GCW

ENGINEERS \ SURVEYORS

MASTER DRAINAGE STUDY FOR

SUMMERLIN WEST VILLAGE 29

62029-300

January 2021

Prepared for:
The Howard Hughes Company, LLC
10845 Griffith Peak Drive, Suite 160
Las Vegas, NV 89135
Phone: (702) 791-4300

Prepared by GCW, Inc.

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HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: SUMMERLIN WEST VILLAGE 29 MASTER DRAINAGE STUDY Date: January 2021

Location of Development: a) Descriptive (Cross Streets) North/South: Grand Park Blvd

East/West: Far Hills Ave

b) Section: 21, 22, 27, 28 Township: 20 Range: 59

c) APN : 137-28-601-001, 137-27-101-004, 137-21-801-004

Name of Owner: The Howard Hughes Company, LLC

Telephone No.: (702) 791-4201 Fax No.: (702)-791-4385 E-Mail Address: April.Chapman@howardhughes.com

Address: 10845 Griffith Peak Drive, Suite 160, Las Vegas, NV 89135

Contact Person-Name: Mohammad Masih Edalat **Telephone No.:** (702) 804-2127

* **E-Mail Address:** Medalat@gcwengineering.com **Fax No.:** (702) 804-2299

Firm: GCW, Inc.

Address: 1555 South Rainbow Blvd, Las Vegas, Nevada 89146

Type of Land Development/Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map	X	Planned Unit Development		Other (Please specify below)
	Large Parcel Map		Building Permit		

1. Total Owned Land Area: At Site: +/- 323 Acres Being Developed/Disturbed: +/- 323 Acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☒ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ **Yes**** ☐ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Mixed-use Master Plan
5. Approximate upstream land area which drains to the subject site: +/- 3000 Acres
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: Summerlin West Planning Area Master Plan Update
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing SD Facility at Sky Vista and Far Hills, Summerlin Detention Basin #5, and Existing SD Facility on Sky Vista
8. Briefly describe your proposed schedule for the subject project: After Master Drianage Study approval, technical drainage studies to follow to address master developer infrastructure improvements including drianage facilities conceptually addressed in this MDS.

Engineer's Seal **01/13/2021**

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.**

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: SUMMERLIN WEST VILLAGE 29 MASTER DRAINAGE STUDY	Map ID: 137-28-601-001, 137-27-101-004, 137-21-801-004
Firm Name: GCW, Inc.	Engineer: Mohammad Masih Edalat
Address: 1555 S. Rainbow Blvd	
City: Las Vegas	State: Nevada Zip: 89146
Phone Number: (702) 804-2127	Fax Number: (702) 804-2299
Property Owner: The Howard Hughes Company, LLC	
Address: 10845 Griffith Peak Drive, Suite 160	
City: Las Vegas	State: Nevada Zip: 89135

Reviewed By:	Date Received:	Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT

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

II. MAPS AND EXHIBITS

Yes	No	
X		A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
X		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**

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

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

III. DRAINAGE PLAN

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

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
_____	N/A	Streets with off-set crowns.
_____	N/A	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
_____	N/A	Property lines.
_____	N/A	Right-of-way lines and widths, existing and proposed.
_____	N/A	Existing improvements and their elevations.
_____	N/A	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
_____	N/A	Concentration points and drainage flow direction with Q100 and V100 and D100 in streets.
_____	N/A	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
_____	N/A	Location and cross-section of street capacity calculations.
_____	N/A	Cross-sectional detail for channels, including cutoff wall locations.
_____	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.
_____	N/A	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
_____	N/A	Building and/or lot numbers.
_____	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**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
_____	NA	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 Q100 flows.
_____	N/A	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.
_____	N/A	Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models. (Ref. Material Provided)
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, Q10 and Q100 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**

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
_____	N/A	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
_____	N/A	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q100 and Q10 flows representing the worst case for interior and all perimeter streets. Q100 d x v < 8. Q10 d x v < 6 and 12 foot dry lane for rights-of-way > 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
_____	N/A	A summary table of interior and exterior street capacity calculations showing the street name, Q100 flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
_____	N/A	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
_____	N/A	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
_____	N/A	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 Q100 weir height or flow depth, whichever is greater.
X	_____	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
_____	N/A	Provide a 50 percent clogging factor in the capacity calculation for drop inlets. (conceptual analysis only, not intended for construction)
_____	N/A	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation. (conceptual analysis only, not intended for construction)
X	_____	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
_____	N/A	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

I. GENERAL REQUIREMENT		
Yes	No	
	NA	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.)
	NA	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	
	N/A	(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
	N/A	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.
	N/A	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.)

II. GRADING PLAN INFORMATION		
Yes	No	
	N/A	Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
	N/A	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.
	N/A	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.
	N/A	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.
	N/A	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
	N/A	Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

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

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.

62029-300

January 13, 2021

Albert Y. Sung, P.E.
City of Las Vegas, Public Works
333 N. Rancho Drive, 7th Floor, Las Vegas, NV 89106

Re: Master Drainage Study for Summerlin West Village 29

Dear Mr. Sung,

This letter is to certify that all documents provided on electronic submittal (CD) match the hardcopy version of the study.

Respectfully submitted,

Masih Edalat, PhD, P.E.
Project Engineer

01/13/21

1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
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MASTER DRAINAGE STUDY
FOR
SUMMERLIN WEST VILLAGE 29

62029-300

January 2021

Authored by:

Masih Edalat, PhD, PE

Prepared by:

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1555 S. Rainbow Boulevard
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I. INTRODUCTION

Summerlin West Village 29 is a ±323-acre area in the Summerlin West Planning Area (SWPA) that is located north and south of Far Hills Avenue, and west of Sky Vista Drive. The Master Conceptual Drainage Study for Summerlin Village 29 (hereafter referred to as the project) provides an ultimate condition drainage pattern for Village 29 and recommends storm drain facilities to convey flow through the site on a conceptual level. This study is designed to serve as a drainage framework for future technical drainage studies for roads and individual parcels within Village 29 that is compatible with SWPA Master Plan Update.

The purpose of this report is to provide a detailed hydrology and to conceptually recommend storm drain facilities to convey runoff in accordance with the Clark County Regional Flood Control District (CCRFCD) HCDDM Manual (Reference 1, hereafter referred to as the HCDDM) and local drainage criteria. The following tasks were performed in the preparation of this study:

- Determine the FEMA floodplain designation for the project site.
- Identify any CCRFCD regional facilities adjacent to or affected by the project.
- Calculate runoff generated for the peak 100-year return period storm for the ultimate condition build-out of the village.
- Recommend a conceptual drainage facility schematic and preliminary sizes necessary for planning the technical design of improvements in the village.
- Review pertinent approved drainage studies in the area for evaluation of drainage impacts affecting the project.

II. LOCATION AND DESCRIPTION OF IMPROVEMENTS

Summerlin West Village 29 is located within Sections 21, 22, 27, and 28, Township 20 South, Range 59 East on APNs 137-28-601-001, 137-27-101-004, and 137-21-801-004 within the jurisdictional limits of the City of Las Vegas (CLV). Please refer to Figure 1 in Appendix D for the location of the project.

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

Figure 2 in Appendix D shows the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) containing Community Panels 32003C2150E and 32003C2125E, both dated September 27, 2002. The project site lies within a Zone X. Areas designated as Zone X are described as being outside the 500-year floodplain. Therefore, this project is not located in a FEMA designated Special Flood Hazard Area (SFHA).

IV. CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) HYDROLOGY AND FACILITIES

Figures 3 and 4, included in Appendix D, show subbasins and CCRFCD facilities based on the 2018 Las Vegas Valley Master Plan Update, respectively (Reference 2, hereafter referred to as the 2018 MPU). Table 1 summarizes CCRFCD facilities inside or adjacent to the project site.

For the Summerlin West area, the 2018 MPU has been superseded by the Flood Control Master Plan Update – Summerlin West Planning Area (SWPA) (hereafter referred to as the SWPA Study). The SWPA Study is a flood control master plan update that restudied the hydrologic patterns of the Summerlin West area according to a revised land use plan and reconfiguration of the overall conceptual storm drain layout. In the SWPA study, the CCRFCD facilities have been updated based on the current Summerlin West Land Plan. Pertinent reference material has been included in Appendix C. In Table 1, regional facility alignments have been compared for reference purposes between the 2018 MPU, the SWPA Study, and the Village 29 MDS (this study).

Table 1 - CCRFCD Facilities

Facility ID	2018 MPU		SWPA		Village 29 MDS	
	Facility Description	Q_{100} (cfs)	Facility Description	Q_{100} (cfs) (CP/Basin)	Facility Description	Q_{100} (cfs) (CP)
APFH0089	EX 8' X 6' RCB	839	EX 8' X 6' RCB	677 (CP3.8)	EX 8' X 6' RCB	785 (CP1)
APFH0144	PRO 5' X 4' RCB	456	-	-	-	-
APM50008	PRO CONC CHNL 50'W 4.5'D 2:1 S	3,634	-	-	Channel with Natural Bottom and Riprap Bank Protection[1]	4,590 (Revised CP3.5C)
APM50047	EX DIVERSION BERM WITH GABION BANK PROTECTION	3,634	-	-	Channel with Natural Bottom and Riprap Bank Protection[1]	4,590 (Revised CP3.5C)
APM50056	PRO CONC CHNL 80'W 4'D 2:1 SS	3,634	-	-	-	-
APM5000	EX 384 AC-FT DETENTION BASIN #5	6,856	Detention Basin	7,649 (CPDB5)	-	-
SD-I (SWPA) Facility ID 30 to 33 (V29 MDS)	-	-	6'X6' RCB	583 (3-F)	10'X7' RCB[1]	770 (V30B CP1)
SD-L (SWPA) Facility ID 41, 49, 64, 65 & 66 (V29 MDS)	-	-	6'X6' RCB	432 (3-G2)	EX 6'X6' RCB	350
Facility ID 56 (V29 MDS)	-	-	-	4,599 (CP3.5B)	(5) 18'X9' RCB[1]	4,615 (Revised CP3.5B)
Facility ID 58 (V29 MDS)	-	-	-	4,565 (CP3.5C)	(5) 18'X9' RCB[1]	4,615 (Revised CP3.5B)

[1] To be constructed by Village 29 MDS.

Meetings between CLV, GCW and HHC were held on August 20, 2019 and December 21, 2020 to discuss the concept of the proposed regional channel facility in the APM5-0008 and APM5-0047 MPU alignments, and a future MPU Amendment to cover changes of regional facilities within Village 29. Summary notes for this meeting have been included in Appendix B.

V. REFERENCED STUDIES

In preparation of this study, the following approved drainage studies and improvement plans were referenced to complete hydrologic and hydraulic analyses. These studies have been reviewed and have been accepted as suitable for reference material. A brief synopsis of the pertinence of each of the referenced items is as follows:

- *Flood Control Master Plan Update – Summerlin West Planning Area* (the SWPA Study) provides the master planned ultimate drainage condition for Summerlin West Planning Area (Reference 3). Village 29 is a portion of Summerlin West Planning Area.
- *Update #1 to the Master Conceptual Drainage Study for Summerlin West Village 25* (Reference 4, hereinafter referred to as the Village 25 MDS) provides drainage pattern and facilities for Village 25 adjacent to Village 29. Note that some Village 25 storm drain facilities were planned to accept runoff from Village 29, and this Master Drainage Study shows discharge from Village 29 into Village 25 facilities. Specific Village 25 projects that constructed facilities to accept Village 29 runoff have been excerpted and included as reference material to show comparison of proposed versus design flows after build-out is complete in Village 29.
- *Technical Drainage Study for Village 24A Detention Basin Modifications,* AKA Summerlin Detention Basin 5 Modifications (Reference 5, hereinafter referred to as the DB5 Study) provided design flow rates for Detention Basin 5. From Village 29, Subbasins V29 L, V29 J, V29 COS-2, V29 COS-3, and V29 COS-4 (shown in orange on Figure 9) drain into Facility ID 60 (DB5 inlet structure #6), and Subbasins V29 M, V29 N, V29 COS-14, V29 GP5, and V29 O (shown in blue) drain into Facility ID 61 (DB5 inlet structure #5).
- *Technical Drainage Study for Village 23B Sky Vista Drive* (Reference 6, hereinafter referred to as the V23B Sky Vista Drive Study) provided storm drain facilities and drainage information on Sky Vista Drive south of the Far Hills Avenue intersection. From Village 29, Subbasins V29 K, V29 STA2, and V29 COS-5 drain into Sky Vista, south of the Far Hills intersection. These subbasins are shown in purple on Figure 9 of this study.
- *Technical Drainage Study for Summerlin Village 25 Sky Vista Drive Improvement Phase I* (Reference 7, hereinafter referred to as the V25 Sky Vista Drive Study) provided storm drain facilities and drainage information on Sky Vista Drive north of the Far Hills Avenue intersection. From Village 29, Subbasins V29 A, V29 B, V29 COS-6, V29 GP1, V29 COS-7, V29 STG1, V29 STG2, and V29 COS-1 drain into Sky Vista, north of Far Hills intersection. These subbasins are shown in yellow on Figure 9.
- *Improvement Plans for Sandstone Rise Drive (Street M)* (Reference 8, hereinafter referred to as the Sandstone Rise Study) provided storm drain information for the existing facility in Sandstone Rise Drive that is adjacent to Village 29.
- *Technical Drainage Study for Summerlin West Detention Basin 5 Temporary Diversion Berm* (Reference 9, hereinafter referred to as the Diversion Berm Study) provided detailed information for the existing diversion berm (Facility ID 74). Note that the existing berm is proposed to be replaced with a natural bottom channel and riprap bank protection.
- *Improvement Plans for Village 23B Far Hills Avenue RCB Improvements* (Reference 10, hereinafter referred to as the Far Hills RCB Study) provided detailed information regarding existing storm drain at the intersection of Far Hills and Sky Vista. From Village 29, V29 CP12 drains from the west, and V29 H drains

from the south into the existing 8'X6' RCB at Far Hills. These subbasins are shown in green on Figure 9.

