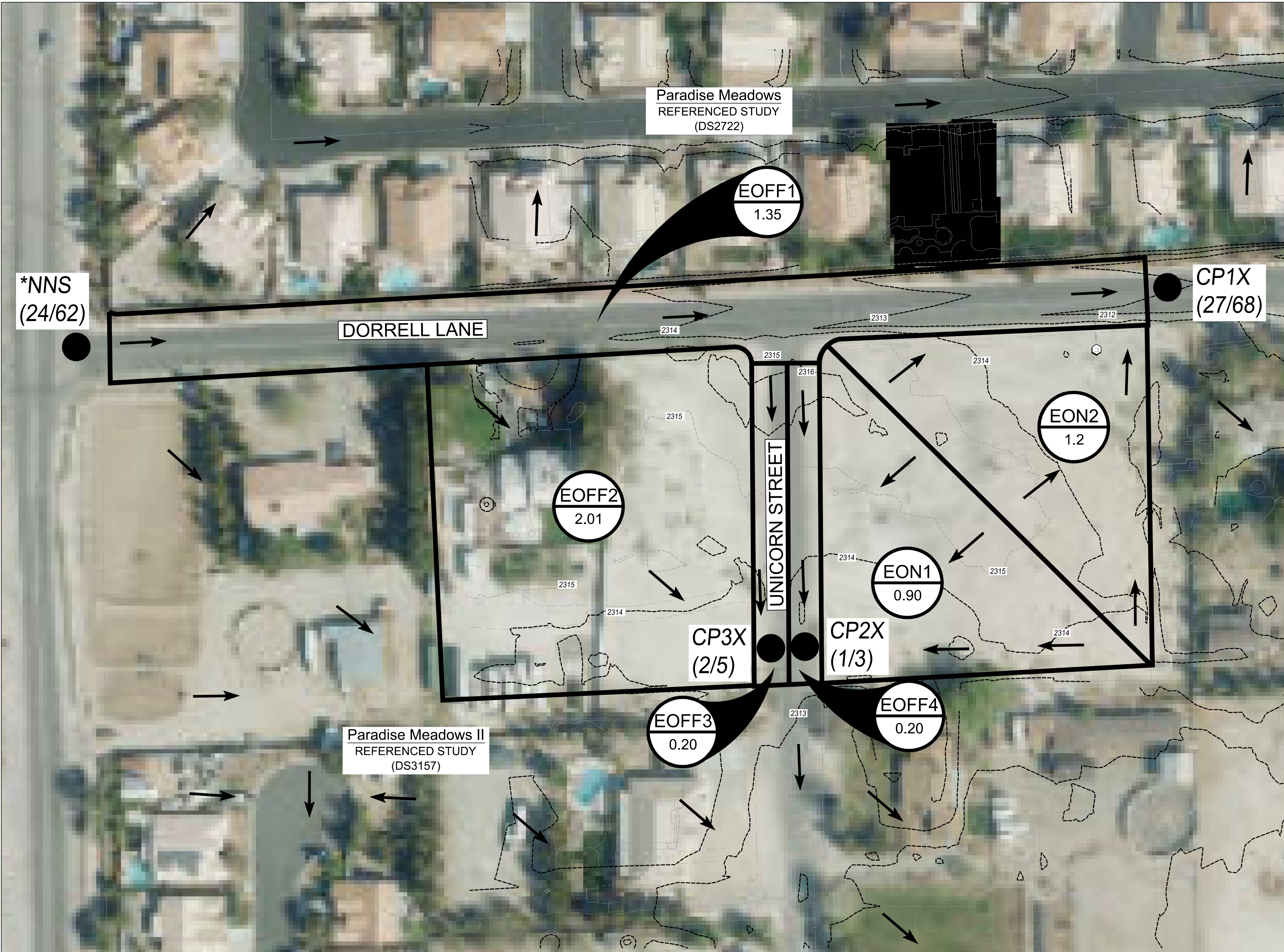


FIGURE 5



Plot Stamp: 3/22/2018 4:33:29 PM - Spencer McMillan
File: P:\B2R011602 - Decatur Donald III\Drainage\Original\Exhibits\Basin Maps\Figure 7-Existing Condition.dwg, Tab: Layout1



LEGEND

- (XXX) CONCENTRATION POINT
- [DON4] BASIN NAME
- ➔ FLOW DIRECTION
- BASIN BOUNDARY



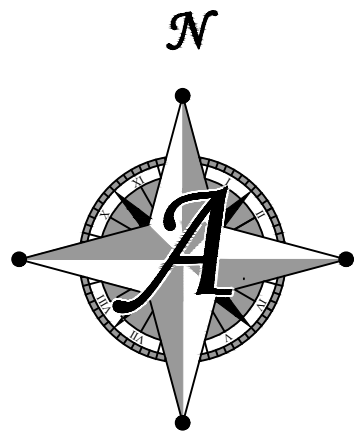
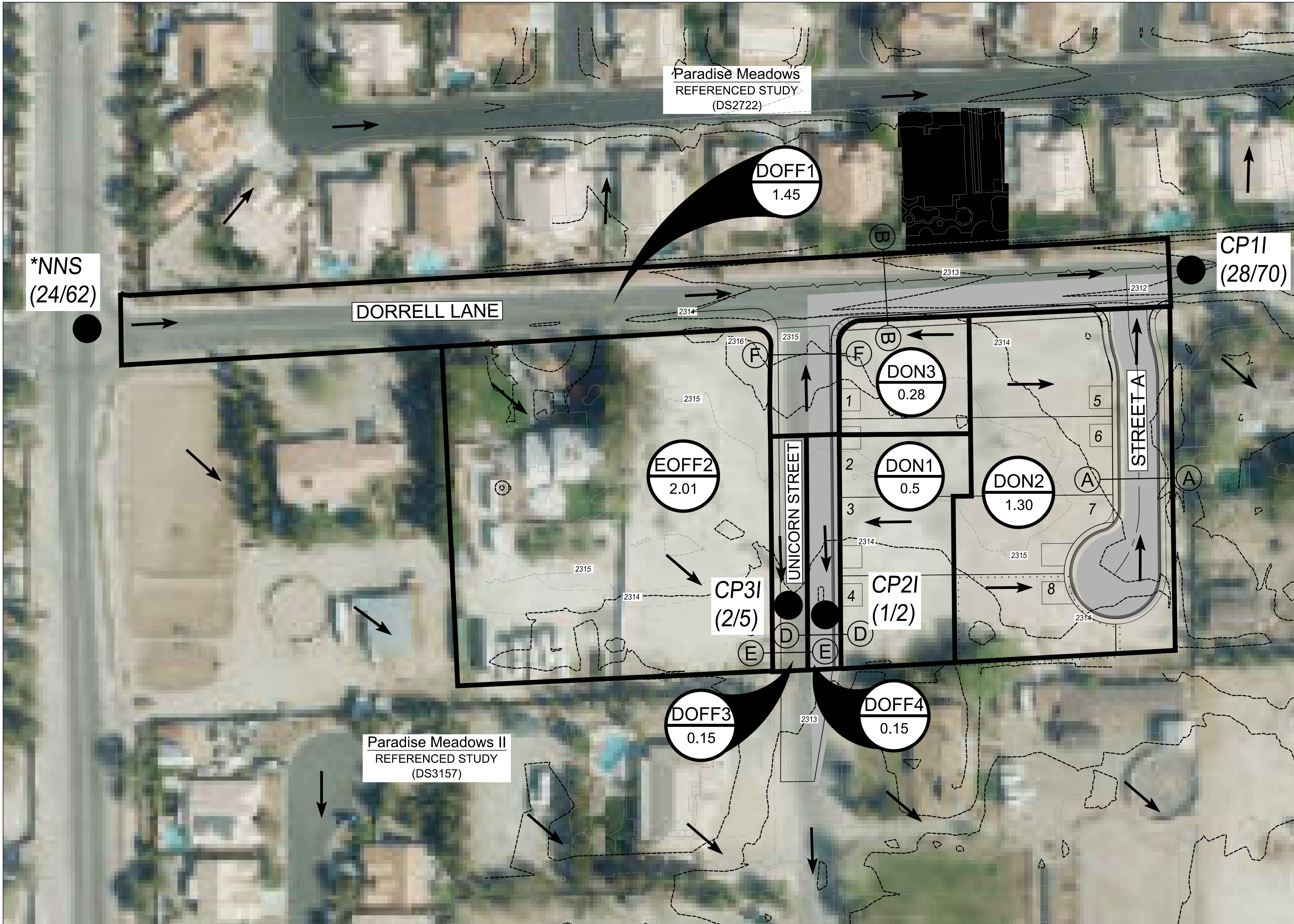
FIGURE 7 - EXISTING CONDITION BASIN MAP
DECATUR DONALD III (UNICORN)
BEAZER
CITY OF LAS VEGAS, NV

#	DATE	DESCRIPTION	BY

DATE	3/2/2018
DRAWN	SHM
DESIGNED	SHM
CHECKED	DCL
PROJECT #	B2R011703
SHEET TITLE	FIGURE 7
SHEET NUMBER	1
HTE #	###

TABLE 1				
HEC-1 SUMMARY (Existing Condition)				
BASIN ID/CONCENTRATION POINT	DRAINAGE AREA (acres)	Reference	Q10	Q100
			cfs	cfs
EON1	1.05	HEC-1	1	2
EON2	1.05	HEC-1	1	2
EOFF1	1.35	HEC-1	2	4
EOFF2	2.01	HEC-1	2	5
EOFF3	0.20	HEC-1	< 1	1
EOFF4	0.20	HEC-1	< 1	1
*NNS	-	NNS	24	62
CP1X	-	EON2+EOFF1+*NNS	27	68
CP2X	-	EON1+EOFF4	1	3
CP3X	-	EOFF2+EOFF3	2	5
*Referenced from the NNS				

Plot Stamp: 3/22/2018 5:09:01 PM - Spencer McMillan
File: P:\B2R011602 - Decatur Donald III\Drawings\Basis Maps\Figure 8-Interim Condition.dwg, Tab: Layout1



LEGEND

- (XXX) CONCENTRATION POINT
- [DON4] BASIN NAME
- ➔ FLOW DIRECTION
- BASIN BOUNDARY
- ⊗ — ⊗ HYDRAULIC SECTION

TABLE 2 HEC-1 SUMMARY (Interim Condition)				
BASIN ID/CONCENTRATION POINT	DRAINAGE AREA	Reference	Q ₁₀	Q ₁₀₀
	(acres)		cfs	cfs
DON1	0.50	HEC-1	1	2
DON2	1.32	HEC-1	1	3
DON3	0.28	HEC-1	<1	1
DOFF1	1.45	HEC-1	2	4
DOFF4	0.15	HEC-1	< 1	<1
EOFF2	2.01	HEC-1	2	5
DOFF3	0.15	HEC-1	< 1	<1
*NNS	-	NNS	24	62
CP1	-	DON2+DOFF1+*NNS	28	70
CP2	-	DON1+DOFF4	1	2
CP3	-	EOFF2+EOFF3	2	5

*Referenced from the NNS

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (10-Year Interim Condition)						
Street	Section	Slope	Flow	Velocity	Flow Depth	VxD
		(%)	(100 year)	(ft/s)	(ft)	
Street A	A	0.50	1	1.16	0.26	0.30
Dorrell Lane	B	0.50	28	2.51	0.6	1.51
Unicorn Street	C	1.49	28	3.77	0.52	1.96
East Half of Unicorn Street	D	0.70	1	1.58	0.28	0.44
West Half of Unicorn Street	E	0.70	2	1.81	0.34	0.62

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (100-Year Interim Condition)						
Street	Section	Slope	Flow	Velocity	Flow Depth	VxD
		(%)	(100 year)	(ft/s)	(ft)	
Street A	A	0.50	3	1.47	0.34	0.50
Dorrell Lane	B	0.50	70	3.29	0.79	2.60
East Half of Unicorn Street	D	0.70	2	1.81	0.34	0.62
West Half of Unicorn Street	E	0.70	5	2.24	0.43	0.96
Unicorn Street	F	1.49	70	4.74	0.68	3.22



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FIGURE 8 - INTERIM/ULTIMATE CONDITION BASIN MAP

DORRELL DECATUR III (UNICORN)

BEAZER

CITY OF LAS VEGAS, NV

DATE	DESCRIPTION

DATE | 3/2/2018

DRAWN | SHM

DESIGNED | SHM

CHECKED | DCL

PROJECT # | B2R011703

SHEET TITLE

FIGURE 8

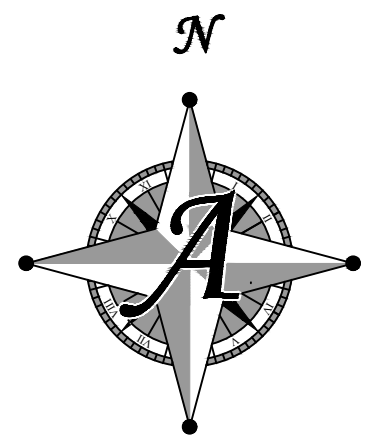
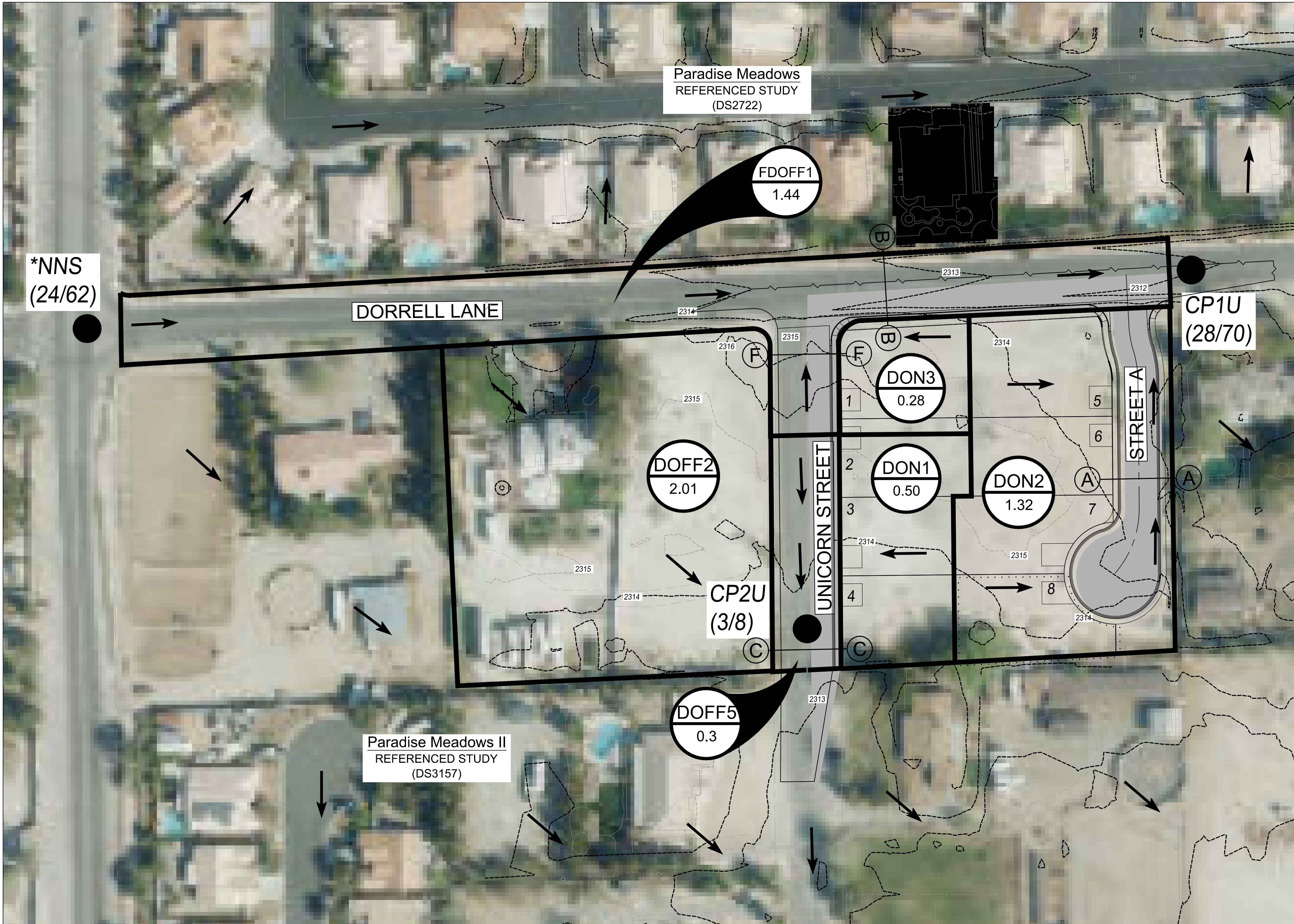
SHEET NUMBER

1

DATE

HTC #

Plot Stamp: 3/22/2018 5:09:19 PM - Spencer McMillan
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LEGEND

- (XXX) CONCENTRATION POINT
- [DON4] BASIN NAME
- ➔ FLOW DIRECTION
- BASIN BOUNDARY
- (X) — (X) HYDRAULIC SECTION

TABLE 3				
HEC-1 SUMMARY (Ultimate Condition)				
BASIN ID/CONCENTRATION POINT	DRAINAGE AREA	Reference	Q ₁₀	Q ₁₀₀
	(acres)		cfs	cfs
DON1	0.50	HEC-1	1	2
DON2	1.32	HEC-1	1	3
DON3	0.28	HEC-1	<1	1
FDOFF1	1.44	HEC-1	2	4
DOFF2	2.01	HEC-1	2	5
DOFF5	0.30	HEC-1	1	1
*NNS	-	NNS	24	62
CP1U	-	DON2+FDOFF1+*NNS	28	70
CP2U	-	DON1+DOFF2+DOFF5	3	8

*Referenced from the NNS

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (10-Year Ultimate Condition)						
Street	Section	Slope (%)	Flow (100 year)	Velocity (ft/s)	Flow Depth (ft)	VxD
Street A	A	0.50	1	1.16	0.26	0.30
Dorrell Lane	B	0.50	28	2.51	0.60	1.51
Unicorn Street	C	0.70	3	1.71	0.31	0.53
Unicorn Street	F	1.49	28	3.77	0.52	1.96

DECATUR DONALD III (UNICORN)						
Street Flow Analysis (100-Year Ultimate Condition)						
Street	Section	Slope (%)	Flow (100 year)	Velocity (ft/s)	Flow Depth (ft)	VxD
Street A	A	0.50	3	1.47	0.34	0.50
Dorrell Lane	B	0.50	70	3.29	0.79	2.60
Unicorn Street	C	0.70	8	2.12	0.40	0.85
Unicorn Street	F	1.49	70	4.74	0.68	3.22



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FIGURE 9 - ULTIMATE CONDITION BASIN MAP

DECATUR DONALD III (UNICORN)

BEAZER

CITY OF LAS VEGAS, NV

#	DATE	DESCRIPTION

DATE | 3/2/2018

DRAWN | SHM

DESIGNED | SHM

CHECKED | DCL

PROJECT # | B2R011703

SHEET TITLE

FIGURE 9

SHEET NUMBER

1

HTE #

###

HYDROLOGIC PARAMETERS





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



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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305—Las Vegas-DeStazo complex, 0 to 2 percent slopes.....	14
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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

EXISTING CONDITION

Custom Soil Resource Report

Soil Map



Custom Soil Resource Report
Soil Map

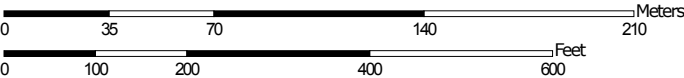


Custom Soil Resource Report
Soil Map



Soil Map may not be valid at this scale.

Map Scale: 1:2,520 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 12, Sep 15, 2017

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

Date(s) aerial images were photographed: Aug 17, 2014—Feb 27, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
305	Las Vegas-DeStazo complex, 0 to 2 percent slopes	29.2	100.0%
Totals for Area of Interest		29.2	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Las Vegas Valley Area, Nevada, Part of Clark County

305—Las Vegas-DeStazo complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hrbs
Elevation: 1,400 to 5,200 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 55 to 70 degrees F
Frost-free period: 180 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Las Vegas and similar soils: 60 percent
Destazo and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Vegas

Setting

Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

H1 - 0 to 2 inches: gravelly fine sandy loam
H2 - 2 to 8 inches: fine sandy loam
H3 - 8 to 12 inches: gravelly sandy clay loam
H4 - 12 to 16 inches: indurated

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 3 to 14 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 85 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 12.0
Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

Description of Destazo

Setting

Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 11 inches: fine sandy loam
H2 - 11 to 51 inches: very gravelly sandy clay loam
H3 - 51 to 62 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

Minor Components

Glencarb

Percent of map unit: 5 percent
Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: LOAMY BOTTOM (030XB020NV)
Hydric soil rating: No

Bluepoint

Percent of map unit: 5 percent
Landform: Fan piedmonts, sand sheets
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Other vegetative classification: LIMY SAND 5-7" P.Z. (030XB037NV_2)
Hydric soil rating: No

Skyhaven

Percent of map unit: 5 percent
Landform: Alluvial flats
Down-slope shape: Linear

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Across-slope shape: Linear

Other vegetative classification: SHALLOW LIMESTONE SLOPE 5-8 P.Z.
(030XB030NV_2)

Hydric soil rating: No

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Custom Soil Resource Report

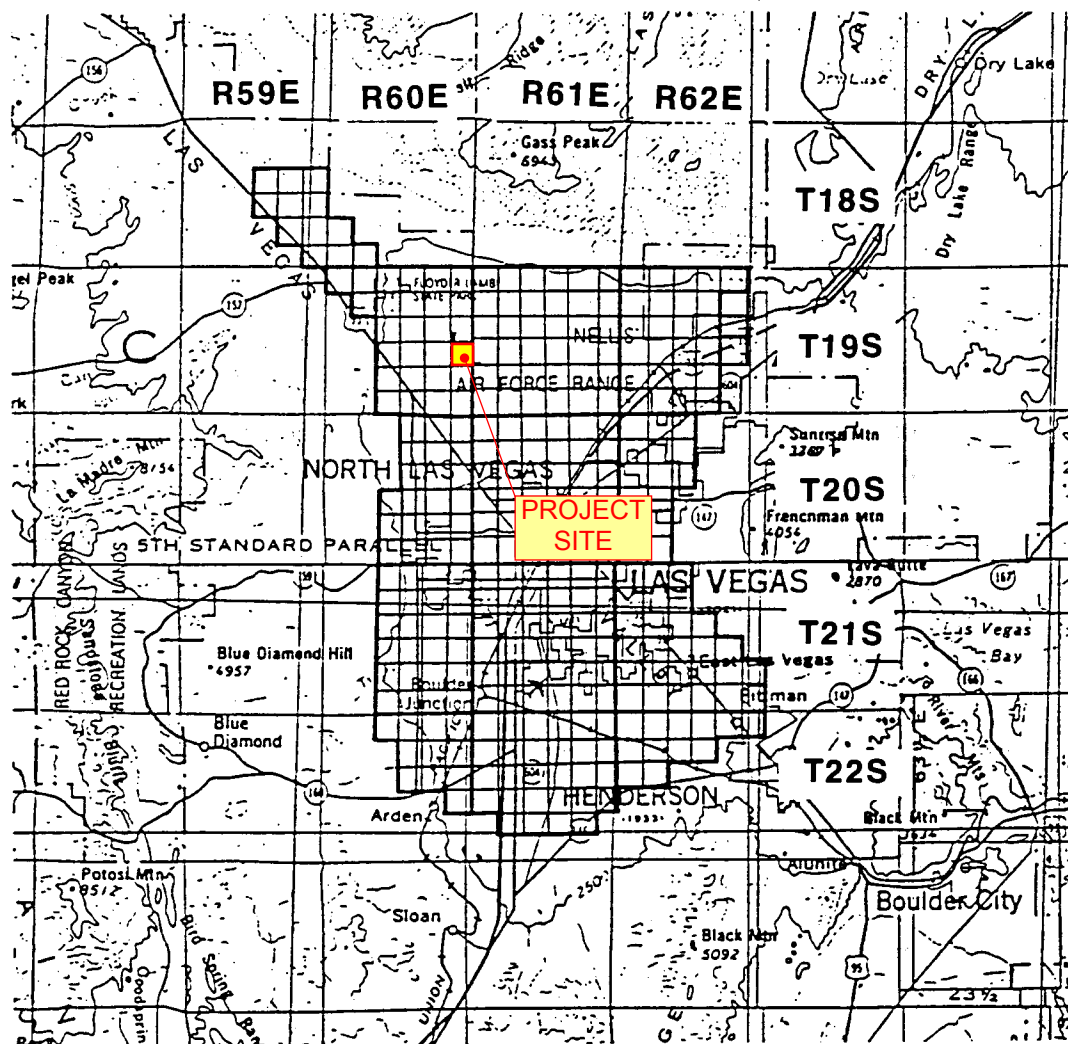
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HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



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

Notes:

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

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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

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

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

Revision	Date

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

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

²Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: >70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

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

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

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

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

Revision	Date

REFERENCE:

TABLE 602A

Curve Number Calculation

Project Name: Decatur Donald III (Unicorn)

Date: 3/2/2018

By: SM

SOIL #305 - Las Vegas DeStazo Complex, 0 to 2 percent slope

SOIL	%	HYDRO- LOGIC GROUP	EXISTING CN ¹	DEVELOPED CN ²
Las Vegas	60	D	88	91
DeStazo	25	C	85	89
Minor Comp	15	D	88	91
Composite CN	100		87.25	90.50

CN = Curve Number

SOIL	%	HYDRO- LOGIC GROUP	EXISTING CN ¹	DEVELOPED CN ²
Composite CN	0		0.00	0.00

CN = Curve Number

Note

1. Existing Curve Number with Desert Shrub in poor condition per Table 602, sheet 4 of 4, in the Drainage Design Manual.
2. Developed Curve Number with Average Lot Size of 7,000 Square Feet per Table 602/602A in the Drainage Design Manual.

Curve Number Calculation

Project Name: Decatur Donald III (Unicorn)
Date: 3/2/2018
By: SM

BASIN	Percentage of Basin (%)		Composite CN VALUE
	Existing SOIL #305	Public Street Improvements	
CN	87.25	98.00	
EON1	100%	0%	87.25
EON2	100%	0%	87.25
EOFF1	30%	70%	94.78
EOFF2 ¹	-	-	85.00
EOFF3	25%	75%	95.31
EOFF4	25%	75%	95.31

Note

1. Referenced from basin "EOF1" from the Paradise Meadows II Study.

Curve Number Calculation

Project Name:	<u>Decatur Donald III (Unicorn)</u>
Date:	<u>3/2/2018</u>
By:	<u>SM</u>

[illegible]

Note

1. Referenced from basin "EOF1" from the Paradise Meadows II Study.



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Company:	Actus	Project Name:	Decatur Donald III (Unicorn)
By:	Spencer McMillan	Description:	Basins
Date:	01/12/18	File Name:	

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check Urbanized Basins		Flag
DESIG:	DEV./EX. (D or E)	CN	K [1]	AREA Ac	AREA Mi^2 [2]	INITIAL LENGTH Feet	SLOPE %	Ti Min [3]	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS [4]	V2 VELOCITY FPS [5]	Tt Min [6]	Tc Calc. [7]	Total Length Feet [8]	Tc Check [9]	Flag Hours [10]
Existing Basins																	
EON1	E	87.25	0.7617	1.05	0.0016	200	1.00	8.61	300	0.30	0.81	1.61	6.17	14.78			0.148
EON2	E	87.25	0.7617	1.05	0.0016	200	1.00	8.61	300	0.30	0.81	1.61	6.17	14.78			0.148
EOFF1	E	94.78	0.8610	1.35	0.0021	28	2.00	1.81	935	0.40	0.94	1.86	12.80	14.61			0.146
EOFF2	E	85.00	0.7320	2.01	0.0031	0	0.00	0.00	410	0.50	1.05	2.08	6.53	6.53			0.065
EOFF3	E	95.31	0.8681	0.20	0.0003	30	2.00	1.81	290	0.70	1.24	2.46	3.90	5.72			0.057
EOFF4	E	95.31	0.8681	0.20	0.0003	30	2.00	1.81	290	0.70	1.24	2.46	3.90	5.72			0.057
Developed Basins																	
DON1	D	90.50	0.8046	0.50	0.0008	0	0.00	0.00	120	1.00	2.02	3.06	0.99	0.99	120	10.667	0.010
DON2	D	90.50	0.8046	1.32	0.0021	170	1.00	6.93	280	0.50	1.43	2.16	3.27	10.20	450	12.500	0.102
DON3	D	90.50	0.8046	0.28	0.0004	0	0.00	0.00	120	1.00	2.02	3.06	0.99	0.99	120	10.667	0.010
DOFF1	D	96.50	0.8838	1.45	0.0023	100	2.00	3.09	935	0.40	1.28	1.94	10.27	13.36	1035	15.750	0.134
DOFF2	D	85.00	0.7320	2.01	0.0031	0	0.00	0.00	410	0.50	1.43	2.16	4.78	4.78	410	12.278	0.048
DOFF3	D	98.00	0.9036	0.15	0.0002	28	2.00	1.48	200	0.70	1.69	2.56	1.97	3.46	228	11.267	0.035
DOFF4	D	98.00	0.9036	0.15	0.0002	28	2.00	1.48	200	0.70	1.69	2.56	1.97	3.46	228	11.267	0.035
DOFF5	D	98.00	0.9036	0.30	0.0005	28	2.00	1.48	200	0.70	1.69	2.56	1.97	3.46	228	11.267	0.035
FDOFF1	D	98.00	0.9036	1.44	0.0023	100	2.00	2.81	935	0.40	1.28	1.94	10.27	13.07	1035	15.750	0.131
[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 500 feet and V2 applies to remaining distance.					
	For Developed Conditions: V1 = 20.2 * (S/100)^0.5					[8]	Total L = Initial L + Travel L										
REFERENCE :														STANDARD FORM 4			

EXISTING CONDITION

```
1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 02MAR18 TIME 14:00:58 *
*****
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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
XXXXXXX XXXX X XXXXX X
X X X X X
X X X X X
X X XXXXXXX XXXXX XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

1 HEC-1 INPUT PAGE 1

```
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID PREPARED FOR
2 ID DECATUR DONALD III (UNICORN)
3 ID 10-Y & 100-Y,6 Hour Storm
4 ID EXISTING CONDITION
5 ID @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
6 ID
7 ID TECHNICAL DRAINAGE STUDY FOR DECATUR DONALD III (UNICORN)
8 ID file name:P:\BZR011703 - Dorrell Decatur\Drain\Phase 3 (Unicorn)\Original\Hy
9 ID
10 ID Actus
11 ID 3203 E. Warm Springs Road Suite, Suite 400
12 ID Las Vegas, Nevada 89120
13 ID
14 ID *****
15 ID * SDN 3 VALUES *
16 ID *****
17 ID
18 ID
19 ID
20 ID *DIAGRAM
21 IT 5 0 0 300
22 IN 5 0 0
23 IO 5 0 0
24 JR PREC .570 1.000
25
26 KK EON2
27 KM EXISTING ONSITE BASIN EON2
28 BA 0.0016
29 PB 2.77
30 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
31 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
32 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
33 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
34 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
35 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
36 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
37 LS 0 87.25
38 UD 0.148
39
40 KK EOFF1
41 KM EXISTING OFFSITE BASIN EOFF1
42 BA 0.0021
43 LS 0 94.78
44 UD 0.146
45
46 KK CP1X
47 KM COMBINATION POINT CP1X
48 HC 2
```

1 HEC-1 INPUT PAGE 2