VI. HYDROLOGY

An ultimate condition hydrologic analysis has been performed for this study. The methodology presented in this study is in compliance with the HCDDM. Refer to Appendix A for hydrologic information. Note that in order to estimate proper flow rates in V29 COS-2, 3, and 4 (CP3.5B and CP3.5C in SWPA), the SWPA Study HEC-1 model is revised to match Village 29 flow pattern. Note that Subbasins 3-E and 3-F are replaced with concentration points 3-E and 3-F, respectively, to represent same drainage areas in more details per this study analysis. The revised HEC-1 model is provided in Appendix A.

Model Description: The Village 29 watersheds were modelled with the SCS Unit Hydrograph method using the Hydrologic Modeling System (HEC-HMS) version 4.3 created by the Army Corps of Engineers. The HEC-HMS model is included in the CD.

Drainage Areas and Flow Patterns: The onsite and offsite drainage patterns have been determined based on the SWPA Study subbasins.

Precipitation – The tributary drainage areas are located outside of the McCarran Rainfall Area as identified in the Manual; therefore, rainfall depths for the offsite drainage subbasins have been determined using the 2018 MPU Rainfall shapefile. Refer to Figures 6 and 7, located in Appendix D, for the 100-year and 10-year Rainfall Maps, respectively. All the drainage basins are less than 8 square miles; therefore, an SDN 3 design storm has been selected for use in the HEC-HMS model.

Note that for the revised SWPA HEC-1 model, same Depth-Area Reduction Factors (DARFs) are used to be consistent with the SWPA Study. Refer to Appendix A for more information.

Soils: Soil survey data has been obtained from the 2018 MPU for the project and the offsite drainage areas. Table 2 below contains a summary of the soil types identified in the hydrologic watershed. Figure 5, located in Appendix D, shows the project site and the respective soil conditions.

Table 2 – Village 29 Soils Summary in Watershed

Soil Type[1]	% HSG 'A'	% HSG 'B'	% HSG 'C'	% HSG 'D'	% Rock
1156	1	10	0	89	0
1502	60	0	0	40	0
1731	10	2	0	88	0

1 – Soil Types obtained from 2018 CCRFCD MPU.

Curve Numbers (CN) – Table 3 contains a summary of the master plan land use designations for both onsite and offsite drainage areas for Village 29. Based on the land uses summarized below, the appropriate land covers have been selected from Table 602 in the Manual. According to the soils conditions summarized in Table 2 and land cover information summarized in Table 3, weighted curve numbers have been calculated for all the subbasins.

Note that the 2018 MPU land use categories are not used for this study because Village 29 is a portion of Summerlin West Planning Area, and in the SWPA Study, Table 602 in the HCDDM is used to derive Curve Numbers. Therefore, same method is used for Village 29 hydrological calculations. Based on the maximum density, a realistic typical lot size was determined accounting for zoning restrictions, internal street layout, and open space requirements zoning. The typical lot size was used to correspond to Table 602 curve number values.

Additionally, for comparison purposes, the maximum land use density corresponded to the applicable land use index from the 2018 MPU. The comparison shows that the methodology of selecting the curve numbers from Table 602 of the HCDDM Manual will likely lead to more conservative results for storm drain planning due to the impervious percentage being higher in the HCDDM. As a result, selected land cover type generates more runoff compared to the corresponding 2018 MPU land cover categories. The corresponding 2018 MPU Land Use Index is provided for each land use designation in Table 3.

Table 3 - Summerlin West Village 29 Land Use Tabulation

Land Use Designation	Maximum Density (Units/Acres)	HCDDM Table 602 - Land Cover Description (Impervious %)	2018 MPU Land Use Index (Impervious %)
SF1	3.5	8,000 SQ FT LOTS (58)	5 (30)
SF2	6	<6,000 SQ FT LOTS (COMMERCIAL AND BUSINESS) (85)	6 (52)
SF3	10	<6,000 SQ FT LOTS (COMMERCIAL AND BUSINESS) (85)	7 (72)
MF2 (R)	21	<6,000 SQ FT LOTS (COMMERCIAL AND BUSINESS) (85)	8 (80)
MF3 (R)	40	<6,000 SQ FT LOTS (COMMERCIAL AND BUSINESS) (85)	8 (80)
SFSD	18	<6,000 SQ FT LOTS (COMMERCIAL AND BUSINESS) (85)	8 (80)
VC(R-C)	-	COMMERCIAL AND BUSINESS (85)	9 (85)
VC(RR-MU)	40	COMMERCIAL AND BUSINESS (85)	9 (85)
COS	-	OPEN SPACE (POOR CONDITION) (0)	1 (0)
COS (W)	-	OPEN SPACE (POOR CONDITION) (0)	1 (0)
DC	-	INDUSTRIAL (72)	10 (72)
NF	-	COMMERCIAL AND BUSINESS (85)	9 (85)
ST	-	IMPERVIOUS AREAS (100)	7 (72)

VII. EXISTING DRAINAGE CONDITION

An existing condition hydrologic model has not been included as part of this study. Provided referenced studies cover existing condition hydrology for the project site. In the existing condition, the majority of the Village 29 area is draining toward Sky Vista Drive, and flows are collected by existing ditches and storm drain facilities. The remaining area including V29 M, V29 L, V29 N and V29 O is draining to Detention Basin 5. Refer to

Appendix C, FIG5 from the V25 Sky Vista Study, FIG5 from the V23B Sky Vista Study, and FIG7 from the DB5 Study.

VIII. ULTIMATE DRAINAGE CONDITION

The ultimate condition is defined as the Summerlin West Planning Area, including the Village 29 area developed. The onsite and offsite drainage patterns have been determined to match drainage patterns as closely as possible with the SWPA Study. Village 29 lies within basins 3-G2, 3-L2, 3-L, 3-N1, and WOUS-4B. Refer to Appendix C for the referenced SWPA Study Basin Map.

Refer to Figure 8 in Appendix D for the Ultimate Condition Drainage Map. The subbasins are named based on their village and their parcel ID. For example, a subbasin that refers to Parcel M in Village 29 is named V29 M. This rule is applied for offsite subbasins as well (e.g., V25 J).

Note that internal to the SWPA basins identified above, the layout of the parcels within Village 29 have been planned differently since the SWPA Study was approved; however, the drainage flow pattern for each parcel has been planned to be fairly consistent with the SWPA study, based on available existing storm drain facilities and allowable flows dictated by the referenced drainage studies summarized in Section V of this study, with a few exceptions. Further detail of these few exceptions that do not follow the SWPA Study has been provided below.

- The SWPA Study shows the total 100-year storm runoff at the intersection of Sky Vista and Far Hills (CP3.8) is 677 cfs. In this study, the runoff at the same location is calculated as 785 cfs (CP1). However, in the V25 Sky Vista Drive Study it has been shown that the existing storm drain facility is working for 807 cfs. Note that the revised WSPG model (representing Village 29 flow rates) for existing storm drain facilities on Sky Vista and Far Hills is provided in Appendix B. Additionally, the existing 8'X6' RCB was initially designed for 872 cfs (referenced from the Far Hills RCB Study). Therefore, even though the drainage pattern does not completely follow the SWPA Study, the changes are considered to be acceptable.

- In this study, Subbasins V29 J and V29 L are proposed to discharge toward CP3.5C, which is in contrast with the SWPA Study. According to the SWPA Study, CP3.5C generates 4,565 cfs. Note that the design flow for Inflow Point #6 of DB5 is 4,779 cfs. The revised SWPA HEC-1 shows 4,590 cfs at CP3.5C after the changes. Therefore, compared to the SWPA Study, the flow increase to the detention basin is acceptable.

Detailed information regarding storm drain facilities planning is provided in Section IX.

Table 4 shows the comparison of Village 29 MDS Ultimate Condition flow to allowable flow with reference to the applicable design study. Note that the table also summarizes a few SWPA relevant concentration points for comparison purposes, and further detail regarding the conclusions of the comparisons to the SWPA Study has been included in Section X of this study.

Table 4 – Comparison of Flow Rates at Summerlin Village 29 Discharge Locations					
Summerlin Village 29 Discharge		**Allowable Discharge**		**SWPA**	
CP/Subbasin ID	**Q_{100} (cfs)**	**Reference Material**	**Q_{100} (cfs)**	**CP ID**	**Q_{100} (cfs)**
V29 CP12	375	The Far Hills RCB Study	711	-	-
V29 H	50	The Far Hills RCB Study	320	-	-
V29 B	65	The V25 Sky Vista Drive Study	49[1]		
V29 CP11	90	The V25 Sky Vista Drive Study	20[1]	-	-
V25 CP2	350	The V25 Sky Vista Drive Study	416	-	-
CP1	785	The Far Hills RCB Study	872	CP3.8	677
Portion of V29 K	NA	The V25 Sky Vista Drive Study	228	-	-
Portion of V29 K	NA	The V25 Sky Vista Drive Study	78	-	-
V29 COS-5 & Open area from V23B	11	The V23B Sky Vista Drive Study	11	-	-
V29 K, V29 STA2, V29 COS-5	152	The V23B Sky Vista Drive Study	318	-	-
Revised CP3.5B (From the revised SWPA HEC-1)	4,615	The Diversion Berm Study	4,779	CP3.5B	4,599
Revised CP3.5C (From the revised SWPA HEC-1)	4,590	The Diversion Berm Study	4,779	CP3.5C	4,565
[1] Acceptable per hydraulic models					

Note that all the current flow rates are less than or equal to the design/allowable flow, except V29 B and V29 CP11. A hydraulic model is provided in Appendix B to validate that the flow increase does not adversely impact the existing receiving facility at V29 B. Additionally, the existing storm drain lateral at the V29 CP11 discharge point is proposed to be upsized per the WSPG hydraulic model. Further description of the hydraulic model has been included in Section IX of this study.

IX. CONCEPTUAL DRAINAGE FACILITIES

In general, a conceptual storm drain schematic has been set up by this study to allow a stub to be provided for each individual parcel. Typical to Summerlin development standards and criteria, this schematic of master drainage facility infrastructure will collect the entire parcel flow prior to discharge into the master streets shown on the land plan in Appendix A. As a result, the only flows that are to be carried in the street are those generated by the street during a storm event. At intersections, the street flow is planned to be entirely collected by the schematic shown on the figure.

Drainage facilities have been conceptually sized using the below criteria for proper planning purposes:

- Flowmaster full flow diameter calculations using Manning's formula to compute the required open area of storm drain to convey the applicable 100-year flow rate, in order to try to maintain the HGL at top of pipe. The computed diameter has been upsized by this study at least one size to account for future hydraulic losses anticipated for items like high velocity head differential at junctions, friction, etc. Note that sizes of the facilities do not decrease in size as the watercourse progresses downstream.
- For the storm drain culverts crossing Park Drift Trail and Grand Park Boulevard that are future CCRFCD facilities, bridge criteria is considered for planning

(Section 1005 of the HCDDM); 2 feet of freeboard for culverts, and water surface elevation not exceeding the top of pipe at the inlet.

- Preliminary HEC-RAS analysis is used to determine a conceptual section for the ultimate condition channel size for COS-2, COS-3, and COS-4. According to the HCDDM, the embankment protection criteria is considered for banks by adding ripraps based on left- and right-bank velocities for erosion protection. Additionally, the channel is sized to ensure enough freeboard is provided (per Sections 706.1 and 706.2 of the HCDDM).
- For storm drain facilities that will have flow velocities greater than 25 fps (up to 30 fps), 1 inch of sacrificial concrete is proposed.

Note that future technical drainage studies will be required for more detailed hydraulic analysis and drop inlet sizes calculations.

Refer to Figure 9 for the recommended storm drain facilities for Summerlin Village 29. Below are items that were considered during the storm drain planning process.

Existing "Village 25 Sky Vista Drive Improvements" Storm Drain:

Due to the revised land plan for Village 29, the distribution of flows to the existing laterals provided in Sky Vista have changed. The below table summarizes the updated flow rates.