```
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
46 KK EON1
47 KM EXISTING ONSITE BASIN EON1
48 BA 0.0016
49 LS 0 87.25
50 UD 0.148
51
52 KK EOFF4
53 KM EXISTING OFFSITE BASIN EOFF4
54 BA 0.0003
55 LS 0 95.31
56 UD 0.057
57
58 KK CP2X
59 KM COMBINATION POINT CP2X
60 HC 2
61
62 KK EOFF2
63 KM EXISTING OFFSITE BASIN EOFF2
64 BA 0.0031
65 LS 0 85.00
66 UD 0.065
```

1

INPUT
LINE

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1

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 .57	RATIO 2 1.00
HYDROGRAPH AT					
+	EON2	.00	1 FLOW TIME	1. 3.58	2. 3.58
HYDROGRAPH AT					
+	EOFF1	.00	1 FLOW TIME	2. 3.58	4. 3.58
2 COMBINED AT					
+	CP1X	.00	1 FLOW TIME	3. 3.58	6. 3.58
HYDROGRAPH AT					
+	EON1	.00	1 FLOW TIME	1. 3.58	2. 3.58
HYDROGRAPH AT					
+	EOFF4	.00	1 FLOW TIME	0. 3.50	1. 3.50
2 COMBINED AT					
+	CP2X	.00	1 FLOW TIME	1. 3.58	3. 3.58
HYDROGRAPH AT					
+	EOFF2	.00	1 FLOW TIME	2. 3.50	5. 3.50
HYDROGRAPH AT					
+	EOFF3	.00	1 FLOW TIME	0. 3.50	1. 3.50
2 COMBINED AT					
+	CP3X	.00	1 FLOW TIME	2. 3.50	5. 3.50

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

Note: Total CP1X: 27/68
An algebraic summation with referenced
flows from *NNS (24/62)

10-YR = 3 + 24 = 27 cfs
100-YR = 6 + 62 = 68 cfs

INTERIM CONDITION

```
1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 02MAR18 TIME 15:03:29 *
*****
```

```
*****
* 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
XXXXXXX XXXX X XXXXX 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.
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DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
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1 HEC-1 INPUT PAGE 1

```
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID PREPARED FOR
2 ID DECATUR DONALD III (UNICORN)
3 ID 10-Y & 100-Y,6 Hour Storm
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6 ID
7 ID TECHNICAL DRAINAGE STUDY FOR DECATUR DONALD III (UNICORN)
8 ID file name:P:\BZR011703 - Dorrell Decatur\Drain\Phase 3 (Unicorn)\Original\Hy
9 ID
10 ID Actus
11 ID 3203 E. Warm Springs Road Suite, Suite 400
12 ID Las Vegas, Nevada 89120
13 ID
14 ID *****
15 ID * SDN 3 VALUES *
16 ID *****
17 ID
18 ID
19 ID
20 ID *DIAGRAM
21 IT 5 0 0 300
22 IN 5 0 0
23 IO 5 0 0
24 JR PREC .570 1.000
25
26 KK DON2
27 KM DEVELOPED ONSITE BASIN DON2
28 BA 0.0021
29 PB 2.77
30 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
31 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
32 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
33 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
34 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
35 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
36 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
37 LS .998 .999 1.00
38 LS 0 90.50
39 UD 0.102
40
41 KK DOFF1
42 KM DEVELOPED OFFSITE BASIN DOFF1
43 BA 0.0023
44 LS 0 96.50
45 UD 0.134
46
47 KK DON3
48 KM DEVELOPED ONSITE BASIN DON3
49 BA 0.0004
50 LS 0 90.50
51 UD 0.010
```

1 HEC-1 INPUT PAGE 2

```
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
48 KK CP1I
49 KM COMBINATION POINT CP1I
50 HC 3
51
52 KK DON1
53 KM DEVELOPED ONSITE BASIN DON1
54 BA 0.0008
55 LS 0 90.50
56 UD 0.010
57
58 KK DOFF4
59 KM DEVELOPED OFFSITE BASIN DOFF4
60 BA 0.0002
61 LS 0 98.00
62 UD 0.035
63
64 KK CP2I
65 KM COMBINATION POINT CP2I
66 HC 2
```

1

MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS
 JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 .57 1.00
 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
				.57	1.00
HYDROGRAPH AT					
+	DON2	.00	1 FLOW	1.	3.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	DOFF1	.00	1 FLOW	2.	4.
			TIME	3.58	3.58
HYDROGRAPH AT					
+	DON3	.00	1 FLOW	0.	1.
			TIME	3.50	3.50
3 COMBINED AT					
+	CP1I	.00	1 FLOW	4.	8.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	DON1	.00	1 FLOW	1.	2.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	DOFF4	.00	1 FLOW	0.	0.
			TIME	3.50	3.50
2 COMBINED AT					
+	CP2I	.00	1 FLOW	1.	2.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	EOFF2	.00	1 FLOW	2.	5.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	DOFF3	.00	1 FLOW	0.	0.
			TIME	3.50	3.50
2 COMBINED AT					
+	CP3I	.00	1 FLOW	2.	5.
			TIME	3.50	3.50

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

Note: Total CP1I: 28/70
 An algebraic summation with referenced
 flows from *NNS (24/62)

10-YR = 4 + 24 = 28 cfs
 100-YR = 8 + 62 = 70 cfs

ULTIMATE CONDITION

```
1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 02MAR18 TIME 14:42:26 *
*****
```

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

```

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

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

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

1 HEC-1 INPUT PAGE 1

```
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID PREPARED FOR
2 ID DECATUR DONALD III (UNICORN)
3 ID 10-Y & 100-Y,6 Hour Storm
4 ID ULTIMATE CONDITION
5 ID @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
6 ID
7 ID TECHNICAL DRAINAGE STUDY FOR DECATUR DONALD III (UNICORN)
8 ID file name:P:\BZR011703 - Dorrell Decatur\Drain\Phase 3 (Unicorn)\Original\Hy
9 ID
10 ID Actus
11 ID 3203 E. Warm Springs Road Suite, Suite 400
12 ID Las Vegas, Nevada 89120
13 ID
14 ID *****
15 ID * SDN 3 VALUES *
16 ID *****
17 ID
18 ID
19 ID
20 ID *DIAGRAM
21 IT 5 0 0 300
22 IN 5 0 0
23 IO 5 0 0
24 JR PREC .570 1.000
25
26 KK DON2
27 KM DEVELOPED ONSITE BASIN DON2
28 BA 0.0021
29 PB 2.77
30 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
31 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
32 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
33 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
34 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
35 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
36 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
37 LS .998 .999 1.00
38 LS 0 90.50
39 UD 0.102
40
41 KK FDOFF1
42 KM DEVELOPED OFFSITE BASIN FDOFF1
43 BA 0.0023
44 LS 0 98.00
45 UD 0.131
46
47 KK DON3
48 KM DEVELOPED ONSITE BASIN DON3
49 BA 0.0004
50 LS 0 90.50
51 UD 0.010
```

1 HEC-1 INPUT PAGE 2

```
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
48 KK CP1U
49 KM COMBINATION POINT CP1U
50 HC 3
51
52 KK DON1
53 KM DEVELOPED ONSITE BASIN DON1
54 BA 0.0008
55 LS 0 90.50
56 UD 0.010
57
58 KK DOFF5
59 KM DEVELOPED OFFSITE BASIN DOFF5
60 BA 0.0005
61 LS 0 98.00
62 UD 0.035
63
64 KK DOFF2
65 KM DEVELOPED OFFSITE BASIN DOFF2
66 BA 0.0031
67 LS 0 85.00
```

65 UD 0.048
66 KK CP2U
67 KM COMBINATION POINT CP2I
68 HC 3
69 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
24	DON2	
	.	
38	FDOFF1	
	.	
43	DON3	
	.	
48	CP1U.....	
	.	
51	DON1	
	.	
56	DOFF5	
	.	
61	DOFF2	
	.	
66	CP2U.....	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 02MAR18 TIME 14:42:26 *

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

PREPARED FOR
DECATUR DONALD III (UNICORN)
10-Y & 100-Y, 6 Hour Storm
ULTIMATE CONDITION
#####

TECHNICAL DRAINAGE STUDY FOR DECATUR DONALD III (UNICORN)
file name:P:\BZR011703 - Dorrell Decatur\Drain\Phase 3 (Unicorn)\Original\Hy

Actus
3203 E. Warm Springs Road Suite, Suite 400
Las Vegas, Nevada 89120

* SDN 3 VALUES *

22 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
NDDTIME	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	
.57	1.00

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
				.57	1.00

HYDROGRAPH AT					
+	DON2	.00	1	FLOW	
				TIME	
				1.	3.
				3.50	3.50
HYDROGRAPH AT					
+	FDOFF1	.00	1	FLOW	
				TIME	
				2.	4.
				3.58	3.58
HYDROGRAPH AT					
+	DON3	.00	1	FLOW	
				TIME	
				0.	1.
				3.50	3.50
3 COMBINED AT					
+	CP1U	.00	1	FLOW	
				TIME	
				4.	8.
				3.50	3.50
HYDROGRAPH AT					
+	DON1	.00	1	FLOW	
				TIME	
				1.	2.
				3.50	3.50
HYDROGRAPH AT					
+	DOFF5	.00	1	FLOW	
				TIME	
				1.	1.
				3.50	3.50
HYDROGRAPH AT					
+	DOFF2	.00	1	FLOW	
				TIME	
				2.	5.
				3.50	3.50
3 COMBINED AT					
+	CP2U	.00	1	FLOW	
				TIME	
				3.	8.
				3.50	3.50

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

Note: Total CP1U: 28/70
 An algebraic summation with referenced
 flows from *NNS (24/62)

10-YR = 4 + 24 = 28 cfs
 100-YR = 8 + 62 = 70 cfs

HYDRAULIC CALCULATIONS

Street Flow Calculations (Interim Condition 100-YR)



Project Description

Input Data

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

Roughness Segment Definitions

Options

Bentley Systems, Inc. Haestad Methods Solution Center FlowMaster V8i (SELECTseries 1) [08.11.01.03]

Section A - Street A - Interim Condition - 100 YR

Results

Normal Depth		0.34	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		2.05	ft ²
Wetted Perimeter		20.35	ft
Hydraulic Radius		0.10	ft
Top Width		19.93	ft
Normal Depth		0.34	ft
Critical Depth		0.32	ft
Critical Slope		0.00788	ft/ft
Velocity		1.47	ft/s
Velocity Head		0.03	ft
Specific Energy		0.37	ft
Froude Number		0.81	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.32	ft
Channel Slope	0.50000	%
Critical Slope	0.00788	ft/ft

Cross Section for Section A - Street A - Interim Condition - 100 YR

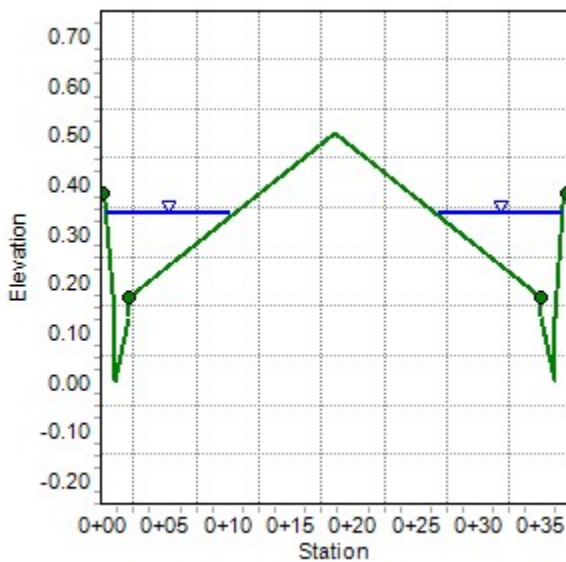
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.34	ft
Discharge	3.00	ft ³ /s

Cross Section Image



Section B - Dorrell Lane - Interim Condition - 100YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.50000 %
Discharge 70.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

Options

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

Section B - Dorrell Lane - Interim Condition - 100YR

Results

Normal Depth		0.79	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		21.30	ft ²
Wetted Perimeter		61.68	ft
Hydraulic Radius		0.35	ft
Top Width		60.00	ft
Normal Depth		0.79	ft
Critical Depth		0.78	ft
Critical Slope		0.00533	ft/ft
Velocity		3.29	ft/s
Velocity Head		0.17	ft
Specific Energy		0.95	ft
Froude Number		0.97	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.79	ft
Critical Depth	0.78	ft
Channel Slope	0.50000	%
Critical Slope	0.00533	ft/ft

Section B - Dorrell Lane - Interim Condition - 100YR

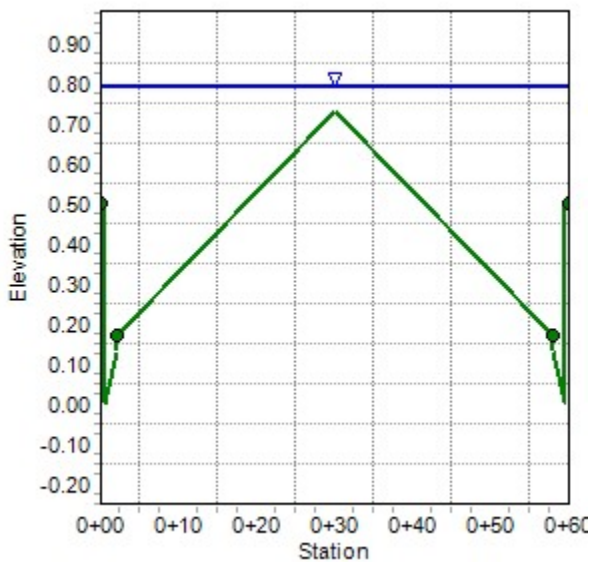
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.79	ft
Discharge	70.00	ft ³ /s

Cross Section Image



Section D - East Half of Unicorn Street - Interim Condition - 100YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.70000 %
Discharge 2.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+30.00, 0.73)	0.016

Options

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

Results

Normal Depth 0.34 ft
Elevation Range 0.00 to 0.73 ft
Flow Area 1.10 ft²
Wetted Perimeter 10.22 ft
Hydraulic Radius 0.11 ft
Top Width 9.83 ft

Section D - East Half of Unicorn Street - Interim Condition - 100YR

Results

Normal Depth	0.34	ft
Critical Depth	0.33	ft
Critical Slope	0.00768	ft/ft
Velocity	1.81	ft/s
Velocity Head	0.05	ft
Specific Energy	0.39	ft
Froude Number	0.96	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.33	ft
Channel Slope	0.70000	%
Critical Slope	0.00768	ft/ft

Section D - East Half of Unicorn Street - Interim Condition - 100YR

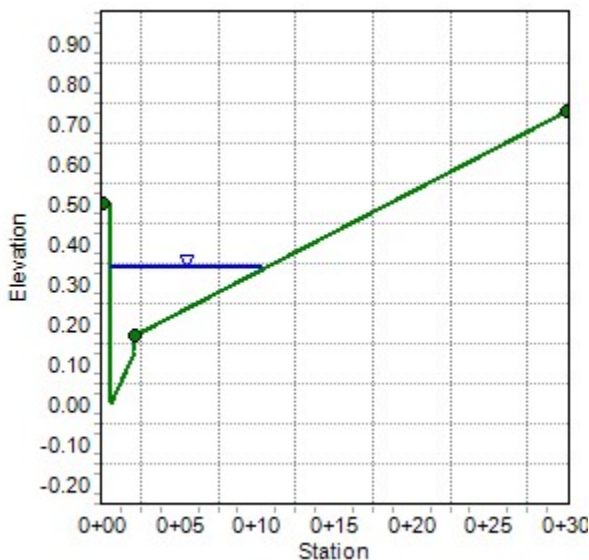
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.70000	%
Normal Depth	0.34	ft
Discharge	2.00	ft ³ /s

Cross Section Image



Section E - West Half of Unicorn Street - Interim Condition - 100YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.70000 %
Discharge 5.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.73
0+28.00	0.17
0+28.00	0.13
0+29.50	0.00
0+29.50	0.50
0+30.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.73)	(0+28.00, 0.17)	0.016
(0+28.00, 0.17)	(0+30.00, 0.50)	0.013

Options

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

Results

Normal Depth 0.43 ft
Elevation Range 0.00 to 0.73 ft
Flow Area 2.24 ft²
Wetted Perimeter 14.97 ft
Hydraulic Radius 0.15 ft
Top Width 14.50 ft

Section E - West Half of Unicorn Street - Interim Condition - 100YR

Results

Normal Depth	0.43	ft
Critical Depth	0.43	ft
Critical Slope	0.00693	ft/ft
Velocity	2.24	ft/s
Velocity Head	0.08	ft
Specific Energy	0.51	ft
Froude Number	1.00	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.43	ft
Critical Depth	0.43	ft
Channel Slope	0.70000	%
Critical Slope	0.00693	ft/ft

Section E - West Half of Unicorn Street - Interim Condition - 100YR

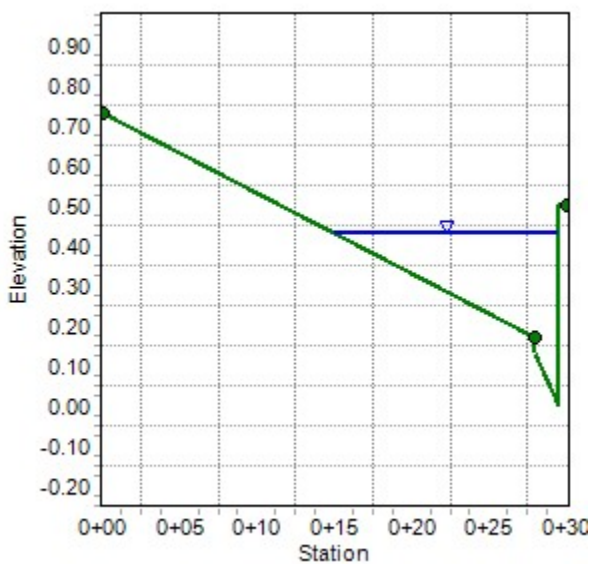
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.70000	%
Normal Depth	0.43	ft
Discharge	5.00	ft ³ /s

Cross Section Image



Project Description

Input Data

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

Roughness Segment Definitions

Options

Bentley Systems, Inc. Haestad Methods Software
3/2/2018 5:32:53 PM 27 Siemons Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 2

Worksheet for Section F - Unicorn Street - Interim Condition - 100YR

Results

Normal Depth		0.68	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		14.77	ft ²
Wetted Perimeter		55.98	ft
Hydraulic Radius		0.26	ft