Table 5 – Comparison of Flow Rates in "Village 25 Sky Vista Drive Improvements" Storm Drain

Facility ID	Facility Description	Sky Vista Q_{100} (cfs)	Village 29 Q_{100} (cfs)
38	EX 30" RCP	25	0
39	EX 36" RCP	49	65
40	Ex. 24" RCP (to be replaced as 42" RCP)	20	90
41	EX 6'X6' RCB	416	350
63	EX 48" RCP	308	181

Note that due to different flows, including an increase in flow to a few of the laterals, a new WSPG model has been prepared to show the updated hydraulics in the trunk line and the laterals. Based on the new hydraulic model, the trunk line in Sky Vista meets CCRFCD criteria; however, the 24" RCP lateral (Facility ID 40) requires removal and replacement for a larger pipe as indicated in the above table. New HGL, calculated from three above hydraulic models, is shown on the V25 Sky Vista improvement plans, provided in Appendix C, to ensure the storm drain and flows meet the criteria. Refer to Appendix B for hydraulic calculations.

Note the following additional items that have also been considered in this study:

- Facility ID 38: An existing 30" RCP lateral intended for V29 D on Sky Vista Drive; however, for hydraulic planning purposes, it is decided that V29 D will drain to Far Hills through a proposed 42" RCP (Facility ID 35).
- Facility ID 11 & 15: Storm drain laterals 11 and 15, shown on Figure 9, have been upsized by two sizes to account for possible future changes in flow pattern in the upstream. Storm drain lateral 11 is anticipated to be an open culvert with headwalls to collect storm runoff from the wash (V30B COS-2).

- Facility ID 57 & 59: A preliminary HEC-RAS analysis showed that a 10-foot deep, 120-foot bottom width channel with a 2:1 side slope, a natural bottom, and riprap on the sides would safely carry the flow through V29 COS-2, COS-3, and COS-4 to the detention basin. The intent is to install this channel as a future CCRFCD regional facility; therefore, with the assumption of having 30-foot width allocation for the channel access road to meet CCRFCD criteria on both sides, a minimum 220-foot width for COS-2, COS-3 and COS-4 is considered as a future channel place holder. Additionally, culverts have been planned crossing Park Drift Trail and Grand Park Boulevard.
- Facility ID 70 & 71: V29 STA2 is planned to drain into Sky Vista Drive, however, there is no existing storm drain stub at this location. Note that per the V23B Sky Vista Drive Study, Facility ID 43 was initially planned for adjacent street runoff collection, however, in the most recent land plan, the street location is changed. According to the V23B Sky Vista Drive Study, there are 2 drop inlets approximately 500 ft and 1000 ft on the downstream on Sky Vista, that are initially designed for nuisance flow but can be used to collect V29 STA2. Drop inlet calculations are provided in Appendix B to ensure existing DIs could safely collect all the additional runoff for V29 STA2 subbasin.
- Facility ID 43 & 44: There are two existing storm drain laterals for V29 K that could be extended through V29 K for storm runoff collection. Note that the design flows for Facility ID 43 and 44 are 228 cfs and 78 cfs, respectively.
- Facility ID 25 & 26: According to hydraulic calculations, 1 inch of sacrificial concrete is proposed for the 6'X6' RCB in Far Hills since the flow velocity is greater than 25 fps.

Refer to Appendix B for hydraulic calculations, and to Appendix D for drainage exhibits.

X. SUMMERLIN WEST MPU (SWPA) CONFORMANCE

Summerlin West Village 29 drainage study is designed to be generally in conformance with the SWPA Study, from both hydrologic and hydraulic points of view. However, there are a few exceptions, as mentioned above, that are caused by land plan changes after approval of the SWPA Study. This study presents the best possible decisions for storm drain routing based on new changes, the SWPA Study, and existing storm drain facilities in the region. Proposed storm drain facilities are slightly conceptually sized to be conservative in some areas to provide more flexibility for possible upcoming changes during the design of each parcel.

Figure 10 was prepared to overlay the applicable SWPA subbasins and concentration points on top of the colored areas taken from Figure 9. This figure shows that the proposed Village 29 drainage patterns are in general conformance with the SWPA, or that there are not major diversions of drainage area from Village 29 expected at a different location downstream than set forth by the SWPA.

Additionally, Table 4 in Section VIII also summarizes, where applicable, the locations in this study's ultimate condition hydrologic model where there is a direct comparison to a SWPA concentration point. These two locations are at SWPA concentration points CP3.5C and CP3.8. Section VIII of this study has discussed the acceptability of the flow being higher at CP3.8 in this study compared to the SWPA due to the design flow rate being higher in the accepting facility. At CP3.5C, the flow is also higher in this study compared to the SWPA; however, similarly to CP3.8, the design flow rate of the accepting facility can accommodate the increase above the SWPA.

As a result of the similarity of the Village 29 vs. SWPA drainage areas produced in Figure 10 and the discussion regarding the flow rate comparisons at CP3.5C and CP3.8, this Village 29 Master Drainage Study is acceptable to the regional plan for the area.

XI. CONCLUSIONS AND RECOMMENDATIONS

1. Methodology used in this report is in compliance with Clark County Regional Flood Control District (CCRFCD) criteria.

2. The project area lies within a designated FEMA Flood Zone X. Therefore, the project is not currently located in a FEMA-designated Special Flood Hazard Area.

3. The site is adjacent to CCRFCD Facilities existing APFH0089, proposed APFH0144, proposed APM50008, existing APM50047, proposed APM50056, and existing APM5000. According to SWPA, the proposed storm drain in Park Drift Trail (Facility IDs 30-33) will be CCRFCD facilities in the future. Additionally, existing APM50047 facility will be replaced by an earthen channel. Therefore, Facility IDs 56-59 will be CCRFCD facilities.

4. The proposed drainage patterns in this report are generally in conformance with the Summerlin West Planning Area Study.

5. The flow rates proposed by this study are less than or equal to the design flow rate at each of the discharge points from the village. Therefore, proposed hydrology and storm drain routing do not negatively impact downstream facilities and improvements.

XII. REFERENCES

1. Clark County Regional Flood Control District. *Hydrologic Criteria and Drainage Design Manual*. August 1999.

2. *CCRFCD 2018 Las Vegas Valley Master Plan Update*. 2018.

3. VTN Nevada. *Summerlin West Planning Area Master Plan Update.* 2018.

4. VTN Nevada. *Master Conceptual Drainage Study for Summerlin West Village 25*. 2019.

5. GCW, Inc. *Technical Drainage Study for Summerlin Detention Basin 5 Modifications*. 2020.

6. GCW, Inc. *Technical Drainage Study for Village 23B Sky Vista Drive*. 2018

7. GCW, Inc. *Technical Drainage Study for Summerlin Village 25 Sky Vista Drive Improvements Phase I*. 2019.

8. Atkins. *Improvement Plans for Sandstone Rise Drive (Street M)*. 2020

9. GCW, Inc. *Technical Drainage Study for Summerlin West Detention Basin 5 Temporary Diversion Berm.* 2020

10. G. C. Wallace, Inc*. Improvement Plans for Village 23B Far Hills Avenue RCB Improvements.* 2013.

APPENDIX LAYOUT

Appendix A — Hydrologic Calculations and Information

1. Land Use Tabulation / Table 602 From the CCRFCD Manual
2. Subbasins Hydrological Information
3. Standard Form 4
4. HEC-HMS Results (Electronic files included in the CD)
5. The Revised SWPA HEC-1 Model

Appendix B — Hydraulic Calculations and Information

1. Normal Depth/Full Flow Capacity Calculations
2. WSPG Calculations
    a. Sky Vista and Far Hills
    b. SD Lateral at V29 B
    c. SD Lateral at V29 CP11
3. Drop Inlet Calculations
    a. Sky Vista South of V29 STA2
4. Inlet Control Nomograph for SD 56 & 58
5. Preliminary HEC-RAS Analysis to size COS-2, 3 and 4 Channel Improvements (SD 57 & 59)
    a. 8/20/2019 Meeting Notes - Summerlin West Washes
    b. 12/21/2020 Meeting Notes - Village 29 Master Drainage Study and COS-3/4 Channel Improvements

Appendix C — Referenced Materials and Supporting Documents

1. Summerlin West Planning Area Master Plan Update
2. Master Conceptual Drainage Study for Summerlin West Village 25
3. Technical Drainage Study for Village 24A Detention Basin Modifications (Summerlin Detention Basin 5 Modifications)
4. Technical Drainage Study for Village 23B Sky Vista Drive Alta Drive to Far Hills Avenue
5. Technical Drainage Study for Summerlin Village 25 Sky Vista Drive Improvements Phase I
6. Improvement Plans for Sandstone Rise Drive (Street M)
7. Technical Drainage Study for Summerlin West Detention Basin 5 Temporary Diversion Berm
8. Improvement Plans for Village 23B Far Hills Avenue RCB Improvements

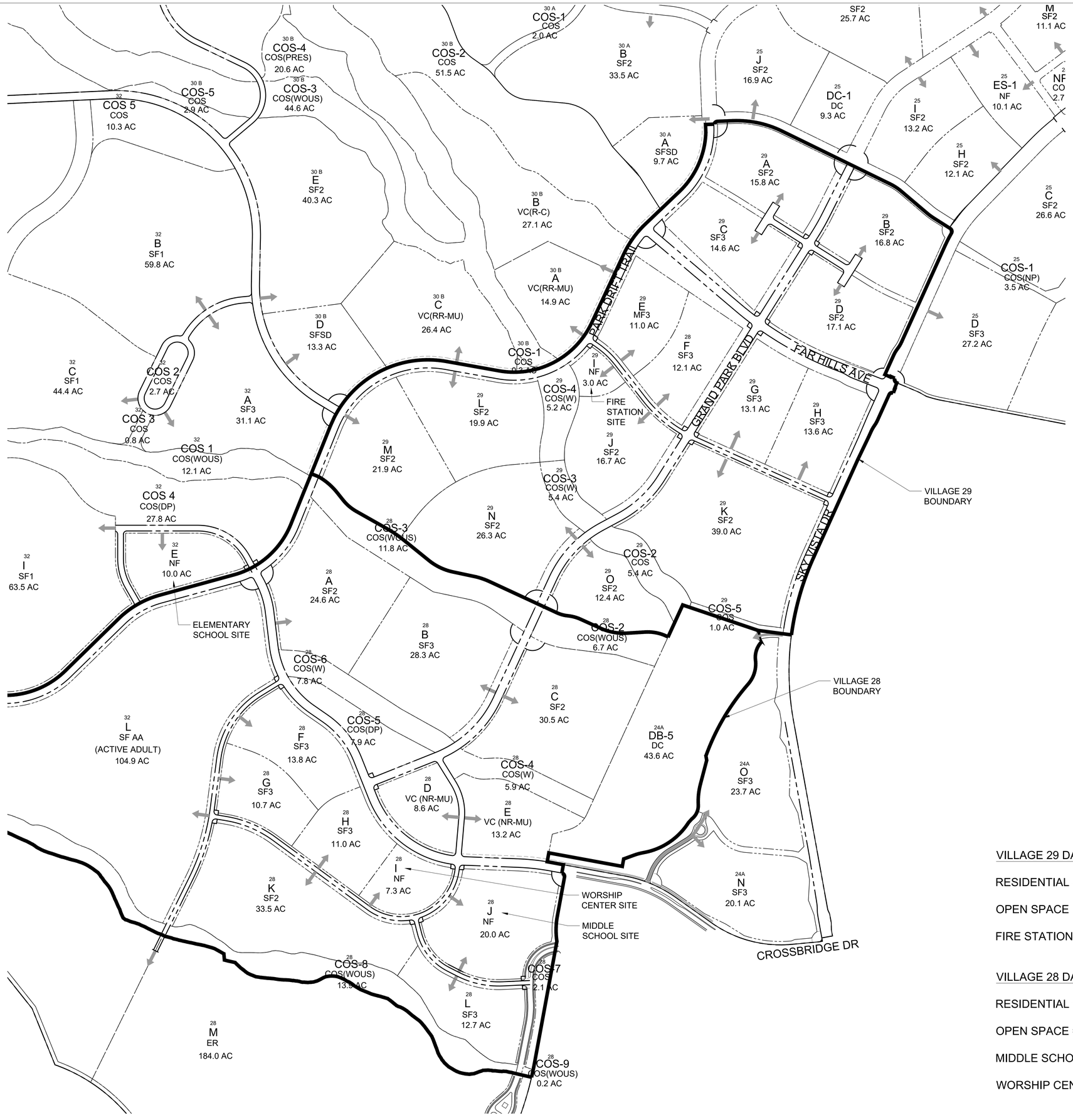
Appendix D — Drainage Figures

1. Figure 1; Vicinity Map
2. Figure 2; FEMA FIRM Map
3. Figure 3; 2018 MPU Subbasin Map
4. Figure 4; 2018 MPU Facility Map

5. Figure 5; 2018 MPU Soil Map
6. Figure 6; 100-Year Rainfall Map
7. Figure 7; 10-Year Rainfall Map
8. Figure 8; Ultimate Condition Basin Map
9. Figure 9; Storm Drain Facilities Map
10. Figure 10; SWPA vs V29 MDS Hydrology

APPENDIX A

Hydrologic Calculations and Information



VILLAGE 29 DATA:

RESIDENTIAL = 250.3 AC *(PREVIOUSLY 273.0 AC)*

OPEN SPACE = 17.0 AC *(PREVIOUSLY 22.4 AC)*

FIRE STATION = 3.0 AC

VILLAGE 28 DATA:

RESIDENTIAL = 165.1 AC *(PREVIOUSLY 150.5 AC)*

OPEN SPACE = 56.3 AC *(PREVIOUSLY 53.7 AC)*

MIDDLE SCHOOL SITE = 20.0 AC

WORSHIP CENTER SITE = 7.3 AC

dtj DESIGN

SUMMERLIN WEST
VILLAGE 28 & 29 FRAMEWORK EXHIBIT

0' 300' 600' 900'
1 = 300'
NORTH

SUMMERLIN WEST VILLAGE 29

GCW ENGINEERS \ SURVEYORS

LAND USE TABULATION		
Land Use Designation	**Maximum Density (Units/Acres)**	**Table 602 - Land Cover Description**
SF1	3.5	8,000 SQ FT LOTS
SF2	6	COMMERCIAL AND BUSINESS
SF3	10	COMMERCIAL AND BUSINESS
MF2 (R)	21	COMMERCIAL AND BUSINESS
MF3 (R)	40	COMMERCIAL AND BUSINESS
SFSD	18	COMMERCIAL AND BUSINESS
VC(R-C)	-	COMMERCIAL AND BUSINESS
VC(RR-MU)	40	COMMERCIAL AND BUSINESS
COS	-	OPEN SPACE (POOR CONDITION)
COS (W)	-	OPEN SPACE (POOR CONDITION)
DC	-	INDUSTRIAL
NF	-	COMMERCIAL AND BUSINESS
ST	-	IMPERVIOUS AREAS

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
See Table 602A					
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

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

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

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

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

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

Revision	Date

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

This table is only used as reference for comparison purposes, see Section VI of the report.

rough 11) are assumed 100% fair condition desert shrub for the open space distribution. Parks/golf courses and schools (land use categories 2 and 12) are assumed 70% open landscaping (grass) in good condition and 30% fair condition desert shrub for the open space distribution. This 70%-30% split was determined after reviewing the Spring 2016 aerial imagery.

4. All designated right-of-way areas were categorized as public facility (land use category 7) to be consistent throughout the Las Vegas Valley.

It should be noted that undeveloped land, open desert (land use category 1) will continue to use 100% poor condition desert shrub (<30% ground cover).

The directly connected impervious area percentages and corresponding open space distribution of each land use category is presented in **Table 2-2**:

Table 2-2 - Land Use Categories

Land Use Index	Land Use Description	Impervious* (%)	Open Landscape Good Condition Grass (%)	Open Desert Shrub Fair Condition Natural Desert Landscaping (%)
1	Undeveloped Land, Open Desert	0	0	100**
2	Parks, Golf Courses	5	66.5	28.5
3	Rural, 0.5-1 units per acre (uses 1 unit/acre)	20	40	40
4	Low-Density Residential, 1-2 units per acre (uses 2 units/acre)	25	37.5	37.5
5	Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)	30	35	35
6	High-Density residential, 4-8 units per acre (uses 6 units/acre)	52	24	24
7	Public Facility and Residential, 8-12 units/acre	72	14	14
8	Very High-Density Residential, 12 units/acre or more	80	0	20
9	Commercial, Retail, Casino, High Rise Condominiums	85	0	15
10	Light Industrial	72	0	28
11	Heavy Industrial	85	0	15
12	Schools	50	35	15
13	Lakes	0	0	0

* Impervious areas are directly connected to the drainage system
** Open Desert Shrub Poor Condition is applied for Undeveloped Land, Open Desert (Land Use Index Number 1)

The land use data used with the 2018 MPU is shown on the W-Maps. **Figure 2-1** shows the geographic comparison between the 2018 and 2008 MPU land use coverages in terms of percent imperviousness. The increase or decrease in impervious area represents an increase or decrease, respectively, in the runoff potential for a given area.

SUMMERLIN WEST VILLAGE 29
SUBBASINS HYDROLOGICAL INFORMATION

GCW ENGINEERS \ SURVEYORS

Subbasins ID	Land Use Designation	AREA (ac)	HSG %A	HSG %B	HSG %C	HSG %D	Rainfall (in)	WCN
V25 DC-1	DC	9.3	10.0	2.0	0.0	88.0	3.48	91.7
V25 GP1	ST	1.6	10.0	2.0	0.0	88.0	3.47	98.0
V25 I	SF2	13.2	9.8	2.1	0.0	88.0	3.46	94.3
V25 J	SF2	16.9	10.0	2.0	0.0	88.0	3.49	94.3
V25 RD2	ST	5.7	8.5	3.3	0.0	88.2	3.47	98.0
V29 A	SF2	15.8	10.0	2.0	0.0	88.0	3.47	94.3
V29 B	SF2	17.1	6.3	5.3	0.0	88.4	3.45	94.5
V29 C	SF3	14.6	4.6	6.8	0.0	88.6	3.47	94.5
V29 COS-1	COS	0.7	2.9	8.3	0.0	88.8	3.45	87.6
V29 COS-10	COS	3.8	1.0	10.0	0.0	89.0	3.47	87.8
V29 COS-11	COS	2.2	1.0	10.0	0.0	89.0	3.45	87.8
V29 COS-12	COS	1.4	1.7	9.9	0.0	88.4	3.46	87.7
V29 COS-13	COS	1.4	39.8	0.8	0.0	59.4	3.45	80.6
V29 COS-14	COS	1.2	10.0	2.0	0.0	88.0	3.45	86.7
V29 COS-2	COS (W)	5.3	10.0	2.0	0.0	88.0	3.44	86.7
V29 COS-3	COS (W)	3.6	10.0	2.0	0.0	88.0	3.46	86.7
V29 COS-4	COS (W)	5.2	48.4	0.8	0.0	50.8	3.47	78.8
V29 COS-5	COS	1.0	10.0	2.0	0.0	88.0	3.43	86.7
V29 COS-6	COS	1.1	10.0	2.0	0.0	88.0	3.47	86.7
V29 COS-7	COS	0.7	10.0	2.0	0.0	88.0	3.48	86.7
V29 COS-8	COS	1.0	1.4	9.6	0.0	89.0	3.46	87.7
V29 COS-9	COS	1.8	1.0	10.0	0.0	89.0	3.47	87.8
V29 D	SF2	16.8	1.2	9.8	0.0	89.0	3.45	94.6
V29 E	MF3	11.0	1.0	10.0	0.0	89.0	3.47	94.6
V29 F	SF3	12.1	1.0	10.0	0.0	89.0	3.46	94.6
V29 FH1	ST	2.3	1.0	10.0	0.0	89.0	3.47	98.0
V29 FH2	ST	3.2	1.0	10.0	0.0	89.0	3.45	98.0
V29 G	SF3	13.1	5.8	9.2	0.0	85.0	3.45	94.4
V29 GP1	ST	1.7	10.0	2.0	0.0	88.0	3.46	98.0
V29 GP2	ST	1.5	1.5	9.5	0.0	88.9	3.46	98.0
V29 GP3	ST	2.2	2.1	9.8	0.0	88.1	3.45	98.0
V29 GP4	ST	2.4	37.7	0.9	0.0	61.4	3.45	98.0
V29 GP5	ST	2.0	10.0	2.0	0.0	88.0	3.45	98.0

SUMMERLIN WEST VILLAGE 29
SUBBASINS HYDROLOGICAL INFORMATION

GCW ENGINEERS \ SURVEYORS

Subbasins ID	Land Use Designation	AREA (ac)	HSG %A	HSG %B	HSG %C	HSG %D	Rainfall (in)	WCN
V29 H	SF3	13.6	16.6	7.3	0.0	76.0	3.44	93.8
V29 I	NF	3.0	8.9	8.7	0.0	82.5	3.47	94.2
V29 J	SF2	16.7	42.2	1.1	0.0	56.7	3.46	92.4
V29 K	SF2	39.0	45.5	0.6	0.0	53.9	3.44	92.3
V29 L	SF2	19.9	20.7	1.6	0.0	77.8	3.48	93.7
V29 M	SF2	21.9	10.0	2.0	0.0	88.0	3.49	94.3
V29 N	SF2	26.2	10.0	2.0	0.0	88.0	3.47	94.3
V29 O	SF2	12.4	10.0	2.0	0.0	88.0	3.44	94.3
V29 PD1	ST	2.8	8.8	3.1	0.0	88.1	3.49	98.0
V29 PD2	ST	2.6	1.0	10.0	0.0	89.0	3.48	98.0
V29 PD3	ST	1.0	11.4	8.2	0.0	80.4	3.48	98.0
V29 PD4	ST	6.1	24.8	1.4	0.0	73.8	3.49	98.0
V29 STA1	ST	2.4	14.8	7.7	0.0	77.5	3.46	98.0
V29 STA2	ST	2.8	60.0	0.0	0.0	40.0	3.44	98.0
V29 STG1	ST	1.4	10.0	2.0	0.0	88.0	3.47	98.0
V29 STG2	ST	1.4	9.2	2.7	0.0	88.1	3.45	98.0
V30A A	SFSD	9.6	10.0	2.0	0.0	88.0	3.49	94.3
V30A B	SF2	33.5	10.0	2.0	0.0	88.0	3.51	94.3
V30A C	SF1	37.6	10.0	2.0	0.0	88.0	3.54	88.1
V30A COS-1	COS	2.0	10.0	2.0	0.0	88.0	3.52	86.8
V30A COS-2	COS	3.3	10.0	2.0	0.0	88.0	3.55	86.7
V30A D	SF1	39.0	10.0	2.0	0.0	88.0	3.54	88.1
V30A RD1	ST	6.7	10.0	2.0	0.0	88.0	3.53	98.0
V30A RD2	ST	2.8	10.0	2.0	0.0	88.0	3.50	98.0
V30B A	VC (RR-MU)	14.9	2.2	9.0	0.0	88.8	3.49	94.6
V30B B	VC (R-C)	27.1	6.6	5.0	0.0	88.4	3.51	94.4
V30B C	VC (RR-MU)	26.4	11.6	1.9	0.0	86.5	3.50	94.3
V30B COS-2	COS	51.5	9.6	2.3	0.0	88.0	3.53	86.7
V30B D	SFSD	13.3	10.0	2.0	0.0	88.0	3.51	94.3
V30B E	SF2	40.3	10.0	2.0	0.0	88.0	3.53	94.3
V30B RD1	ST	6.3	10.0	2.0	0.0	88.0	3.53	98.0
V32 A	SF3	31.1	10.0	2.0	0.0	88.0	3.52	94.3
V32 B	SF1	59.7	10.0	2.0	0.0	88.0	3.55	88.1
V32 COS-5	COS	10.3	10.0	2.0	0.0	88.0	3.55	86.7
V32 RD1	ST	1.4	10.0	2.0	0.0	88.0	3.53	98.0