Top Width		54.53	ft
Normal Depth		0.68	ft
Critical Depth		0.78	ft
Critical Slope		0.00532	ft/ft
Velocity		4.74	ft/s
Velocity Head		0.35	ft
Specific Energy		1.02	ft
Froude Number		1.60	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.68	ft
Critical Depth	0.78	ft
Channel Slope	1.49000	%
Critical Slope	0.00532	ft/ft

Cross Section for Section F - Unicorn Street - Interim Condition -

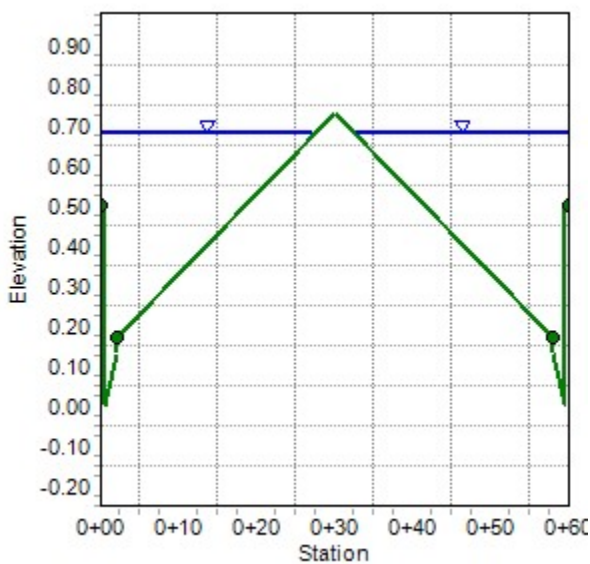
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.49000	%
Normal Depth	0.68	ft
Discharge	70.00	ft ³ /s

Cross Section Image



HYDRAULIC CALCULATIONS

Street Flow Calculations (Interim Condition 10-YR)



Worksheet for Section A - Street A - Interim Condition - 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.50000 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+00.15	0.36
0+01.00	0.13
0+01.00	0.00
0+02.00	0.13
0+02.00	0.17
0+18.50	0.50
0+35.00	0.17
0+35.00	0.13
0+36.00	0.00
0+36.00	0.13
0+36.75	0.36
0+37.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+35.00, 0.17)	0.016
(0+35.00, 0.17)	(0+37.00, 0.38)	0.013

Options

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

Worksheet for Section A - Street A - Interim Condition - 10 YR

Results

Normal Depth		0.26	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		0.86	ft ²
Wetted Perimeter		12.34	ft
Hydraulic Radius		0.07	ft
Top Width		11.95	ft
Normal Depth		0.26	ft
Critical Depth		0.24	ft
Critical Slope		0.00879	ft/ft
Velocity		1.16	ft/s
Velocity Head		0.02	ft
Specific Energy		0.28	ft
Froude Number		0.77	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.26	ft
Critical Depth	0.24	ft
Channel Slope	0.50000	%
Critical Slope	0.00879	ft/ft

Cross Section for Section A - Street A - Interim Condition - 10 YR

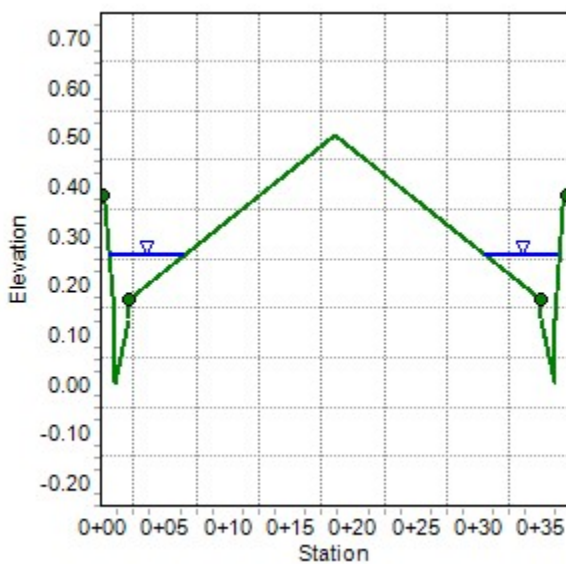
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.26	ft
Discharge	1.00	ft ³ /s

Cross Section Image



Project Description

Input Data

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

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

Worksheet for Section B - Dorrell Lane - Interim Condition - 10YR

Results

Normal Depth		0.60	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		11.16	ft ²
Wetted Perimeter		48.76	ft
Hydraulic Radius		0.23	ft
Top Width		47.45	ft
Normal Depth		0.60	ft
Critical Depth		0.59	ft
Critical Slope		0.00611	ft/ft
Velocity		2.51	ft/s
Velocity Head		0.10	ft
Specific Energy		0.70	ft
Froude Number		0.91	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.60	ft
Critical Depth	0.59	ft
Channel Slope	0.50000	%
Critical Slope	0.00611	ft/ft

Cross Section for Section B - Dorrell Lane - Interim Condition - 10YR

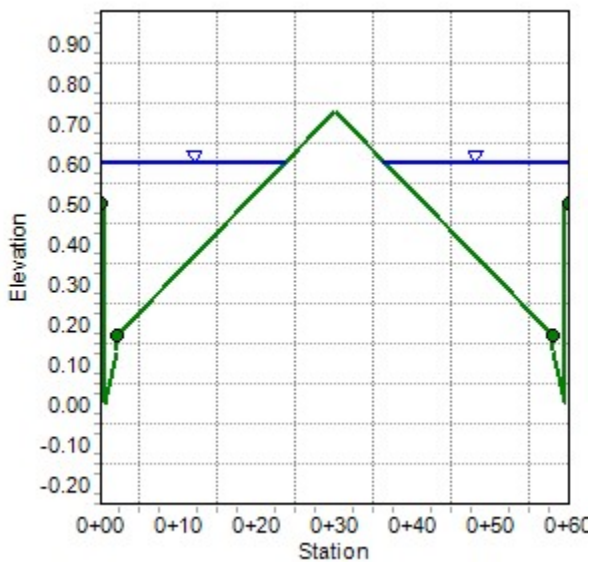
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.60	ft
Discharge	28.00	ft ³ /s

Cross Section Image



Section D - East Half of Unicorn Street - Interim Condition - 10YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.70000 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+30.00, 0.73)	0.016

Options

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

Results

Normal Depth 0.28 ft
Elevation Range 0.00 to 0.73 ft
Flow Area 0.63 ft²
Wetted Perimeter 7.39 ft
Hydraulic Radius 0.09 ft
Top Width 7.06 ft

Section D - East Half of Unicorn Street - Interim Condition - 10YR

Results

Normal Depth	0.28	ft
Critical Depth	0.28	ft
Critical Slope	0.00818	ft/ft
Velocity	1.58	ft/s
Velocity Head	0.04	ft
Specific Energy	0.32	ft
Froude Number	0.93	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.28	ft
Channel Slope	0.70000	%
Critical Slope	0.00818	ft/ft

Section D - East Half of Unicorn Street - Interim Condition - 10YR

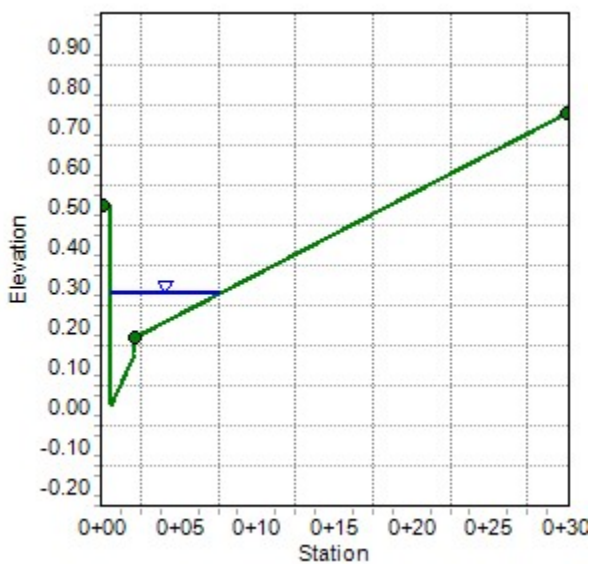
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.70000	%
Normal Depth	0.28	ft
Discharge	1.00	ft ³ /s

Cross Section Image



Section E - West Half of Unicorn Street - Interim Condition - 10YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.70000 %
Discharge 2.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.73
0+28.00	0.17
0+28.00	0.13
0+29.50	0.00
0+29.50	0.50
0+30.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.73)	(0+28.00, 0.17)	0.016
(0+28.00, 0.17)	(0+30.00, 0.50)	0.013

Options

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

Results

Normal Depth 0.34 ft
Elevation Range 0.00 to 0.73 ft
Flow Area 1.10 ft²
Wetted Perimeter 10.22 ft
Hydraulic Radius 0.11 ft
Top Width 9.83 ft

Section E - West Half of Unicorn Street - Interim Condition - 10YR

Results

Normal Depth	0.34	ft
Critical Depth	0.33	ft
Critical Slope	0.00768	ft/ft
Velocity	1.81	ft/s
Velocity Head	0.05	ft
Specific Energy	0.39	ft
Froude Number	0.96	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.33	ft
Channel Slope	0.70000	%
Critical Slope	0.00768	ft/ft

Section E - West Half of Unicorn Street - Interim Condition - 10YR

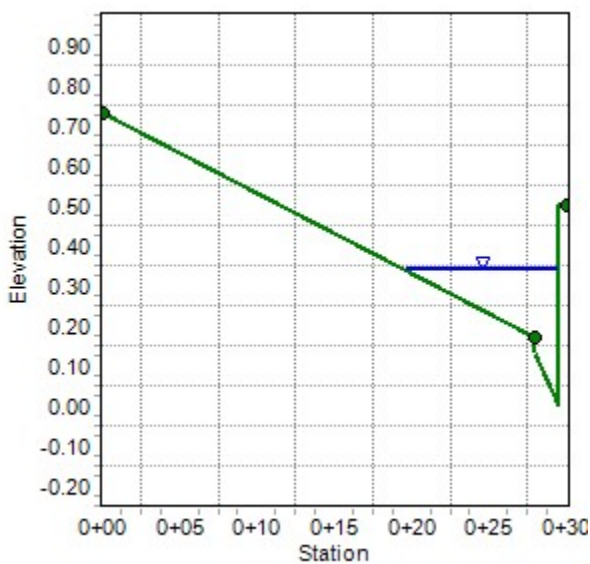
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.70000	%
Normal Depth	0.34	ft
Discharge	2.00	ft ³ /s

Cross Section Image



Project Description

Input Data

Station (ft)	Elevation (ft)
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Roughness Segment Definitions

Options

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Worksheet for Section F - Unicorn Street - Interim Condition - 10YR

Results

Normal Depth		0.52	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		7.42	ft ²
Wetted Perimeter		39.91	ft
Hydraulic Radius		0.19	ft
Top Width		38.78	ft
Normal Depth		0.52	ft
Critical Depth		0.59	ft
Critical Slope		0.00607	ft/ft
Velocity		3.77	ft/s
Velocity Head		0.22	ft
Specific Energy		0.74	ft
Froude Number		1.52	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.52	ft
Critical Depth	0.59	ft
Channel Slope	1.49000	%
Critical Slope	0.00607	ft/ft

Cross Section for Section F - Unicorn Street - Interim Condition - 10YR

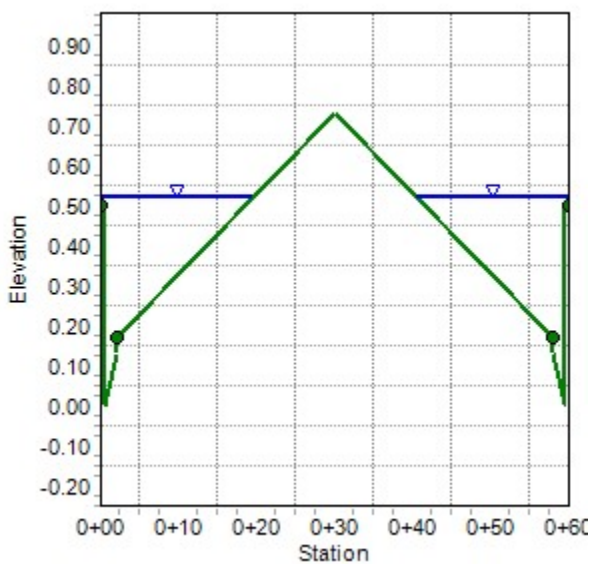
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.49000	%
Normal Depth	0.52	ft
Discharge	28.00	ft ³ /s

Cross Section Image



HYDRAULIC CALCULATIONS

Street Flow Calculations (Ultimate Condition 100-YR)



Section A - Street A - Ultimate Condition - 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.50000 %
Discharge 3.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+00.15	0.36
0+01.00	0.13
0+01.00	0.00
0+02.00	0.13
0+02.00	0.17
0+18.50	0.50
0+35.00	0.17
0+35.00	0.13
0+36.00	0.00
0+36.00	0.13
0+36.75	0.36
0+37.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+35.00, 0.17)	0.016
(0+35.00, 0.17)	(0+37.00, 0.38)	0.013

Options

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

Section A - Street A - Ultimate Condition - 100 YR

Results

Normal Depth		0.34	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		2.05	ft ²
Wetted Perimeter		20.35	ft
Hydraulic Radius		0.10	ft