HYDROLOGIC CRITERIA AND DESIGN MANUAL

TIME OF CONCENTRATION

GCW ENGINEERS \ SURVEYORS

SUMMERLIN WEST VILLAGE 29
ULTIMATE CONDITIONS

Project No: 62029-300
Date: 02-Dec-20
Calculated by: ME

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK URBANIZED BASINS		Tc	Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	CN (16)	K (2)	AREA Ac (3)	AREA Sq Mi (4)	INITIAL LENGTH Feet (5)	SLOPE % (6)	Ti Min (7)	TRAVEL LENGTH Feet (8)	SLOPE % (9a)	V1 VELOCITY fps (9b)	V2 VELOCITY fps (10)	Tt Min (11)	TOTAL LENGTH Feet (12)	Tc = (L/180)+10 Min (13)	Min (14)	Tlag = 0.6Tc/60 Hours (15)	RAINFALL in
V25 DC-1	D	91.7	0.8204	9.3	0.015	50	1.0	3.6	1069	3.4	3.7	5.6	3.9	1119	16.2	7.5	**0.07**	3.48
V25 GP1	D	98.0	0.9036	1.6	0.002	35	2.0	1.7	452	1.9	2.8	4.3	2.7	487	12.7	4.3	**0.05**	3.47
V25 I	D	94.3	0.8554	13.2	0.021	100	1.0	4.4	1376	2.7	3.3	5.0	5.4	1476	18.2	9.8	**0.10**	3.46
V25 J	D	94.3	0.8553	16.9	0.026	100	1.0	4.4	1410	4.5	4.3	6.5	4.3	1510	18.4	8.7	**0.09**	3.49
V25 RD2	D	98.0	0.9036	5.7	0.009	24	2.0	1.4	2316	6.3	5.1	7.7	5.6	2340	23.0	7.0	**0.07**	3.47
V29 A	D	94.3	0.8553	15.8	0.025	100	1.0	4.4	1399	5.2	4.6	7.0	4.0	1499	18.3	8.4	**0.08**	3.47
V29 B	D	94.5	0.8569	17.1	0.027	100	1.0	4.4	1481	4.2	4.1	6.2	4.6	1581	18.8	9.0	**0.09**	3.45
V29 C	D	94.5	0.8577	14.6	0.023	100	1.0	4.4	1545	4.1	4.1	6.2	4.9	1645	19.1	9.2	**0.09**	3.47
V29 COS-1	D	87.6	0.7658	0.7	0.001	100	1.0	6.0	607	4.6	4.3	6.6	2.2	707	13.9	8.2	**0.08**	3.45
V29 COS-10	D	87.8	0.7688	3.8	0.006	100	1.0	6.0	301	6.7	5.2	7.9	1.0	401	12.2	6.9	**0.07**	3.47
V29 COS-11	D	87.8	0.7688	2.2	0.003	100	1.0	6.0	197	9.1	6.1	9.2	0.5	297	11.6	6.5	**0.07**	3.45
V29 COS-12	D	87.7	0.7671	1.4	0.002	100	1.0	6.0	62	6.0	4.9	7.5	0.2	162	10.9	6.2	**0.06**	3.46
V29 COS-13	D	80.6	0.6734	1.4	0.002	100	1.0	7.7	56	7.9	5.7	8.6	0.2	156	10.9	7.8	**0.08**	3.45
V29 COS-14	D	86.7	0.7544	1.2	0.002	100	1.0	6.2	57	13.3	7.4	11.2	0.1	157	10.9	6.3	**0.06**	3.45
V29 COS-2	D	86.7	0.7544	5.3	0.008	100	1.0	6.2	971	5.4	4.7	7.1	2.9	1071	15.9	9.1	**0.09**	3.44
V29 COS-3	D	86.7	0.7547	3.6	0.006	100	1.0	6.2	671	4.7	4.4	6.6	2.3	771	14.3	8.6	**0.09**	3.46
V29 COS-4	D	78.8	0.6498	5.2	0.008	100	1.0	8.1	767	3.9	4.0	6.1	2.8	867	14.8	10.9	**0.11**	3.47
V29 COS-5	D	86.7	0.7544	1.0	0.001	100	1.0	6.2	808	4.7	4.4	6.6	2.7	908	15.0	8.9	**0.09**	3.43
V29 COS-6	D	86.7	0.7546	1.1	0.002	100	1.0	6.2	57	5.9	4.9	7.4	0.2	157	10.9	6.4	**0.06**	3.47
V29 COS-7	D	86.7	0.7544	0.7	0.001	100	1.0	6.2	614	6.3	5.1	7.7	1.9	714	14.0	8.1	**0.08**	3.48
V29 COS-8	D	87.7	0.7682	1.0	0.002	100	1.0	6.0	77	11.0	6.7	10.1	0.2	177	11.0	6.2	**0.06**	3.46
V29 COS-9	D	87.8	0.7688	1.8	0.003	100	1.0	6.0	182	5.5	4.7	7.2	0.6	282	11.6	6.6	**0.07**	3.47
V29 D	D	94.6	0.8591	16.8	0.026	100	1.0	4.3	1485	4.1	4.1	6.2	4.7	1585	18.8	9.0	**0.09**	3.45
V29 E	D	94.6	0.8592	11.0	0.017	100	1.0	4.3	1033	3.8	4.0	6.0	3.6	1133	16.3	7.9	**0.08**	3.47
V29 F	D	94.6	0.8592	12.1	0.019	100	1.0	4.3	908	4.5	4.3	6.5	3.0	1008	15.6	7.3	**0.07**	3.46
V29 FH1	D	98.0	0.9036	2.3	0.004	38	2.0	1.7	1230	6.0	5.0	7.5	3.3	1268	17.0	5.0	**0.05**	3.47
V29 FH2	D	98.0	0.9036	3.2	0.005	38	2.0	1.7	1157	6.1	5.0	7.6	3.1	1195	16.6	4.9	**0.05**	3.45
V29 G	D	94.4	0.8558	13.1	0.0205	100	1.0	4.4	1348	3.0	3.5	5.3	5.0	1448	18.0	9.4	**0.094**	3.45
V29 GP1	D	98.0	0.9036	1.7	0.0027	35	2.0	1.7	686	2.0	2.8	4.3	3.7	721	14.0	5.3	**0.053**	3.46
V29 GP2	D	98.0	0.9036	1.5	0.0024	35	2.0	1.7	697	4.0	4.0	6.1	2.6	732	14.1	4.3	**0.050**	3.46
V29 GP3	D	98.0	0.9036	2.2	0.0034	35	2.0	1.7	982	1.8	2.7	4.2	5.0	1017	15.7	6.6	**0.066**	3.45

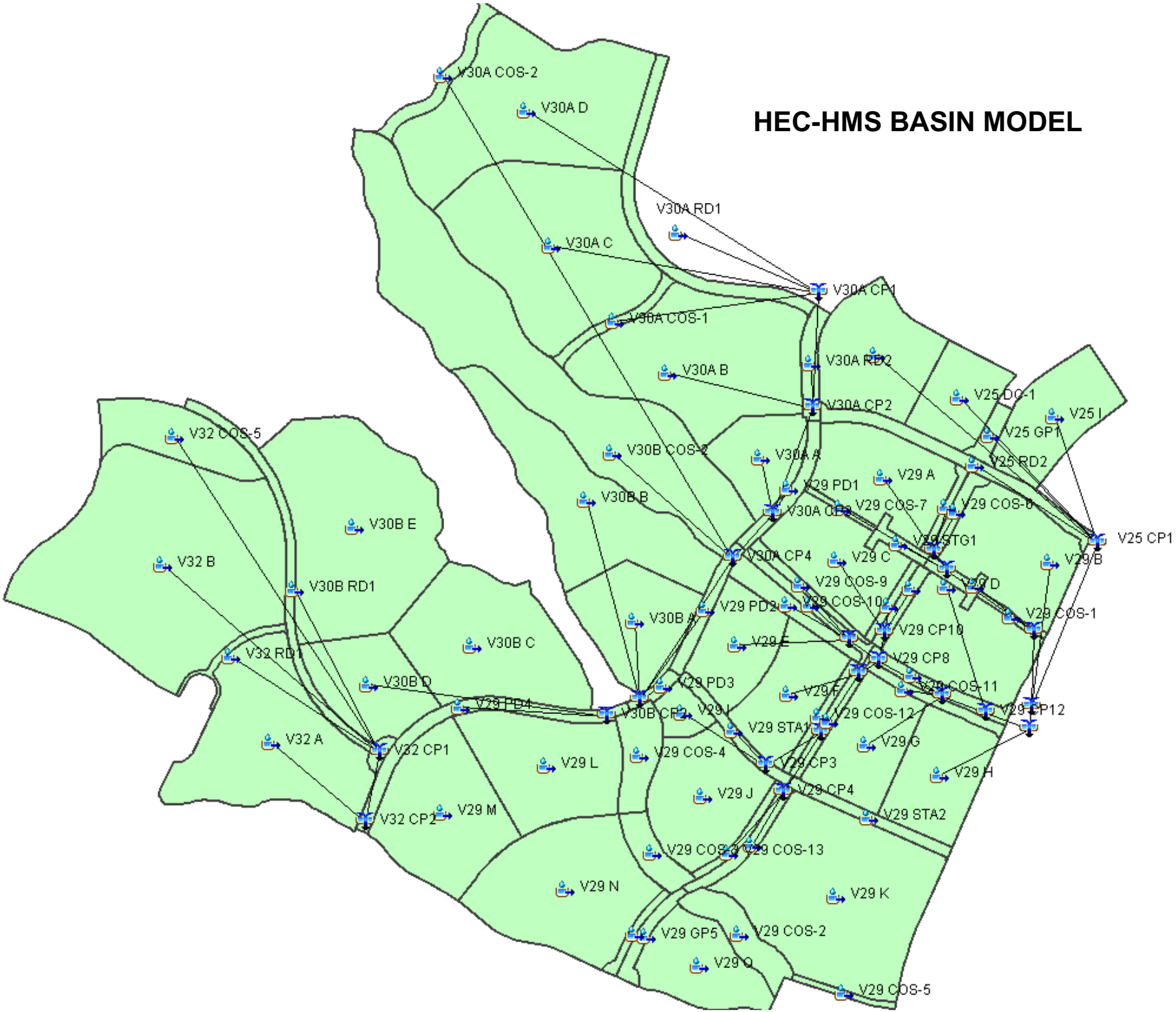
DESIG: (1)	DEV./EX. (D or E)	CN (16)	K (2)	AREA Ac (3)	AREA Sq Mi (4)	INITIAL LENGTH Feet (5)	SLOPE % (6)	Ti Min (7)	TRAVEL LENGTH Feet (8)	SLOPE % (9a)	V1 VELOCITY fps (9b)	V2 VELOCITY fps (10)	Tt Min (11)	TOTAL LENGTH Feet (12)	Tc = (L/180)+10 Min (13)	Min (14)	Tlag = 0.6Tc/60 Hours (15)	RAINFALL in
V29 GP4	D	98.0	0.9036	2.4	0.0038	35	2.0	1.7	1162	1.1	2.1	3.2	7.5	1197	16.6	9.1	**0.091**	3.45
V29 GP5	D	98.0	0.9036	2.0	0.0031	35	2.0	1.7	849	3.5	3.8	5.8	3.2	884	14.9	4.9	**0.050**	3.45
V29 H	D	93.8	0.8479	13.6	0.0212	100	1.0	4.5	1286	3.3	3.7	5.6	4.6	1386	17.7	9.2	**0.092**	3.44
V29 I	D	94.2	0.8537	3.0	0.0047	100	1.0	4.4	518	5.5	4.8	7.2	1.8	618	13.4	6.2	**0.062**	3.47
V29 J	D	92.4	0.8302	16.7	0.0262	100	1.0	4.9	1547	2.2	3.0	4.5	6.6	1647	19.1	11.5	**0.115**	3.46
V29 K	D	92.3	0.8277	39.0	0.0610	100	1.0	4.9	2271	3.5	3.8	5.7	7.3	2371	23.2	12.2	**0.122**	3.44
V29 L	D	93.7	0.8470	19.9	0.0310	100	1.0	4.6	1371	5.6	4.8	7.2	3.8	1471	18.2	8.3	**0.083**	3.48
V29 M	D	94.3	0.8553	21.9	0.0342	100	1.0	4.4	1541	4.0	4.1	6.2	4.9	1641	19.1	9.3	**0.093**	3.49
V29 N	D	94.3	0.8553	26.2	0.0410	100	1.0	4.4	1384	4.9	4.5	6.8	4.0	1484	18.2	8.4	**0.084**	3.47
V29 O	D	94.3	0.8553	12.4	0.0194	100	1.0	4.4	1347	3.8	3.9	5.9	4.5	1447	18.0	8.9	**0.089**	3.44
V29 PD1	D	98.0	0.9036	2.8	0.0044	38	2.0	1.7	1150	2.4	3.1	4.7	5.0	1188	16.6	6.7	**0.067**	3.49
V29 PD2	D	98.0	0.9036	2.6	0.0041	38	2.0	1.7	1056	1.9	2.8	4.2	5.2	1094	16.1	6.9	**0.069**	3.48
V29 PD3	D	98.0	0.9036	1.0	0.0015	38	2.0	1.7	412	3.1	3.5	5.4	1.9	450	12.5	3.7	**0.050**	3.48
V29 PD4	D	98.0	0.9036	6.1	0.0096	38	2.0	1.7	1324	5.0	4.5	6.8	3.9	1362	17.6	5.6	**0.056**	3.49
V29 STA1	D	98.0	0.9036	2.4	0.0038	19	2.0	1.2	1156	6.1	5.0	7.5	3.1	1175	16.5	4.3	**0.050**	3.46
V29 STA2	D	98.0	0.9036	2.8	0.0044	19	2.0	1.2	1309	4.6	4.3	6.6	4.0	1328	17.4	5.2	**0.052**	3.44
V29 STG1	D	98.0	0.9036	1.4	0.0022	19	2.0	1.2	553	7.3	5.5	8.3	1.6	572	13.2	2.9	**0.050**	3.47
V29 STG2	D	98.0	0.9036	1.4	0.0022	19	2.0	1.2	447	6.7	5.2	7.9	1.4	466	12.6	2.7	**0.050**	3.45
V30A A	D	94.3	0.8554	9.6	0.0151	100	1.0	4.4	1058	4.8	4.4	6.7	3.3	1158	16.4	7.7	**0.077**	3.49
V30A B	D	94.3	0.8553	33.5	0.0523	100	1.0	4.4	1706	6.2	5.0	7.6	4.3	1806	20.0	8.7	**0.087**	3.51
V30A C	D	88.1	0.7734	37.6	0.0587	100	1.0	5.9	2137	5.4	4.7	7.1	5.6	2237	22.4	11.5	**0.115**	3.54
V30A COS-1	D	86.8	0.7552	2.0	0.0032	100	1.0	6.2	1096	2.3	3.1	4.6	4.9	1196	16.6	11.1	**0.111**	3.52
V30A COS-2	D	86.7	0.7546	3.3	0.0051	100	1.0	6.2	1348	1.4	2.4	3.6	7.5	1448	18.0	13.7	**0.137**	3.55
V30A D	D	88.1	0.7734	39.0	0.0609	100	1.0	5.9	1909	5.9	4.9	7.4	4.9	2009	21.2	10.7	**0.107**	3.54
V30A RD1	D	98.0	0.9036	6.7	0.0104	38	2.0	1.7	2945	5.0	4.5	6.8	7.8	2983	26.6	9.5	**0.095**	3.53
V30A RD2	D	98.0	0.9036	2.8	0.0043	38	2.0	1.7	855	3.2	3.6	5.5	3.4	893	15.0	5.1	**0.051**	3.50
V30B A	D	94.6	0.8587	14.9	0.0232	100	1.0	4.3	1224	2.9	3.4	5.2	4.7	1324	17.4	9.1	**0.091**	3.49
V30B B	D	94.4	0.8567	27.1	0.0423	100	1.0	4.4	2437	6.6	5.2	7.9	5.7	2537	24.1	10.1	**0.101**	3.51
V30B C	D	94.3	0.8541	26.4	0.0412	100	1.0	4.4	1609	6.1	5.0	7.5	4.1	1709	19.5	8.5	**0.085**	3.50
V30B COS-2	D	86.7	0.7550	51.5	0.0805	100	1.0	6.2	4438	7.3	5.5	8.3	9.4	4538	35.2	15.6	**0.156**	3.53
V30B D	D	94.3	0.8553	13.3	0.0208	100	1.0	4.4	1271	6.1	5.0	7.6	3.4	1371	17.6	7.8	**0.078**	3.51
V30B E	D	94.3	0.8553	40.3	0.0629	100	1.0	4.4	2029	5.1	4.6	6.9	5.5	2129	21.8	9.9	**0.099**	3.53
V30B RD1	D	98.0	0.9036	6.3	0.0098	35	2.0	1.7	3358	5.7	4.8	7.3	8.2	3393	28.9	9.9	**0.099**	3.53
V32 A	D	94.3	0.8553	31.1	0.0486	100	1.0	4.4	1590	5.1	4.6	6.9	4.4	1690	19.4	8.9	**0.089**	3.52
V32 B	D	88.1	0.7734	59.7	0.0933	100	1.0	5.9	2265	5.8	4.9	7.4	5.7	2365	23.1	11.6	**0.116**	3.55
V32 COS-5	D	86.7	0.7546	10.3	0.0161	100	1.0	6.2	1273	5.9	4.9	7.5	3.4	1373	17.6	9.6	**0.096**	3.55
V32 RD1	D	98.0	0.9036	1.4	0.0021	35	2.0	1.7	1044	2.7	3.3	5.0	4.3	1079	16.0	6.0	**0.060**	3.53

Tc = Ti + Tt Tlag = 0.6 Tc For the travel time (Tt) calculations,

$Ti = 1.8\ (1.1 - K)\ L^{1/2} / S^{1/3}$ V1 applies to the first 500 feet of travel distance; Existing: $V1 = 14.8*(S/100)^{1/2}$ Developed: $V1 = 20.2*(S/100)^{1/2}$

K = 0.0132 (CN) - 0.39	V2 applies to the remaining travel distance.	$V2 = 29.4*(S/100)^{1/2}$	$V2 = 30.6*(S/100)^{1/2}$
REFERENCE:			**STANDARD FORM 4**

HEC-HMS BASIN MODEL



SUMMERLIN WEST VILLAGE 29
SUBBASINS 100-YR FLOW

GCW ENGINEERS \ SURVEYORS

Subbasins ID	Land Use Designation	AREA (ac)	Q_{100} (cfs)
V25 DC-1	DC	9.3	35
V25 GP1	ST	1.6	7
V25 I	SF2	13.2	49
V25 J	SF2	16.9	65
V25 RD2	ST	5.7	24
V29 A	SF2	15.8	61
V29 B	SF2	17.1	65
V29 C	SF3	14.6	56
V29 COS-1	COS	0.7	2
V29 COS-10	COS	3.8	13
V29 COS-11	COS	2.2	8
V29 COS-12	COS	1.4	5
V29 COS-13	COS	1.4	4
V29 COS-14	COS	1.2	4
V29 COS-2	COS (W)	5.3	16
V29 COS-3	COS (W)	3.6	12
V29 COS-4	COS (W)	5.2	11
V29 COS-5	COS	1.0	3
V29 COS-6	COS	1.1	4
V29 COS-7	COS	0.7	2
V29 COS-8	COS	1.0	3
V29 COS-9	COS	1.8	6
V29 D	SF2	16.8	64
V29 E	MF3	11.0	44
V29 F	SF3	12.1	49
V29 FH1	ST	2.3	10
V29 FH2	ST	3.2	14
V29 G	SF3	13.1	49
V29 GP1	ST	1.7	8
V29 GP2	ST	1.5	7
V29 GP3	ST	2.2	9
V29 GP4	ST	2.4	10
V29 GP5	ST	2.0	9

SUMMERLIN WEST VILLAGE 29
SUBBASINS 100-YR FLOW

GCW ENGINEERS \ SURVEYORS

Subbasins ID	Land Use Designation	AREA (ac)	Q_{100} (cfs)
V29 H	SF3	13.6	50
V29 I	NF	3.0	13
V29 J	SF2	16.7	56
V29 K	SF2	39.0	128
V29 L	SF2	19.9	77
V29 M	SF2	21.9	83
V29 N	SF2	26.2	102
V29 O	SF2	12.4	47
V29 PD1	ST	2.8	12
V29 PD2	ST	2.6	11
V29 PD3	ST	1.0	4
V29 PD4	ST	6.1	28
V29 STA1	ST	2.4	11
V29 STA2	ST	2.8	13
V29 STG1	ST	1.4	6
V29 STG2	ST	1.4	6
V30A A	SFSD	9.6	39
V30A B	SF2	33.5	130
V30A C	SF1	37.6	115
V30A COS-1	COS	2.0	6
V30A COS-2	COS	3.3	10
V30A D	SF1	39.0	122
V30A RD1	ST	6.7	27
V30A RD2	ST	2.8	13
V30B A	VC (RR-MU)	14.9	57
V30B B	VC (R-C)	27.1	101
V30B C	VC (RR-MU)	26.4	103
V30B COS-2	COS	51.5	145
V30B D	SFSD	13.3	54
V30B E	SF2	40.3	152
V30B RD1	ST	6.3	25
V32 A	SF3	31.1	121
V32 B	SF1	59.7	183
V32 COS-5	COS	10.3	32
V32 RD1	ST	1.4	6

SUMMERLIN WEST VILLAGE 29
CONCENTRATION POINTS INFORMATION

GCW ENGINEERS \ SURVEYORS

CP ID	Tributary	AREA (sq mi)	Q_{100} (cfs)
V25 CP1	V25 J, DC-1, V25 I, V25 GP1, V25 RD2	0.07	181
V25 CP2	V25 CP1, V29 B, V29 CP11, SKY0 (from V25 MDS)	0.14	350
V29 CP1	V29A, V29 GP1, V29 COS-6	0.03	73
V29 CP2	V29 CP1, V29 COS-7, V29 STG1	0.03	81
V29 CP3	V29 I, V29 STA1	0.01	24
V29 CP4	V29 GP4, V29 COS-13	0.01	13
V29 CP5	V29 CP3, V29 CP4, V29 GP3, V29 COS-12	0.02	51
V29 CP6	V29 CP5, V29 F	0.04	101
V29 CP7	V29 E, V29 COS-10, V29 FH1, V29 COS-9	0.03	74
V29 CP8	V29 CP10, V29 CP6, V29 CP7	0.10	240
V29 CP9	V29 CP8, V29 G, V29 FH2, V29 COS-11	0.12	311
V29 CP10	V29 C, V29 COS-8, V29 GP2	0.03	66
V29 CP11	V29 CP2, V29 STG2, V29 COS-1	0.04	90
V29 CP12	V29 CP9, V29D	0.15	375
CP1	V25 CP2, V29 CP12, V29 H, RD1 (from V23B Sky V)	0.31	785
V30A CP1	V30A D, V30A C, V30A RD1, V30A COS-1	0.13	268
V30A CP2	V30A CP1, V30A B, V30A RD2	0.19	411
V30A CP3	V30A CP2, V30A A, V29 PD1	0.21	462
V30A CP4	V30A CP3, V30B COS2, V30A COS-2	0.29	596
V30B CP1	V30A CP4, V29 PD2, V30B B, V30B A, V29 PD3	0.37	770
V30B CP2	V30B D, V29 PD4	0.03	81
V32 CP1	V32 B, V32 COS-5, V30B RD1, V32 RD1	0.12	244
V32 CP2	V32 CP1, V32 A	0.17	365
SWPA Concentration Points			
CP3.8	3-G2, 3-L2	-	677
CP3.5B	CP3.5A, 3-E, 3-F	-	4,599
CP3.5C	CP3.5B, WOUS-4B	-	4,565
CP3.6B	CP3.6A, 3-N1	-	2,762
CP3.6A	3-8, 3-K1, 3-K2	-	2,562
CP3.5A	CP3.4B, WOUS-5	-	3,855

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *                    *         609 SECOND STREET            *
 *                                      *                    *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   11JAN21  TIME  10:02:26  *                    *          (916) 756-1104              *
 *                                      *                    *                                      *
 ****************************************                    ****************************************
```

THE SWPA REVISED HEC-1

```
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     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


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

                        *DIAGRAM
 *** FREE ***
             1          ID   ************************************************************
             2          ID   * ........................................................ *
             3          ID   * :            SUMMERLIN WEST PLANNING AREA               : *
             4          ID   * :                   REVISED HEC-1 MODEL                 : *
             5          ID   * :                                                       : *
             6          ID   * :.......................................................: *
             7          ID   * :             RETURN PERIOD_ _ _ _10 & 100-YEAR         : *
             8          ID   * :             DISTRIBUTION_ _ _ _ 6-HOUR SDN3           : *
             9          ID   * :             PROJECT NO_ _ _ _ _ 62029-300             : *
            10          ID   * :             FILENAME_ _ _ _ _ _ ULT.H1                : *
            11          ID   * :             DATE_ _ _ _ _ _ _ _ 12/15/2020            : *
            12          ID   * :             MODELED BY_ _ _ _ _ ME                    : *
            13          ID   * :.......................................................: *
            14          ID   * :                                                       : *
            15          ID   * :.......................................................: *
            16          ID   ************************************************************
            17          ID
            18          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            19          ID
            20          ID         AREA    DARF
            21          ID         SQ.MI.
            22          ID
            23          ID         0 - 0.5 0.99
            24          ID         0.5 - 1 0.975
            25          ID         1 - 2   0.95
            26          ID         2 - 3   0.925
            27          ID         3 - 4   0.915
            28          ID         4 - 5   0.908
            29          ID         5 - 6   0.903
            30          ID         6 - 7   0.895
            31          ID         7 - 8   0.885
            32          ID
            33          IT       5       0       0     300
            34          IO       5       0
            35          IN       5       0       0
            36          JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.885
                        *
            37          KK     3-1
            38          BA    2.22
            39          PB    3.75
            40          PC   0.000   .0200   .0570   .0700   .0870   .1080   .1240   .1300   .1300   .1300
            41          PC   .1300   .1300   .1300   .1330   .1400   .1420   .1480   .1580   .1720   .1810
            42          PC   .1900   .1970   .1990   .2000   .2010   .2040   .2140   .2290   .2410   .2490
            43          PC   .2510   .2560   .2700   .2780   .2810   .2830   .2950   .3220   .3520   .4090
            44          PC   .4990   .5900   .7100   .7440   .7810   .8120   .8190   .8350   .8510   .8560
            45          PC   .8600   .8680   .8760   .8880   .9100   .9260   .9370   .9500   .9700   .9760
            46          PC   .9820   .9850   .9870   .9890   .9900   .9930   .9930   .9940   .9950   .9980
            47          PC   .9980   .9990  1.000
```

```
  48          LS       0   87.00
  49          UD   0.582
              *
1                                       HEC-1 INPUT                                          PAGE  2

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


  50          KK     3-1
  51          RD    3322   0.092   0.030       0    TRAP     125       0
              *

  52          KK     3-2
  53          BA  0.2268
  54          PB    3.67
  55          LS       0    85.4
  56          UD   0.108
              *

  57          KK   CP3.1
  58          HC       2
              *

  59          KK  RCP3.1
  60          RD     590   0.063   0.030       0    TRAP     125       0
              *

  61          KK     3-3
  62          BA  0.1736
  63          PB    3.65
  64          LS       0    88.0
  65          UD   0.081
              *

  66          KK   CP3.2
  67          HC       2
              *

  68          KK  RCP3.2
  69          RD    4000   0.078   0.030       0    TRAP      50       2
              *

  70          KK     3-4
  71          BA  0.3475
  72          PB    3.68
  73          LS       0    88.0
  74          UD   0.092
              *

  75          KK     3-5
  76          BA  0.2936
  77          PB    3.65
  78          LS       0    87.7
  79          UD   0.094
              *

  80          KK   CP3.3
  81          HC       2
              *
1                                       HEC-1 INPUT                                          PAGE  3

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


  82          KK  RCP3.3
  83          RD    2300   0.058   0.015       0    DEEP       8
              *

  84          KK     3-6
  85          BA  0.0887
  86          PB    3.62
  87          LS       0    88.0
  88          UD   0.077
              *