Top Width		19.93	ft
Normal Depth		0.34	ft
Critical Depth		0.32	ft
Critical Slope		0.00788	ft/ft
Velocity		1.47	ft/s
Velocity Head		0.03	ft
Specific Energy		0.37	ft
Froude Number		0.81	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.32	ft
Channel Slope	0.50000	%
Critical Slope	0.00788	ft/ft

Section A - Street A - Ultimate Condition - 100 YR

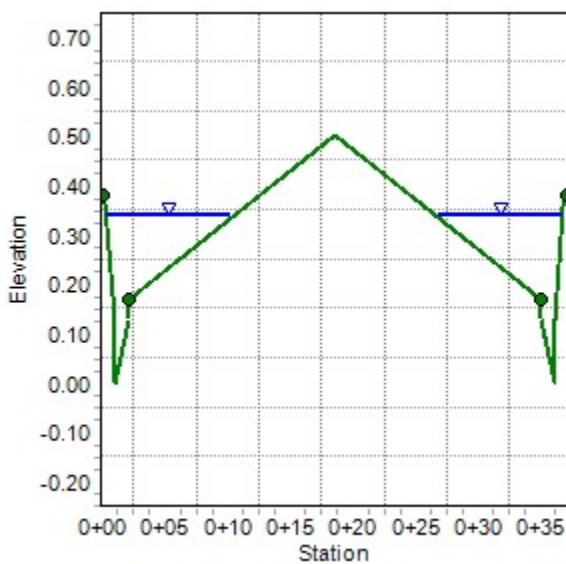
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.34	ft
Discharge	3.00	ft ³ /s

Cross Section Image



Worksheet for Section B - Dorrell Lane - Ultimate Condition - 100YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.50000 %
Discharge 70.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

Options

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

Worksheet for Section B - Dorrell Lane - Ultimate Condition - 100YR

Results

Normal Depth		0.79	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		21.30	ft ²
Wetted Perimeter		61.68	ft
Hydraulic Radius		0.35	ft
Top Width		60.00	ft
Normal Depth		0.79	ft
Critical Depth		0.78	ft
Critical Slope		0.00533	ft/ft
Velocity		3.29	ft/s
Velocity Head		0.17	ft
Specific Energy		0.95	ft
Froude Number		0.97	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.79	ft
Critical Depth	0.78	ft
Channel Slope	0.50000	%
Critical Slope	0.00533	ft/ft

Cross Section for Section B - Dorrell Lane - Ultimate Condition - 100YR

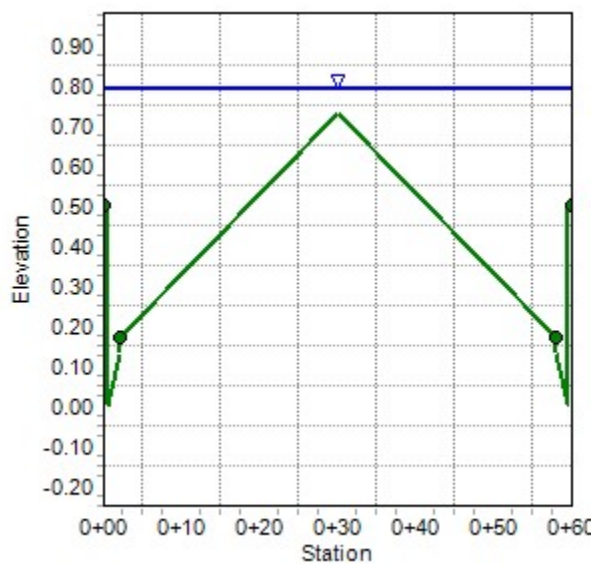
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.79	ft
Discharge	70.00	ft ³ /s

Cross Section Image



Worksheet for Section C - Unicorn Street - Ultimate Condition - 100YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.70000 %
Discharge 8.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

Options

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

Worksheet for Section C - Unicorn Street - Ultimate Condition - 100YR

Results

Normal Depth		0.40	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		3.77	ft ²
Wetted Perimeter		27.35	ft
Hydraulic Radius		0.14	ft
Top Width		26.44	ft
Normal Depth		0.40	ft
Critical Depth		0.40	ft
Critical Slope		0.00712	ft/ft
Velocity		2.12	ft/s
Velocity Head		0.07	ft
Specific Energy		0.47	ft
Froude Number		0.99	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.40	ft
Critical Depth	0.40	ft
Channel Slope	0.70000	%
Critical Slope	0.00712	ft/ft

Cross Section for Section C - Unicorn Street - Ultimate Condition -

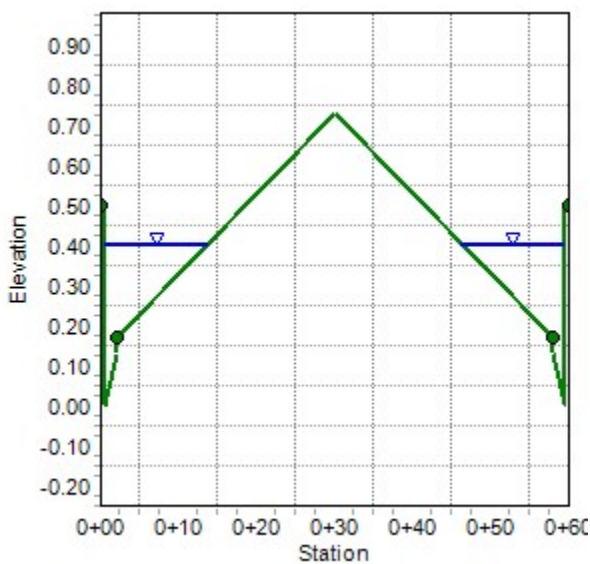
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.70000	%
Normal Depth	0.40	ft
Discharge	8.00	ft ³ /s

Cross Section Image



Worksheet for Section F - Unicorn Street - Ultimate Condition - 100YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 1.49000 %
Discharge 70.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

Options

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

Worksheet for Section F - Unicorn Street - Ultimate Condition - 100YR

Results

Normal Depth		0.68	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		14.77	ft ²
Wetted Perimeter		55.98	ft
Hydraulic Radius		0.26	ft
Top Width		54.53	ft
Normal Depth		0.68	ft
Critical Depth		0.78	ft
Critical Slope		0.00532	ft/ft
Velocity		4.74	ft/s
Velocity Head		0.35	ft
Specific Energy		1.02	ft
Froude Number		1.60	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.68	ft
Critical Depth	0.78	ft
Channel Slope	1.49000	%
Critical Slope	0.00532	ft/ft

Cross Section for Section F - Unicorn Street - Ultimate Condition -

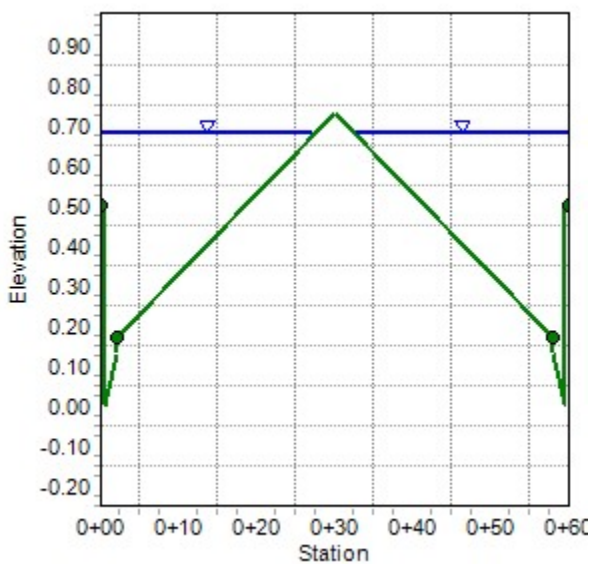
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.49000	%
Normal Depth	0.68	ft
Discharge	70.00	ft ³ /s

Cross Section Image



HYDRAULIC CALCULATIONS

Street Flow Calculations (Ultimate Condition 10-YR)



Worksheet for Section A - Street A - Ultimate Condition - 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.50000 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+00.15	0.36
0+01.00	0.13
0+01.00	0.00
0+02.00	0.13
0+02.00	0.17
0+18.50	0.50
0+35.00	0.17
0+35.00	0.13
0+36.00	0.00
0+36.00	0.13
0+36.75	0.36
0+37.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+35.00, 0.17)	0.016
(0+35.00, 0.17)	(0+37.00, 0.38)	0.013

Options

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

Worksheet for Section A - Street A - Ultimate Condition - 10 YR

Results

Normal Depth		0.26	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		0.86	ft ²
Wetted Perimeter		12.34	ft
Hydraulic Radius		0.07	ft
Top Width		11.95	ft
Normal Depth		0.26	ft
Critical Depth		0.24	ft
Critical Slope		0.00879	ft/ft
Velocity		1.16	ft/s
Velocity Head		0.02	ft
Specific Energy		0.28	ft
Froude Number		0.77	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.26	ft
Critical Depth	0.24	ft
Channel Slope	0.50000	%
Critical Slope	0.00879	ft/ft

Cross Section for Section A - Street A - Ultimate Condition - 10 YR

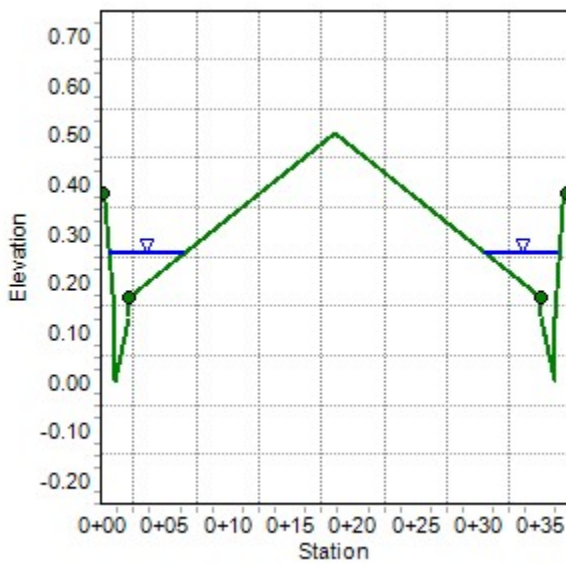
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.26	ft
Discharge	1.00	ft ³ /s

Cross Section Image



Project Description

Input Data

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

Options

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Worksheet for Section B - Dorrell Lane - Ultimate Condition - 10YR

Results

Normal Depth		0.60	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		11.16	ft ²
Wetted Perimeter		48.76	ft
Hydraulic Radius		0.23	ft
Top Width		47.45	ft
Normal Depth		0.60	ft
Critical Depth		0.59	ft
Critical Slope		0.00611	ft/ft
Velocity		2.51	ft/s
Velocity Head		0.10	ft
Specific Energy		0.70	ft
Froude Number		0.91	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.60	ft
Critical Depth	0.59	ft
Channel Slope	0.50000	%
Critical Slope	0.00611	ft/ft

Cross Section for Section B - Dorrell Lane - Ultimate Condition - 10YR

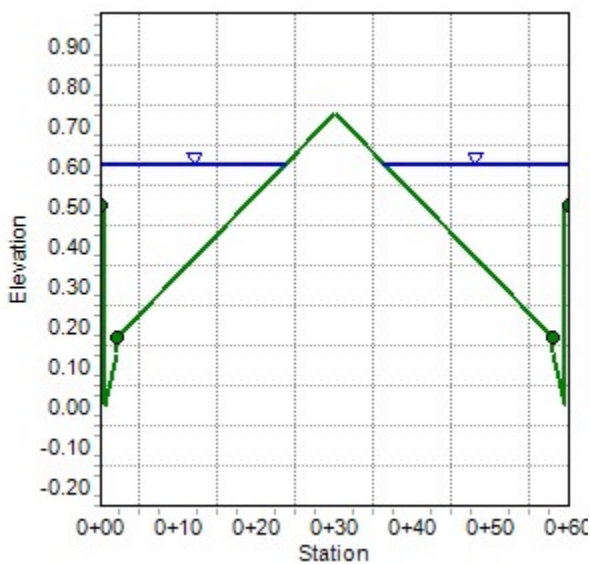
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.60	ft
Discharge	28.00	ft ³ /s

Cross Section Image



Worksheet for Section C - Unicorn Street - Ultimate Condition - 10YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.70000 %
Discharge 3.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

Options

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

Worksheet for Section C - Unicorn Street - Ultimate Condition - 10YR

Results

Normal Depth		0.31	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		1.75	ft ²
Wetted Perimeter		17.93	ft
Hydraulic Radius		0.10	ft
Top Width		17.22	ft
Normal Depth		0.31	ft
Critical Depth		0.31	ft
Critical Slope		0.00790	ft/ft
Velocity		1.71	ft/s
Velocity Head		0.05	ft
Specific Energy		0.36	ft
Froude Number		0.95	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.31	ft
Critical Depth	0.31	ft
Channel Slope	0.70000	%
Critical Slope	0.00790	ft/ft

Cross Section for Section C - Unicorn Street - Ultimate Condition -

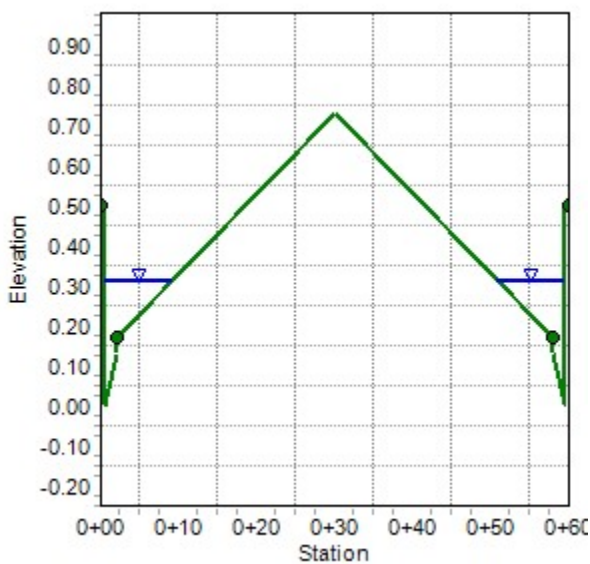
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.70000	%
Normal Depth	0.31	ft
Discharge	3.00	ft ³ /s

Cross Section Image



Worksheet for Section F - Unicorn Street - Ultimate Condition - 10YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 1.49000 %
Discharge 28.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.00	0.73
0+58.00	0.17
0+58.00	0.13
0+59.50	0.00
0+59.50	0.50
0+60.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.17)	0.013
(0+02.00, 0.17)	(0+58.00, 0.17)	0.016
(0+58.00, 0.17)	(0+60.00, 0.50)	0.013

Options

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

Worksheet for Section F - Unicorn Street - Ultimate Condition - 10YR

Results

Normal Depth		0.52	ft
Elevation Range	0.00 to 0.73 ft		
Flow Area		7.42	ft ²
Wetted Perimeter		39.91	ft
Hydraulic Radius		0.19	ft
Top Width		38.78	ft
Normal Depth		0.52	ft
Critical Depth		0.59	ft
Critical Slope		0.00607	ft/ft
Velocity		3.77	ft/s
Velocity Head		0.22	ft
Specific Energy		0.74	ft
Froude Number		1.52	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.52	ft
Critical Depth	0.59	ft
Channel Slope	1.49000	%
Critical Slope	0.00607	ft/ft

Cross Section for Section F - Unicorn Street - Ultimate Condition -

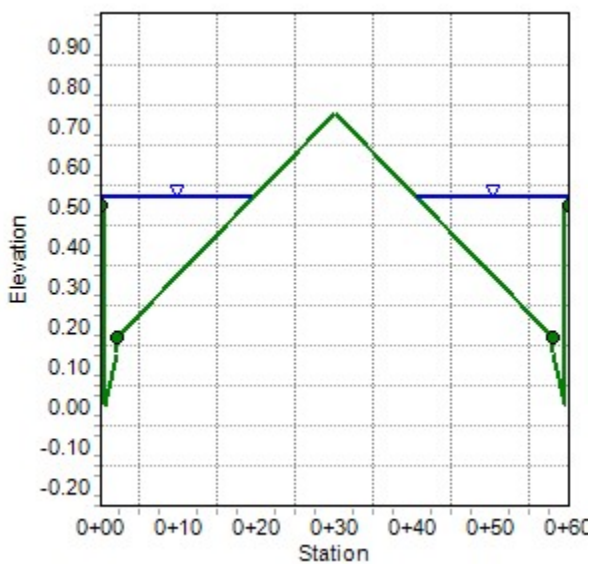
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.49000	%
Normal Depth	0.52	ft
Discharge	28.00	ft ³ /s

Cross Section Image



HYDRAULIC CALCULATIONS

Finished Floor Elevation Check



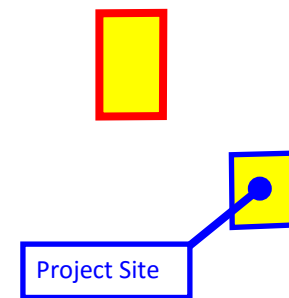
DECATUR DONALD III (UNICORN)														
FINISH FLOOR ANALYSIS - CITY OF LAS VEGAS JURISDICTION														
INPUT INFORMATION							FINISHED FLOORS							NOTES
Lot Number	Hydraulic Section Utilized	Centerline Elevation	T/C ¹	Roll, L Curb, or R-Curb?	F/L ²	D ₁₀₀	Flowline FF min ³	Centerline (of TC) FF min ⁴	Pad	Section	FF Design	Flowline Check	Centerline Check	See References on Last Sheet (ft)
		(ft)	(ft)	Type	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	F	2314.22	2314.66	R-Type	2314.28	0.68	2315.64	2315.72	2316.6	1.00	2317.60	OK	OK	
2	C	2315.06	2314.76	R-Type	2314.38	0.4	2315.18	2316.56	2316.6	1.00	2317.60	OK	OK	
3	C	2314.37	2314.53	R-Type	2314.15	0.4	2314.95	2315.87	2315.6	1.00	2316.60	OK	OK	
4	C	2313.71	2313.76	R-Type	2313.38	0.4	2314.18	2315.21	2314.9	1.00	2315.90	OK	OK	
5	A	2312.61	2312.75	R-Type	2312.37	0.34	2313.05	2314.11	2314.1	1.00	2315.10	OK	OK	
6	A	2313.04	2313.10	R-Type	2312.72	0.34	2313.40	2314.54	2314.5	1.00	2315.50	OK	OK	
7	A	2313.51	2313.48	R-Type	2313.10	0.34	2313.78	2315.01	2314.6	1.00	2315.60	OK	OK	
8	A	2313.91	2313.74	R-Type	2313.36	0.34	2314.04	2315.41	2315.5	1.00	2316.50	OK	OK	
Where:														
1: Top of Curb at High Side of Lot														
2: TC - 0.38 feet (for R Type Curb)														
3: Minimum Allowable Finished Floor Elevation above flowline @ high side of lot = (2 x D ₁₀₀) + F/L														
4: Minimum Allowable Finished Floor Elevation above centerline (or TC whichever is higher) elevation = Centerline elevation (or Center TC) + 1.5 feet														

REFERENCES

Northwest Neighborhood Study

Future Drainage Conditions Map





REFERENCES

Technical Drainage Study for Paradise Meadows II (CLV DS: 3157)

Approval Letter
Standard Form 4
HEC-1
Interim/Ultimate Subbasin Map



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		September 5, 2002
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: "Paradise Meadows II"		COPIES TO: Southwest Engineering
Cross Streets:	NEC Bradley Road & Deer Springs Way	D.R. Horton
File Number:	DS3157B	Cheri Edelman, P.E., DEVCO
Parcel Number:	125-24-601-004, -007	
Zoning Action:		
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES X NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID G.R. #
1 st Submittal	6/24/2002	7/8/2002	Not Accepted	\$250.00	
2 nd Submittal	08/02/2002	08/14/2002	Not Accepted	\$250.00	
3 rd Submittal	08/30/2002	09/05/2002	See Comments Below	\$250.00	\$750.00:90905
			TOTAL FEES (LDDRS):	\$750.00	

REMARKS:

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

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

- All drainage easements must be common lots and labeled as "Public Drainage Easement to be privately maintained by the Homeowners Association" in the grading plan and recorded as such on the final map.
- The common lot between Bradley Road and the proposed project was utilized as flow area in the drainage analysis. This area must be a "Public Drainage Easement to be privately maintained by the Homeowners Association," and labeled as such on the grading plans.
- Many streets within this development are designed to a 0.40% slope. This street slope is the minimum allowed without a nuisance storm drain system and is difficult to construct. The engineer and developer is advised that ponding in proposed improvements is not allowed. Sections of substandard improvements may have to be removed and replaced during the inspection process.

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.

END OF REMARKS

Ays/jwb

T/R/S: T19S/R60E/24

AREA G24

Project Site

GRADING PLANS AND DETAILS





1. ACTUS SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES IN THE PLANS OR CONDITIONS IN THE FIELD.
2. CONSTRUCTION OF BLOCK WALLS REQUIRES A SEPARATE BUILDING PERMIT AND APPROVAL BY THE BUILDING DEPARTMENT.
3. FOR ROADWAY WIDENING AND HALF STREET IMPROVEMENTS THE CONTRACTOR SHALL VERIFY CROSS SLOPES FROM EXISTING PAVED SURFACES TO THE PROPOSED GRADE 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.

GRADING CONSTRUCTION NOTES

- 1 CONSTRUCT "L" CURB AND GUTTER PER CCAUSD #216
- 2 CONSTRUCT "R" CURB AND GUTTER PER CCAUSD 217.3.S1
- 3 CONSTRUCT 5' WIDE SIDEWALK PER CCAUSD #234.
- 4 CONSTRUCT 8' CROSS GUTTER PER CCAUSD #228.
- 5 CONSTRUCT RESIDENTIAL DRIVEWAY PER CCAUSD #223, #223.1, AND DETAIL "5" ON SHEET C4
- 6 MATCH EX. ASPHALT, CURB, SIDEWALK, GUTTER, OR VALLEY GUTTER.
- 7 SIDEWALK RAMP PER CCAUSD #235 CASE 1 "A" & "B" = 8' UNLESS OTHERWISE NOTED.
- 8 CONSTRUCT PAD PER TYPICAL PAD SECTION DETAIL "1" ON SHEET C4
- 9 SAWCUT EXISTING A.C. PAVEMENT FOR PLAN
- 10 INSTALL 3.5" AC OVER 5" TYPE II AGGREGATE BASE
- 11 5" TRANSITION "L" CURB TO "R" CURB PER DETAIL "3" ON SHEET C4
- 12 INSTALL 2.5" AC OVER 4.5" TYPE II AGGREGATE BASE
- 13 CONSTRUCT HALF STREET CROSS GUTTER PER CCAUSD #229
- 14 ADJUST EXISTING UTILITY TO GRADE
- 15 EXISTING POWER POLE TO BE REMOVED. SEE NV ENERGY PLANS

SOILS NOTE

ALL GRADING SHALL CONFORM TO GEOTECHNICAL REPORT
BY: WRIGHT ENGINEERS
ORIGINAL PROJECT NUMBER: 171053
DATED: MAY 19, 2017

FLOOD ZONE DESCRIPTION:

THIS SITE IS LOCATED IN ZONE "X", AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN, PER THE FLOOD INSURANCE RATE MAP COMMUNITY PANEL 32003C 1765F AND 32003C 2583F CLARK COUNTY, NEVADA DATED NOVEMBER 16, 2011.