  89          KK    R3-6
  90          RD    5500   0.080   0.013       0    CIRC       5
              *

  91          KK     3-7
  92          BA  0.1300
  93          PB    3.61
  94          LS       0    87.2
  95          UD   0.074
              *

  96          KK    R3-7
  97          RD    5300   0.080   0.013       0    CIRC       5
              *
```

```
  98          KK     3-J
  99          BA  0.3464
 100          PB    3.58
 101          LS       0    86.1
 102          UD   0.197
              *

 103          KK   CP3.J
 104          HC       4
              *

 105          KK  WOUS-4
 106          BA  0.1363
 107          PB    3.56
 108          LS       0    86.9
 109          UD   0.280
              *

 110          KK  CP3.4A
 111          HC       3
              *

 112          KK RCP3.4A
 113          RD     800   0.067   0.030       0    TRAP     200       2
              *
1                                          HEC-1 INPUT                                          PAGE  4

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


 114          KK     3-D
 115          BA  0.1826
 116          PB    3.59
 117          LS       0    86.6
 118          UD   0.132
              *

 119          KK  CP3.4B
 120          HC       2
              *

 121          KK RCP3.4B
 122          RD    3000   0.064   0.030       0    TRAP     125       2
              *

 123          KK  WOUS-5
 124          BA  0.2255
 125          PB    3.62
 126          LS       0    87.1
 127          UD   0.264
              *

 128          KK  CP3.5A
 129          HC       2
              *

 130          KK RCP3.5A
 131          RD    1200   0.050   0.030       0    TRAP      50       2
              *

 132          KK   30B-E
 133          BA  0.0629
 134          PB    3.53
 135          LS       0    94.3
 136          UD   0.099
              *

 137          KK   30B-D
 138          BA  0.0208
 139          PB    3.51
 140          LS       0    94.3
 141          UD   0.078
              *

 142          KK   30B-C
 143          BA  0.0412
 144          PB    3.50
 145          LS       0    94.3
 146          UD   0.085
              *
1                                          HEC-1 INPUT                                          PAGE  5

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


 147          KK V29-PD4
 148          BA  0.0096
 149          PB    3.49
```

```
 150          LS       0    98.0
 151          UD   0.056
              *

 152          KK     3-E
 153          HC       4
              *

 154          KK  V30A-D
 155          BA  0.0609
 156          PB    3.54
 157          LS       0    88.1
 158          UD   0.107
              *

 159          KK  V30A-C
 160          BA  0.0587
 161          PB    3.54
 162          LS       0    88.1
 163          UD   0.115
              *

 164          KKV30A-RD1
 165          BA  0.0104
 166          PB    3.53
 167          LS       0    98.0
 168          UD   0.095
              *

 169          KKV30ACOS-1
 170          BA  0.0032
 171          PB    3.52
 172          LS       0    86.8
 173          UD   0.111
              *

 174          KK  DUMMY1
 175          HC       4
              *

 176          KKV30A-RD2
 177          BA  0.0043
 178          PB    3.50
 179          LS       0    98.0
 180          UD   0.051
              *
```



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

 181          KK  V30A-B
 182          BA  0.0523
 183          PB    3.51
 184          LS       0    94.3
 185          UD   0.087
              *

 186          KK  V30A-A
 187          BA  0.0151
 188          PB    3.49
 189          LS       0    94.3
 190          UD   0.077
              *

 191          KK V29-PD1
 192          BA  0.0044
 193          PB    3.49
 194          LS       0    98.0
 195          UD   0.067
              *

 196          KKV30ACOS-2
 197          BA  0.0051
 198          PB    3.55
 199          LS       0    86.7
 200          UD   0.137
              *

 201          KK  DUMMY2
 202          HC       5
              *

 203          KKV30B-COS-2
 204          BA  0.0805
 205          PB    3.53
 206          LS       0    86.7
 207          UD   0.156
              *
```

```
          208          KK V29-PD2
          209          BA  0.0041
          210          PB    3.48
          211          LS       0    98.0
          212          UD   0.069
                       *

          213          KK  V30B-B
          214          BA  0.0423
          215          PB    3.51
          216          LS       0    94.4
          217          UD   0.101
                       *
1                                          HEC-1 INPUT                                          PAGE  7

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


          218          KK  V30B-A
          219          BA  0.0232
          220          PB    3.49
          221          LS       0    94.6
          222          UD   0.091
                       *

          223          KK V29-PD3
          224          BA  0.0015
          225          PB    3.48
          226          LS       0    98.0
          227          UD   0.050
                       *

          228          KK  DUMMY3
          229          HC       5
                       *

          230          KK     3-F
          231          HC       3
                       *

          232          KK  CP3.5B
          233          HC       3
                       *

          234          KK RCP3.5B
          235          RD    2570   0.043   0.030       0    TRAP      80       2
                       *

          236          KKV29COS-2
          237          BA  0.0084
          238          PB    3.44
          239          LS       0    86.7
          240          UD   0.091
                       *

          241          KKV29COS-3
          242          BA  0.0057
          243          PB    3.46
          244          LS       0    86.7
          245          UD   0.086
                       *

          246          KKV29COS-4
          247          BA  0.0081
          248          PB    3.47
          249          LS       0    78.8
          250          UD   0.109
                       *
1                                          HEC-1 INPUT                                          PAGE  8

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


          251          KK WOUS-4B
          252          HC       3
                       *

          253          KK    V29L
          254          BA  0.0310
          255          PB    3.48
          256          LS       0    93.7
          257          UD   0.083
                       *

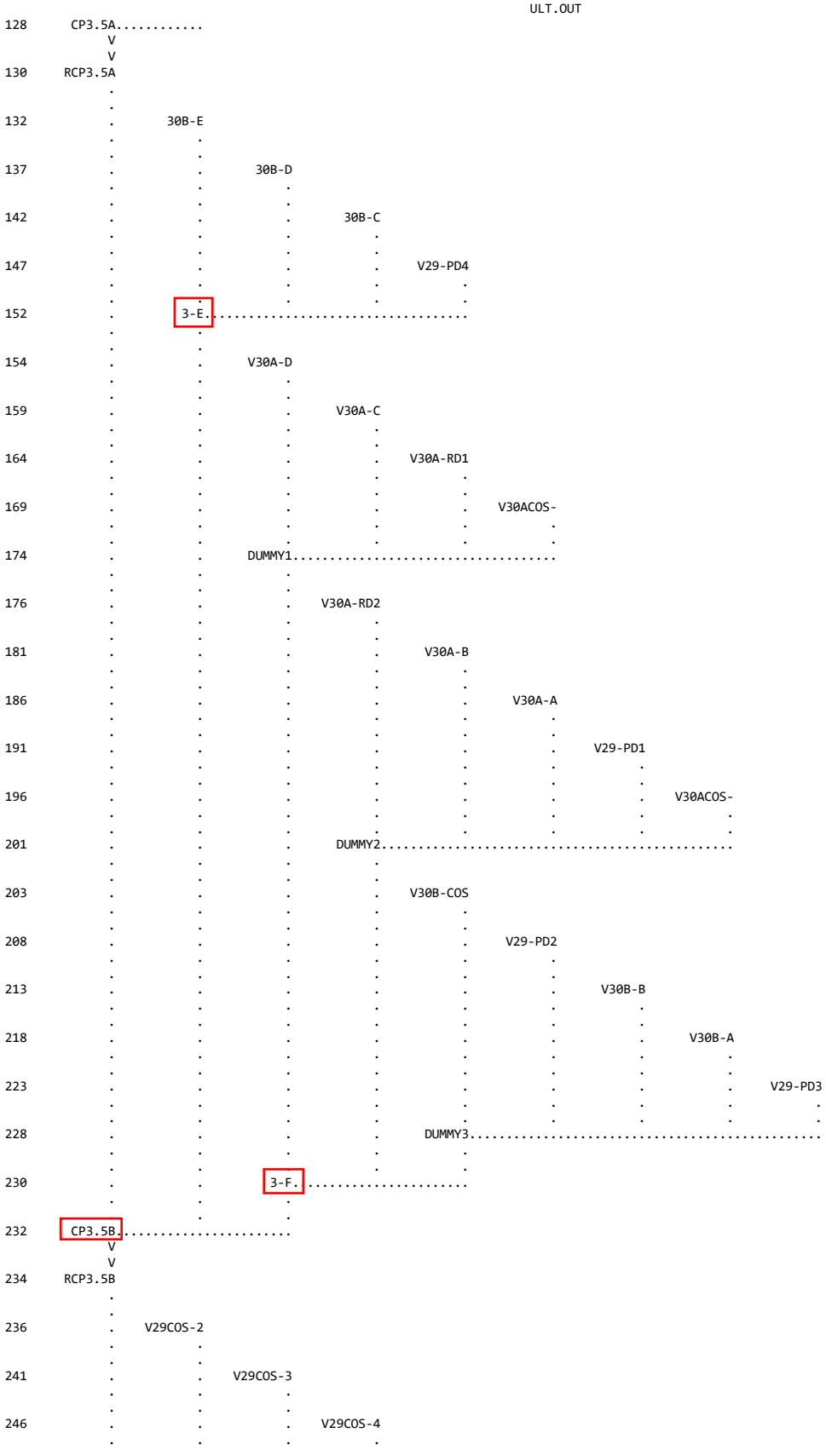
          258          KK    V29J
          259          BA  0.0262
          260          PB    3.46
          261          LS       0    92.4
```

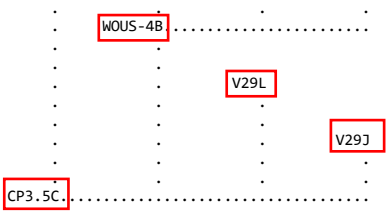
```
           262           UD   0.115
                         *

           263           KK  CP3.5C
           264           HC       4
                         *
           265           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    37         3-1
               V
               V
    50         3-1
               .
               .
    52         .         3-2
               .           .
               .           .
    57       CP3.1.............
             V
             V
    59      RCP3.1
             .
             .
    61         .         3-3
               .           .
               .           .
    66       CP3.2.............
             V
             V
    68      RCP3.2
             .
             .
    70         .         3-4
               .           .
               .           .
    75         .           .         3-5
               .           .           .
               .           .           .
    80         .       CP3.3............
               .           V
               .           V
    82         .      RCP3.3
               .           .
               .           .
    84         .           .         3-6
               .           .           V
               .           .           V
    89         .           .        R3-6
               .           .           .
               .           .           .
    91         .           .           .         3-7
               .           .           .           V
               .           .           .           V
    96         .           .           .        R3-7
               .           .           .           .
               .           .           .           .
    98         .           .           .           .         3-J
               .           .           .           .           .
               .           .           .           .           .
   103         .       CP3.J.................................
               .           .
               .           .
   105         .           .      WOUS-4
               .           .           .
               .           .           .
   110      CP3.4A.......................
             V
             V
   112     RCP3.4A
             .
             .
   114         .         3-D
               .           .
               .           .
   119      CP3.4B............
             V
             V
   121     RCP3.4B
             .
             .
   123         .      WOUS-5
               .           .
               .           .
```


CP3.5A
RCP3.5A
30B-E
30B-D
30B-C
V29-PD4
3-E.
V30A-D
V30A-C
V30A-RD1
V30ACOS-
DUMMY1
V30A-RD2
V30A-B
V30A-A
V29-PD1
V30ACOS-
DUMMY2
V30B-COS
V29-PD2
V30B-B
V30B-A
V29-PD3
DUMMY3
3-F.
CP3.5B.
RCP3.5B
V29COS-2
V29COS-3
V29COS-4



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   11JAN21  TIME  10:02:26   *
*                                       *
*****************************************
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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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************************************************************
* ........................................................ *
* :           SUMMERLIN WEST PLANNING AREA               : *
* :                  REVISED HEC-1 MODEL                 : *
* :                                                      : *
* :......................................................: *
* :             RETURN PERIOD_ _ _ _10 & 100-YEAR        : *
* :             DISTRIBUTION_ _ _ _ 6-HOUR SDN3          : *
* :             PROJECT NO_ _ _ _ _ 62029-300            : *
* :             FILENAME_ _ _ _ _ _ ULT.H1               : *
* :             DATE_ _ _ _ _ _ _ _ 12/15/2020           : *
* :             MODELED BY_ _ _ _ _ ME                   : *
* :......................................................: *
* :                                                      : *
* :......................................................: *
************************************************************
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JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ.MI.	DARF
0 - 0.5	0.99
0.5 - 1	0.975
1 - 2	0.95
2 - 3	0.925
3 - 4	0.915
4 - 5	0.908
5 - 6	0.903
6 - 7	0.895
7 - 8	0.885