FLOOD DESIGNATION PROVIDED BY FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

BENCHMARK

CITY OF LAS VEGAS BENCHMARK STATION: 5LV90 24NEE6

RIVET AND PLATE IN THE TOP OF CURB AT THE SOUTHWEST CORNER OF DECATUR BOULEVARD AND DORRELL LANE.

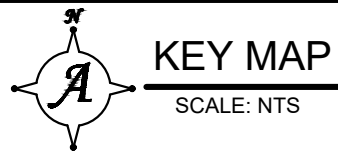
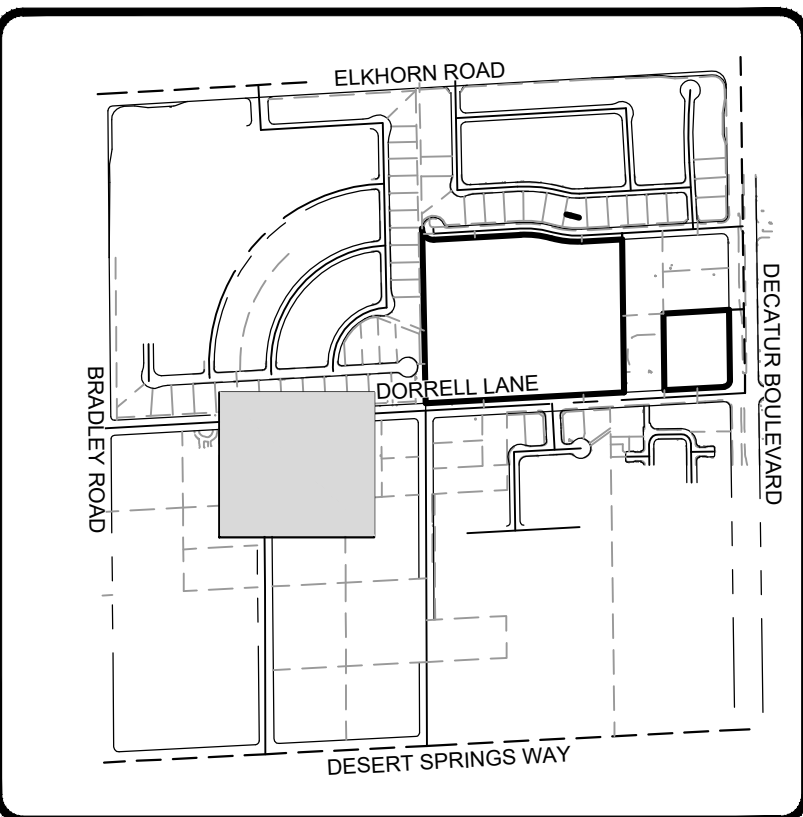
ELEVATION = 702.412 METERS (NAVD'88 2008 ADJUSTMENT)
ELEVATION = 2304.51 US SURVEY FEET (NAV'88 2008 ADJUSTMENT)

BASIS OF BEARING

NORTH 00°47'07" WEST, BEING THE BEARING OF EAST LINE OF THE NORTHEAST QUARTER (NE $\frac{1}{4}$) OF THE NORTHEAST QUARTER (NE $\frac{1}{4}$) OF SECTION 24, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS RECORDED IN FILE 106 OF SURVEYS AT PAGE 81, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

DISCLAIMER NOTE

THE UNDERGROUND UTILITIES AS SHOWN HEREON HAVE BEEN LOCATED FROM OBSERVED FIELD SURVEY EVIDENCE AND EXISTING DRAWINGS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING: PLANS PROVIDED BY THE CLIENT, UTILITY COMPANIES, AND MUNICIPAL AGENCIES. THE SURVEYOR MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OF OR ADJACENT TO THE PROJECT. THE SURVEYOR DOES NOT WARRANT THAT THE UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH THE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.



LEGEND

PROPOSED		EXISTING	
		- - - - -	PROPERTY LINE / ROW LINE
		- . - . -	EASEMENT LINE
		— — — — —	CENTER LINE
			EDGE OF ASPHALT
			CURB & GUTTER
			RETAINING WALL
			SAWCUT LINE
			FLOW LINE
			GRADE BREAK
		(---)(2500)---	MAJOR 5' CONTOUR
		(---)(2501)---	MINOR 1' CONTOUR
			SCARP (3:1 MAX)
			CONCRETE SIDEWALK/ VALLEY GUTTER
			PROPOSED ASPHALT
			REMOVE AND REPLACE ASPHALT
			PHASE LINE
			CUT / FILL LINE
			FUTURE GRADE TAG
			EXISTING GRADE TAG
			PROPOSED GRADE TAG
FF			FINISHED FLOOR
TC			TOP OF CURB
AC			TOP OF PAVEMENT
FL			FLOW LINE GRADE
EP			EDGE OF PAVEMENT
TB			TOP OF BERM
TW			TOP OF RETAINING WALL
TF			TOP OF WALL FOOTING
 1.00%			GRADE SLOPE
			SECTION MARKER-DETAIL NUMBER ABOVE SHEET NUMBER

ESTIMATED QUANTITIES

NOTE: QUANTITIES SHOWN ARE RAW QUANTITIES AND APPROXIMATE.
CONTRACTOR TO DETERMINE HIS OWN QUANTITIES FOR GRADING
PURPOSES.

WORK UNDER THIS PLAN CONSTITUTES GRADING IN ACCORDANCE WITH 2009 IBC; ENGINEERING REPORTS AND CERTIFICATIONS IN CONFORMANCE WITH IBC SHALL BE FILED WITH THE COUNTY PRIOR TO COUNTY APPROVAL AT FINAL INSPECTION.

CUT: 1,777 CY
FILL: 2,166 CY
NET: 389 CY (FILL)

SIGHT VISIBILITY RESTRICTION ZONES

SIGHT VISIBILITY ZONE NOTE

NO WALLS, FENCES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES, FIRE HYDRANTS, TREES, AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM TOP OF CURB, OR WHERE NO CURB EXISTS, A HEIGHT OF 27 INCHES MEASURED FROM THE TOP OF ADJACENT ASPHALT, GRAVEL OR PAVEMENT STREET SURFACE, THIS RESTRICTION EXTENDS ALONG THE SIGHT VISIBILITY LINE THROUGH LANDSCAPED MEDIANS.

REFER TO TRAFFIC SHEETS C15 & C16 FOR SIGHT VISIBILITY
ZONE DIMENSIONS.

PRIVATE STREET NOTE:

ALL PRIVATE STREETS ARE P.U.E., PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY THE HOA.

ENGINEER'S CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE
APPROVED UPDATED DRAINAGE STUDY ON FILE WITH THE CITY OF
LAS VEGAS FOR CLV# 640226

DARRYL LATTIMORE, P.E.

DATE _____



3203 E. Warm Springs Rd., Suite 400
Las Vegas, NV 89120
www.Actus-NV.com
(702) 586-9296

Engineering - Surveying - Consulting - Planning

GRADING PLAN
DECATUR & DONALD III
BEAZER HOMES
CITY OF LAS VEGAS, NEVADA

[illegible]

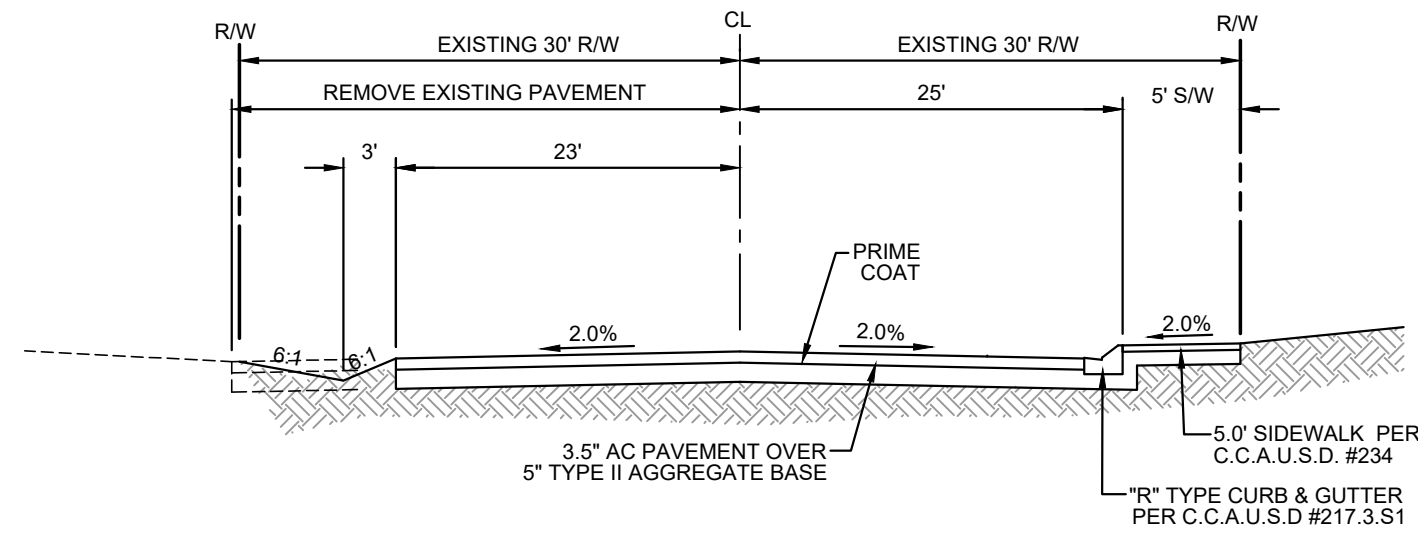
3/5/2018

DATE	03-01-2018
DRAWN	BP
DESIGNED	BP
CHECKED	DCL
PROJECT #	BZR011801
SHEET TITLE	
GRADING PLAN	
SHEET NUMBER	

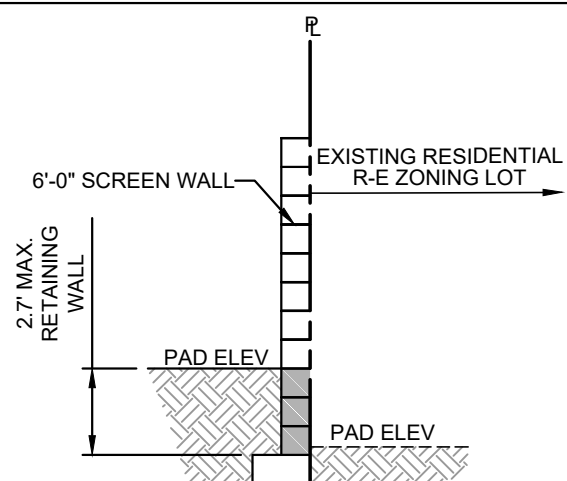
C3

Plot Stamp: 3/5/2018 8:03:39 AM - Darryl Lattimore
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Plot Stamp: 3/5/2018 8:04:04 AM - Darryl Lattimore
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A UNICORN STREET SECTION
NOT TO SCALE

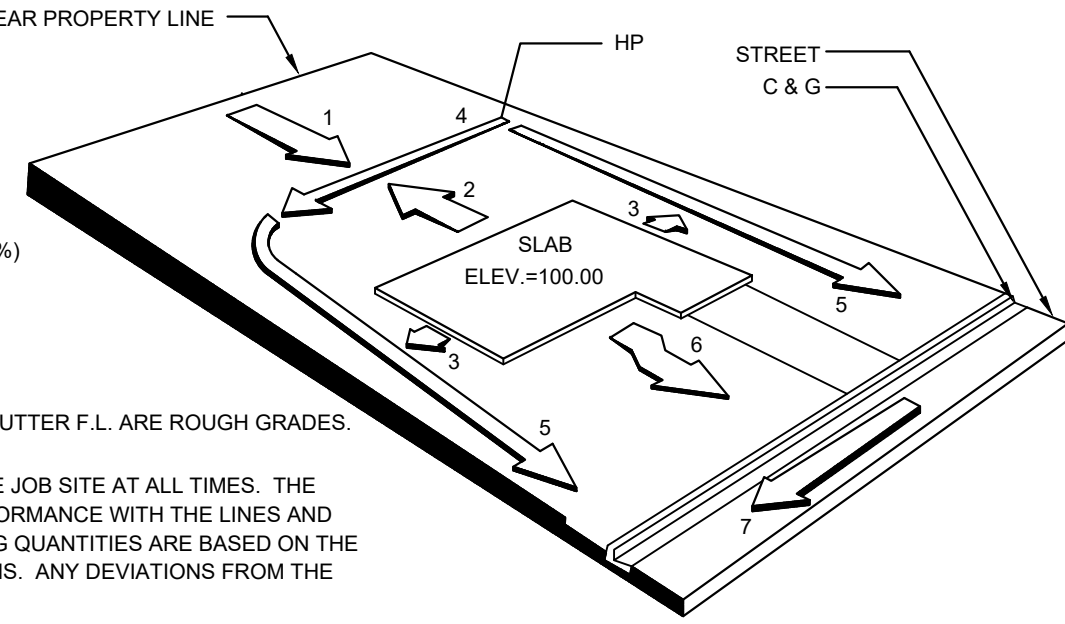


G SOUTH PROPERTY LINE SECTION
NOT TO SCALE

WALL NOTES

1. WALL DETAILS ARE FOR REFERENCE ONLY AND DO NOT CONSTITUTE A STRUCTURAL DESIGN.
2. CONSTRUCTION OF BLOCK WALLS REQUIRE A SEPARATE BUILDING PERMIT AND APPROVAL BY THE BUILDING DEPARTMENT.
3. ALL PERIMETER WALLS TO BE CONSTRUCTED WITH DECORATIVE BLOCK FACING THE PUBLIC R.O.W.

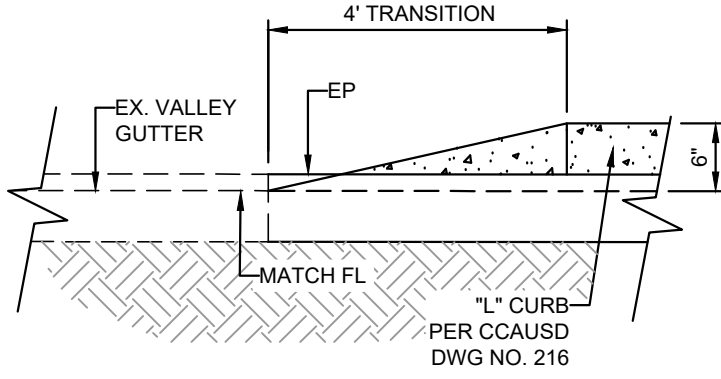
1. SLOPE FROM REAR TO SWALE
2. SLOPE FROM HOUSE TO SWALE (MIN. 5%)
3. SLOPE FROM HOUSE TO SIDE SWALE (MIN. 5%)
4. REAR SWALE (5' MIN. FROM REAR OF HOUSE)
5. SIDE SWALE
6. SLOPE FROM HOUSE TO BACK OF CURB (MIN. 2%)
7. SLOPE OF STREET



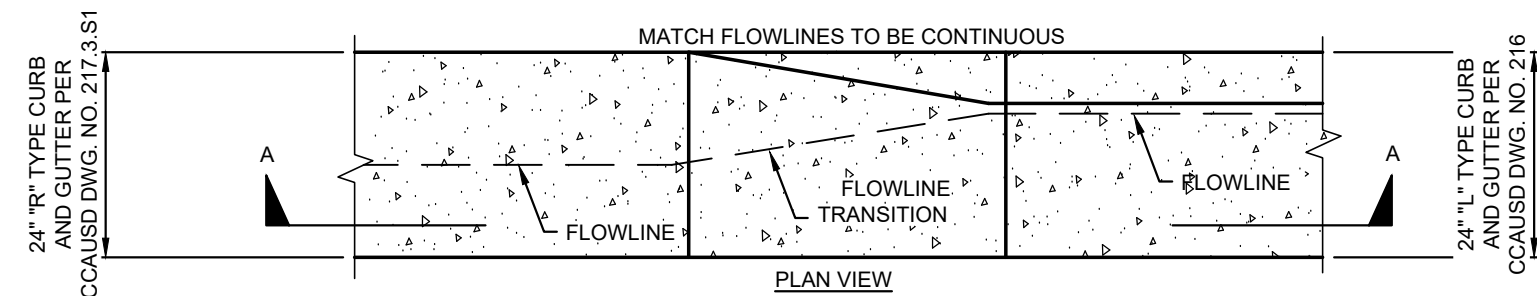
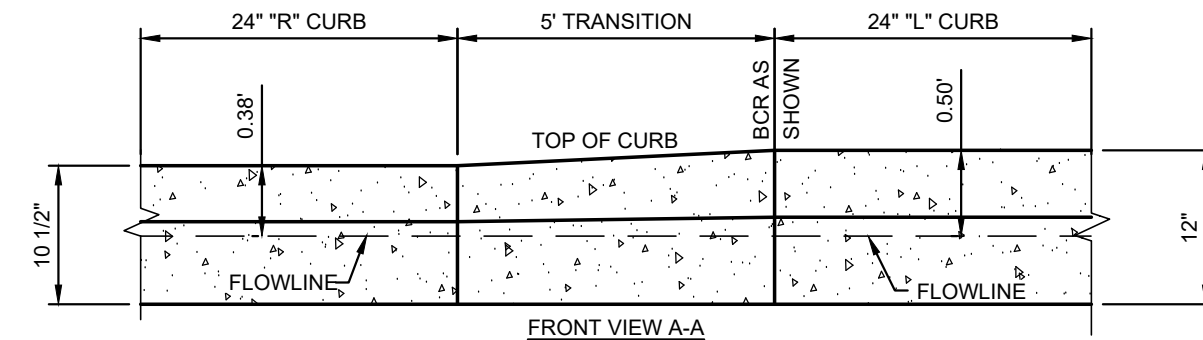
PERSPECTIVE VIEW

- A. INDICATED GRADES OTHER THAN T.C., F.G. & GUTTER F.L. ARE ROUGH GRADES. (0.3' LOWER THAN FINISHED GRADE).
- B. THE ROUGH GRADING PLANS SHALL BE ON THE JOB SITE AT ALL TIMES. THE ROUGH GRADING SHALL BE FINISHED IN CONFORMANCE WITH THE LINES AND GRADES SHOWN ON THE PLANS. THE GRADING QUANTITIES ARE BASED ON THE ELEVATION AND DETAILS SHOWN ON THE PLANS. ANY DEVIATIONS FROM THE PLANS WILL RESULT IN QUANTITY CHANGES.
- C. CARE SHALL BE EXERCISED IN GRADING CORNER LOTS.
- D. ROUGH PAD ELEVATIONS SHALL BE GRADED TO WITHIN 0.3' OF THE PAD ELEVATIONS SHOWN ON THE PLANS.

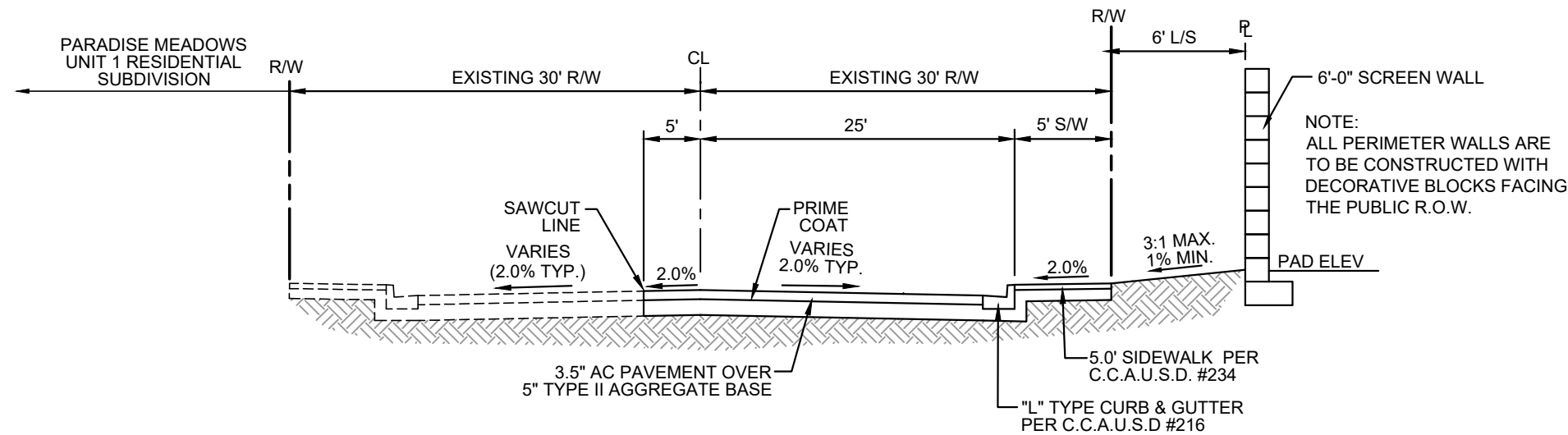
1 TYPE "A" PAD GRADING DETAIL TYP.
NOT TO SCALE



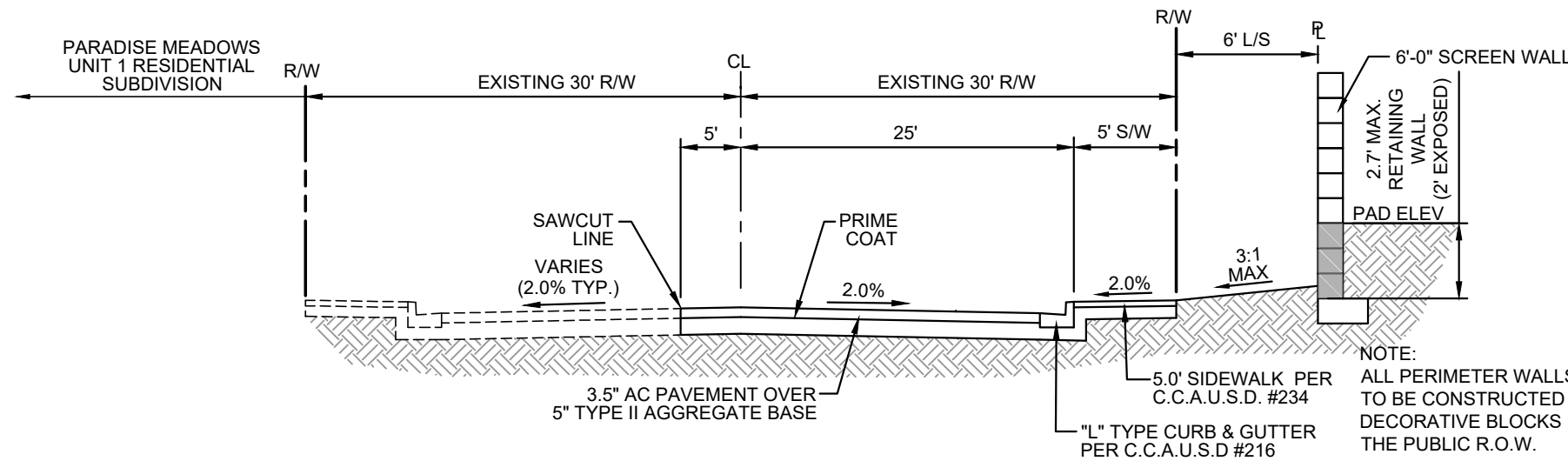
2 "L" CURB TO VALLEY GUTTER TRANSITION DETAIL
NOT TO SCALE



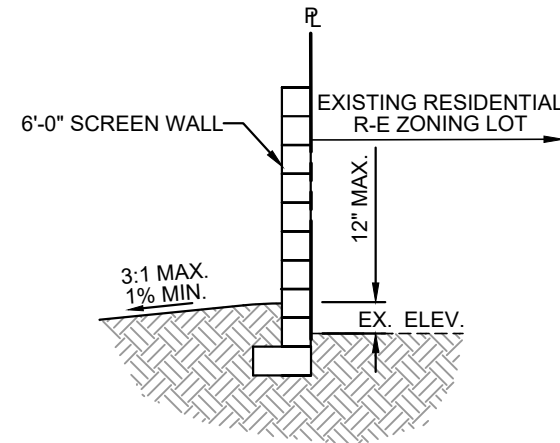
3 5' "L" CURB TO "R" CURB TRANSITION
NOT TO SCALE



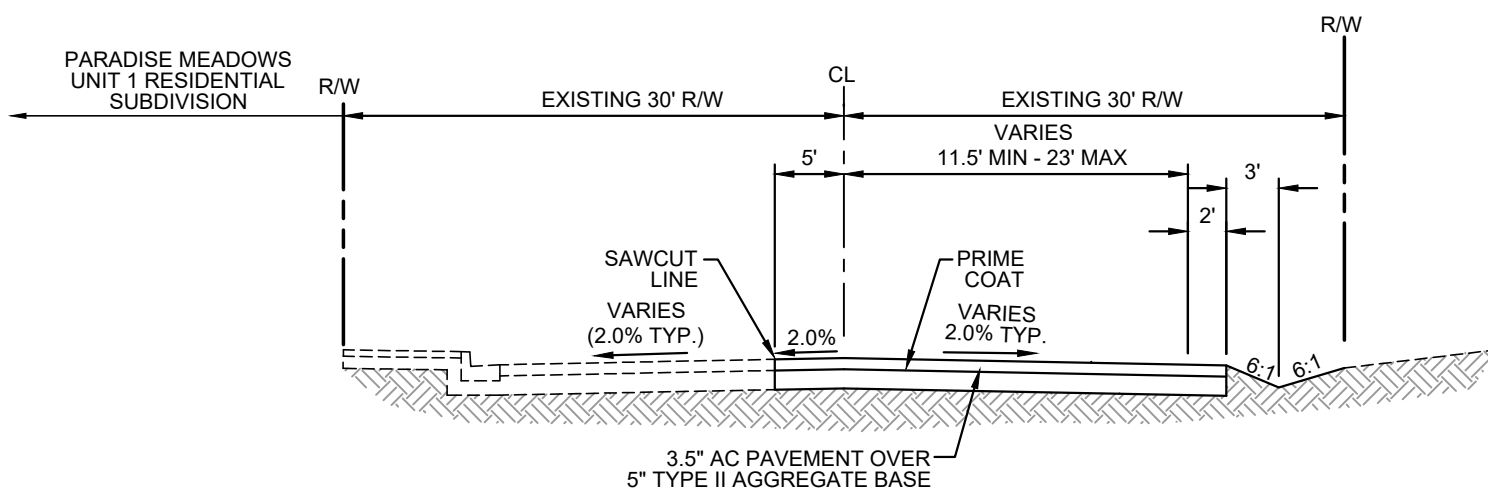
B DORRELL LANE SECTION
NOT TO SCALE



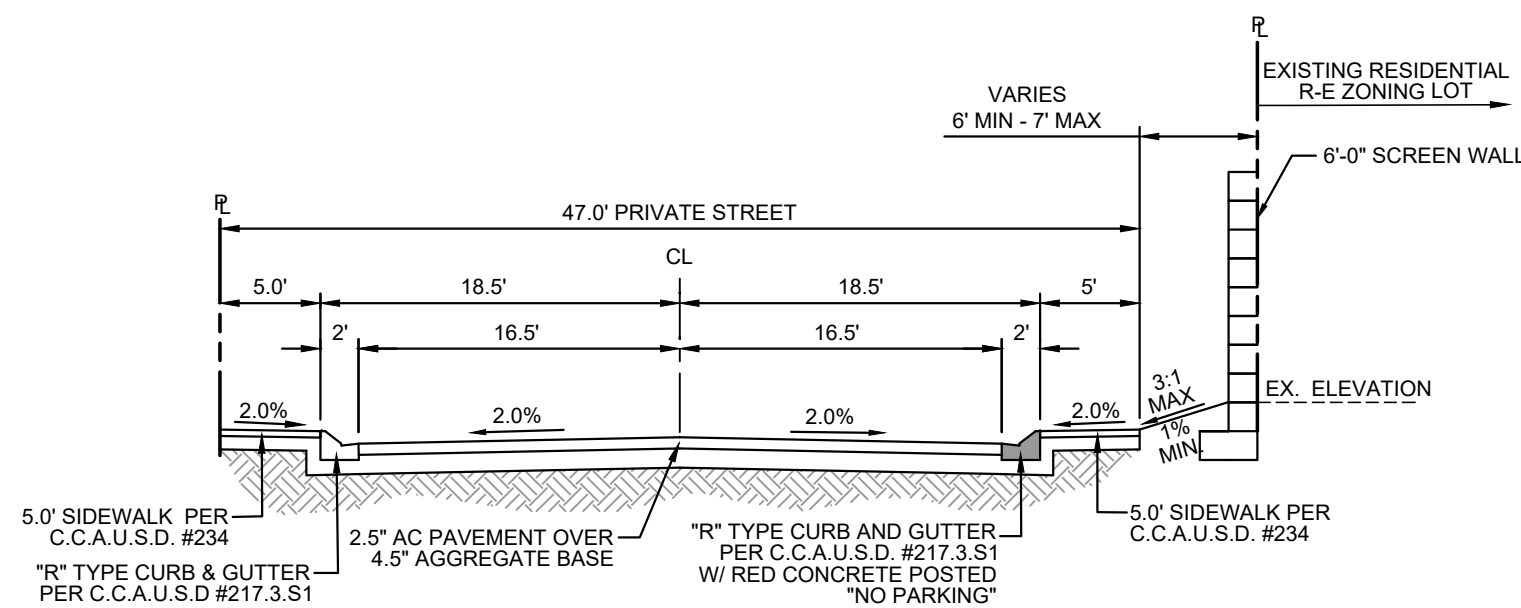
H DORRELL LANE SECTION
NOT TO SCALE



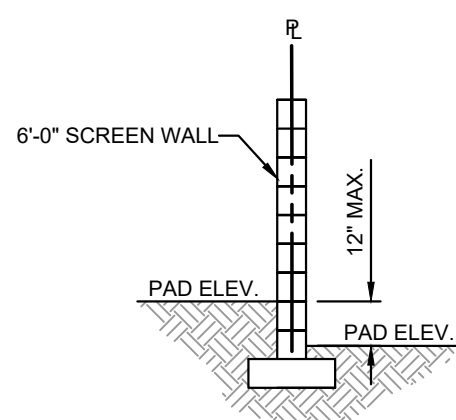
I EASTERN PROPERTY LINE SECTION
NOT TO SCALE



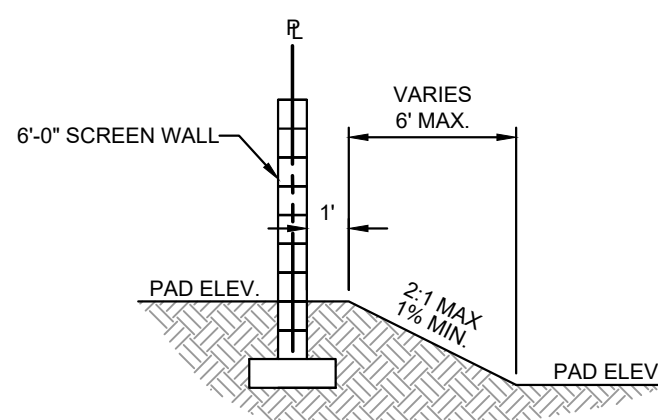
C DORRELL LANE SECTION
NOT TO SCALE



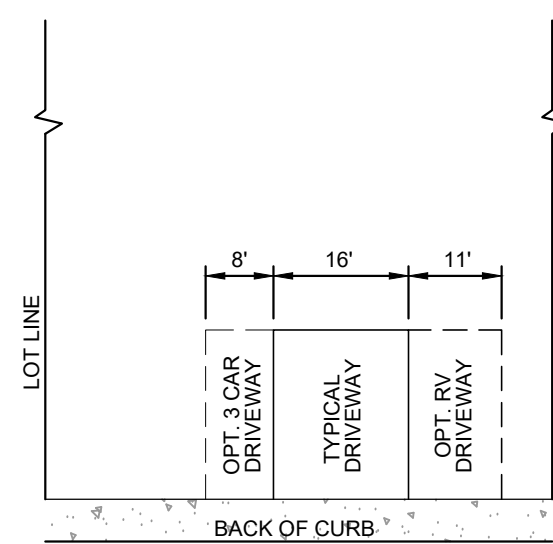
D 47' (PRIVATE) STREET SECTION
NOT TO SCALE



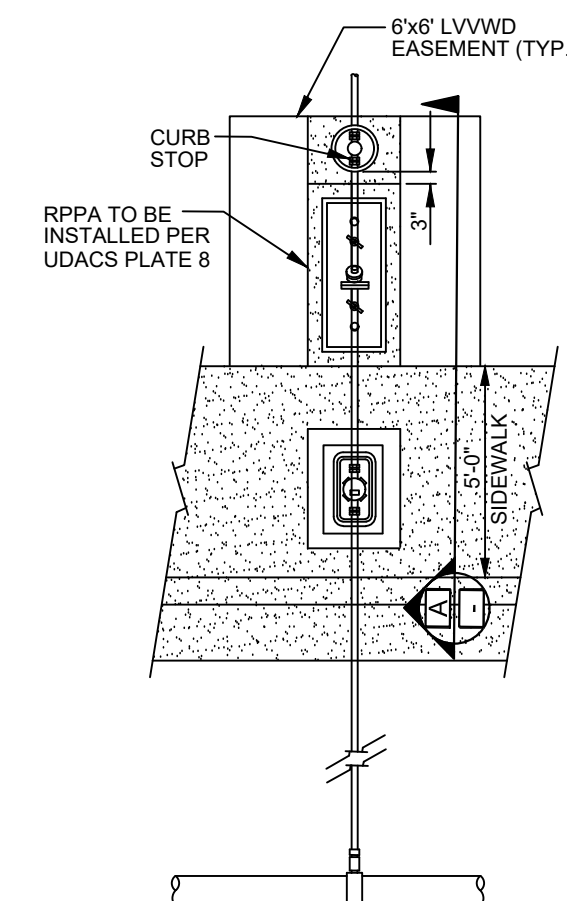
E LOT LINE SECTION
NOT TO SCALE



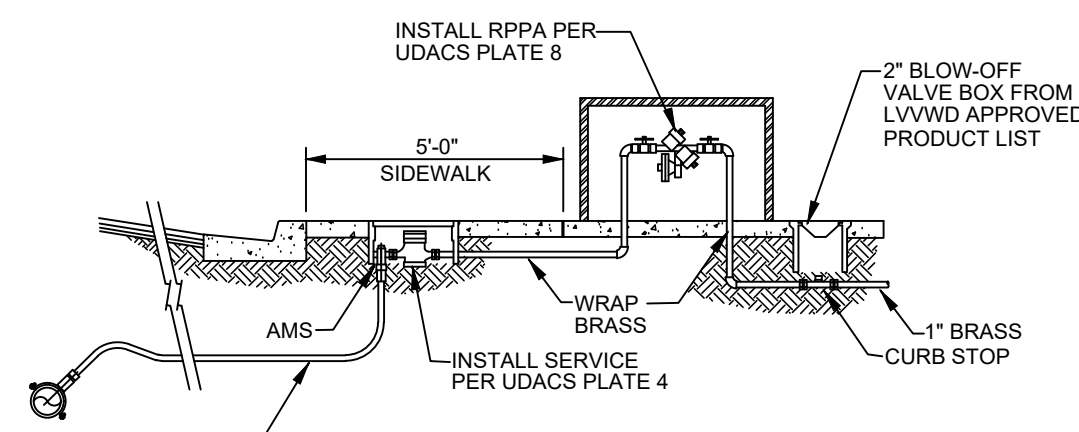
F LOT LINE SECTION
NOT TO SCALE



5 TYP. DRIVEWAY DETAIL
NOT TO SCALE



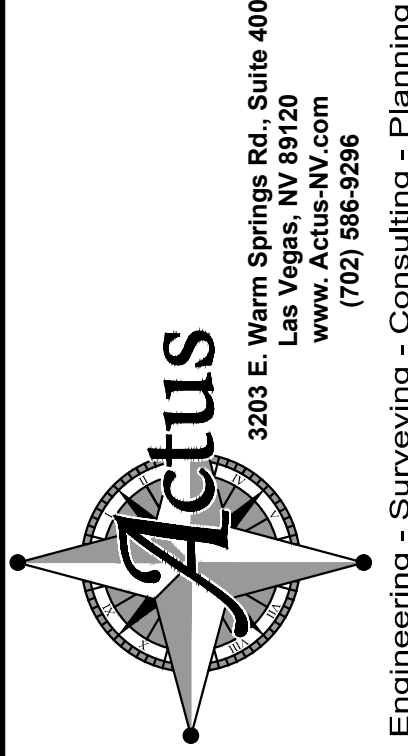
4 METER WITH RPPA PER UDACS PLATE #4 AND #8 AND CURB STOP
NOT TO SCALE



A SECTION
NOT TO SCALE

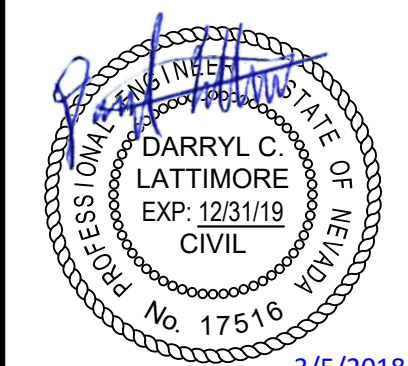
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. XXXXXX FIRST APPROVED DATE:
LVVWD APPROVED FIRE FLOW 1500 GPM AT 20 PSI RESIDUAL



DETAILS AND SECTIONS
DECATUR & DONALD III
BEAZER HOMES
CITY OF LAS VEGAS, NEVADA

BY	DATE	DESCRIPTION



DATE	03-01-2018
DRAWN	BP
DESIGNED	BP
CHECKED	DCL
PROJECT #	B2R011801
SHEET TITLE	DETAILS AND SECTIONS
SHEET NUMBER	

C4