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

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

                COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE   24.92 HOURS

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

   JP          MULTI-PLAN OPTION
                    NPLAN          1  NUMBER OF PLANS
```

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.99 .98 .95 .93 .92 .91 .90 .89 .88

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 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .89	RATIO 9 .88
HYDROGRAPH AT													
+	3-1	2.22	1	FLOW	2324.	2276.	2196.	2117.	2085.	2063.	2047.	2021.	1989.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
ROUTED TO													
+	3-1	2.22	1	FLOW	2311.	2269.	2184.	2104.	2077.	2050.	2038.	2013.	1981.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
HYDROGRAPH AT													
+	3-2	.23	1	FLOW	428.	418.	403.	388.	382.	377.	374.	370.	363.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT													
+	CP3.1	2.45	1	FLOW	2387.	2342.	2255.	2172.	2144.	2116.	2104.	2078.	2045.
				TIME	4.00	4.08	4.00	4.08	4.08	4.08	4.08	4.08	4.08
ROUTED TO													
+	RCP3.1	2.45	1	FLOW	2385.	2342.	2254.	2172.	2144.	2116.	2103.	2078.	2044.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
HYDROGRAPH AT													
+	3-3	.17	1	FLOW	392.	384.	371.	358.	353.	349.	347.	343.	338.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT													
+	CP3.2	2.62	1	FLOW	2446.	2399.	2310.	2222.	2193.	2165.	2148.	2125.	2087.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.08	4.00	4.08
ROUTED TO													
+	RCP3.2	2.62	1	FLOW	2442.	2403.	2309.	2219.	2198.	2164.	2148.	2130.	2087.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
HYDROGRAPH AT													
+	3-4	.35	1	FLOW	761.	745.	720.	695.	685.	678.	673.	665.	655.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	3-5	.29	1	FLOW	625.	613.	592.	571.	563.	557.	553.	546.	538.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT													
+	CP3.3	.64	1	FLOW	1386.	1358.	1312.	1266.	1248.	1235.	1226.	1211.	1193.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO													
+	RCP3.3	.64	1	FLOW	1338.	1309.	1264.	1219.	1202.	1188.	1180.	1166.	1147.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	3-6	.09	1	FLOW	201.	197.	190.	184.	181.	179.	178.	176.	173.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO													
+	R3-6	.09	1	FLOW	181.	177.	171.	164.	162.	162.	163.	158.	155.
				TIME	3.50	3.50	3.58	3.50	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	3-7	.13	1	FLOW	290.	284.	274.	265.	261.	258.	256.	253.	249.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO													
+	R3-7	.13	1	FLOW	263.	259.	248.	239.	235.	234.	232.	228.	224.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	3-J	.35	1	FLOW	555.	543.	523.	504.	496.	490.	486.	480.	472.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
4 COMBINED AT													
+	CP3.J	1.21	1	FLOW	2247.	2204.	2128.	2053.	2023.	2006.	1994.	1967.	1934.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	WOUS-4	.14	1	FLOW	193.	189.	182.	176.	173.	171.	170.	168.	165.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67

3 COMBINED AT													
+	CP3.4A	3.96	1	FLOW	3880.	3789.	3651.	3515.	3464.	3421.	3399.	3358.	3291.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RCP3.4A	3.96	1	FLOW	3836.	3748.	3606.	3471.	3421.	3377.	3355.	3314.	3250.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	3-D	.18	1	FLOW	342.	335.	323.	311.	307.	303.	301.	297.	293.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP3.4B	4.15	1	FLOW	4177.	4082.	3929.	3782.	3727.	3680.	3656.	3611.	3542.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RCP3.4B	4.15	1	FLOW	4005.	3917.	3763.	3650.	3570.	3552.	3527.	3461.	3410.
				TIME	3.58	3.67	3.58	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	WOUS-5	.23	1	FLOW	341.	334.	322.	311.	306.	303.	300.	297.	292.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	CP3.5A	4.37	1	FLOW	4333.	4252.	4082.	3961.	3876.	3855.	3828.	3757.	3702.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO													
+	RCP3.5A	4.37	1	FLOW	4328.	4246.	4077.	3953.	3869.	3847.	3820.	3752.	3693.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	30B-E	.06	1	FLOW	150.	147.	143.	139.	137.	136.	135.	134.	132.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	30B-D	.02	1	FLOW	53.	52.	50.	49.	48.	48.	48.	47.	47.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	30B-C	.04	1	FLOW	102.	100.	97.	94.	93.	92.	92.	91.	90.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V29-PD4	.01	1	FLOW	27.	27.	26.	26.	25.	25.	25.	25.	24.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT													
+	3-E	.13	1	FLOW	332.	326.	317.	308.	304.	302.	300.	297.	293.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30A-D	.06	1	FLOW	120.	117.	113.	109.	108.	107.	106.	105.	103.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30A-C	.06	1	FLOW	113.	111.	107.	104.	102.	101.	100.	99.	98.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	V30A-RD1	.01	1	FLOW	27.	26.	25.	25.	25.	24.	24.	24.	24.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30ACOS-	.00	1	FLOW	6.	6.	6.	5.	5.	5.	5.	5.	5.
				TIME	3.50	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
4 COMBINED AT													
+	DUMMY1	.13	1	FLOW	264.	259.	250.	242.	238.	236.	234.	231.	228.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30A-RD2	.00	1	FLOW	13.	12.	12.	12.	12.	11.	11.	11.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30A-B	.05	1	FLOW	129.	127.	123.	119.	118.	117.	116.	115.	114.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30A-A	.02	1	FLOW	38.	38.	36.	35.	35.	35.	34.	34.	34.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V29-PD1	.00	1	FLOW	12.	12.	12.	11.	11.	11.	11.	11.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

HYDROGRAPH AT												
+	V30ACOS-	.01	1	FLOW	9.	9.	9.	9.	8.	8.	8.	8.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
5 COMBINED AT													
+	DUMMY2	.08	1	FLOW	200.	197.	191.	186.	183.	182.	181.	179.	177.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30B-COS	.08	1	FLOW	143.	140.	135.	130.	128.	126.	125.	124.	122.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	V29-PD2	.00	1	FLOW	11.	11.	11.	10.	10.	10.	10.	10.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30B-B	.04	1	FLOW	100.	98.	95.	92.	91.	90.	90.	89.	88.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V30B-A	.02	1	FLOW	56.	55.	54.	52.	52.	51.	51.	50.	50.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V29-PD3	.00	1	FLOW	4.	4.	4.	4.	4.	4.	4.	4.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
5 COMBINED AT													
+	DUMMY3	.15	1	FLOW	296.	290.	281.	272.	268.	266.	264.	261.	257.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	3-F	.37	1	FLOW	760.	746.	723.	699.	690.	683.	678.	671.	661.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	CP3.5B	4.87	1	FLOW	5211.	5099.	4909.	4747.	4648.	4615.	4569.	4501.	4426.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RCP3.5B	4.87	1	FLOW	5068.	4968.	4778.	4621.	4530.	4497.	4473.	4398.	4321.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	V29COS-2	.01	1	FLOW	16.	16.	15.	15.	14.	14.	14.	14.	14.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V29COS-3	.01	1	FLOW	11.	11.	11.	10.	10.	10.	10.	10.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V29COS-4	.01	1	FLOW	11.	11.	10.	10.	10.	10.	9.	9.	9.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	WOUS-4B	.02	1	FLOW	38.	37.	36.	34.	34.	34.	33.	33.	32.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V29L	.03	1	FLOW	76.	74.	72.	70.	69.	69.	68.	67.	67.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	V29J	.03	1	FLOW	55.	54.	52.	51.	50.	50.	49.	49.	48.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT													
+	CP3.5C	4.95	1	FLOW	5171.	5069.	4876.	4716.	4624.	4590.	4565.	4489.	4411.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .00									
3-1	MANE	2.67	2312.79	243.40	2.37	5.00	2311.00	245.00	2.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2811E+03 EXCESS= .0000E+00 OUTFLOW= .2812E+03 BASIN STORAGE= .7057E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.70	2269.49	242.74	2.32	5.00	2269.47	245.00	2.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2751E+03 EXCESS= .0000E+00 OUTFLOW= .2751E+03 BASIN STORAGE= .7657E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.74	2185.83	243.50	2.24	5.00	2184.24	245.00	2.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2651E+03 EXCESS= .0000E+00 OUTFLOW= .2651E+03 BASIN STORAGE= .7911E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.78	2108.26	241.58	2.15	5.00	2104.30	245.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2551E+03 EXCESS= .0000E+00 OUTFLOW= .2551E+03 BASIN STORAGE= .8044E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.79	2078.61	243.05	2.12	5.00	2077.34	245.00	2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2511E+03 EXCESS= .0000E+00 OUTFLOW= .2511E+03 BASIN STORAGE= .7668E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.81	2053.14	241.29	2.10	5.00	2050.03	245.00	2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2483E+03 EXCESS= .0000E+00 OUTFLOW= .2483E+03 BASIN STORAGE= .7990E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.81	2040.66	242.04	2.08	5.00	2038.22	245.00	2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2463E+03 EXCESS= .0000E+00 OUTFLOW= .2464E+03 BASIN STORAGE= .6825E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.83	2014.32	243.25	2.05	5.00	2013.08	245.00	2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2432E+03 EXCESS= .0000E+00 OUTFLOW= .2432E+03 BASIN STORAGE= .6882E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

3-1	MANE	2.85	1983.59	241.95	2.02	5.00	1980.60	245.00	2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2392E+03 EXCESS= .0000E+00 OUTFLOW= .2392E+03 BASIN STORAGE= .8923E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.1	MANE	.53	2387.63	241.16	2.36	5.00	2384.70	245.00	2.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3074E+03 EXCESS= .0000E+00 OUTFLOW= .3074E+03 BASIN STORAGE= .1309E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.1	MANE	.53	2342.34	240.88	2.30	5.00	2341.59	245.00	2.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3007E+03 EXCESS= .0000E+00 OUTFLOW= .3007E+03 BASIN STORAGE= .1410E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.1	MANE	.54	2255.53	240.80	2.22	5.00	2254.17	245.00	2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2897E+03 EXCESS= .0000E+00 OUTFLOW= .2897E+03 BASIN STORAGE= .1427E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.1	MANE	.55	2171.77	244.96	2.14	5.00	2171.67	245.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2787E+03 EXCESS= .0000E+00 OUTFLOW= .2787E+03 BASIN STORAGE= .1411E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.1	MANE	.55	2143.76	244.58	2.10	5.00	2143.62	245.00	2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2744E+03 EXCESS= .0000E+00 OUTFLOW= .2744E+03 BASIN STORAGE= .1433E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.1 MANE .55 2115.91 244.77 2.08 5.00 2115.56 245.00 2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2713E+03 EXCESS= .0000E+00 OUTFLOW= .2713E+03 BASIN STORAGE= .1347E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.1 MANE .55 2102.94 244.78 2.06 5.00 2102.81 245.00 2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2691E+03 EXCESS= .0000E+00 OUTFLOW= .2691E+03 BASIN STORAGE= .1312E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.1 MANE .56 2077.77 244.89 2.04 5.00 2077.51 245.00 2.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2657E+03 EXCESS= .0000E+00 OUTFLOW= .2657E+03 BASIN STORAGE= .1323E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.1 MANE .56 2043.63 244.80 2.00 5.00 2043.51 245.00 2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2613E+03 EXCESS= .0000E+00 OUTFLOW= .2613E+03 BASIN STORAGE= .1318E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.62 2443.94 243.26 2.36 5.00 2441.64 245.00 2.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3294E+03 EXCESS= .0000E+00 OUTFLOW= .3294E+03 BASIN STORAGE= .5073E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.63 2402.96 245.03 2.31 5.00 2402.86 245.00 2.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3223E+03 EXCESS= .0000E+00 OUTFLOW= .3223E+03 BASIN STORAGE= .4308E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.67 2309.54 245.74 2.22 5.00 2309.17 245.00 2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3105E+03 EXCESS= .0000E+00 OUTFLOW= .3105E+03 BASIN STORAGE= .4458E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.71 2222.41 243.88 2.14 5.00 2219.41 245.00 2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2987E+03 EXCESS= .0000E+00 OUTFLOW= .2988E+03 BASIN STORAGE= .4531E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.72 2198.33 245.02 2.10 5.00 2198.22 245.00 2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2941E+03 EXCESS= .0000E+00 OUTFLOW= .2941E+03 BASIN STORAGE= .4656E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.74 2164.40 243.44 2.08 5.00 2163.78 245.00 2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2908E+03 EXCESS= .0000E+00 OUTFLOW= .2908E+03 BASIN STORAGE= .4688E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.74 2150.19 244.17 2.06 5.00 2147.60 245.00 2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2885E+03 EXCESS= .0000E+00 OUTFLOW= .2885E+03 BASIN STORAGE= .4167E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.75 2130.26 245.11 2.04 5.00 2129.82 245.00 2.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2848E+03 EXCESS= .0000E+00 OUTFLOW= .2848E+03 BASIN STORAGE= .4438E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.2 MANE 2.77 2088.19 243.96 2.00 5.00 2086.54 245.00 2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2801E+03 EXCESS= .0000E+00 OUTFLOW= .2801E+03 BASIN STORAGE= .5229E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.89	1379.99	210.94	2.38	5.00	1338.01	210.00	2.38

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8121E+02 EXCESS= .0000E+00 OUTFLOW= .8121E+02 BASIN STORAGE= .3072E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.90	1350.19	211.10	2.32	5.00	1309.15	210.00	2.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7948E+02 EXCESS= .0000E+00 OUTFLOW= .7948E+02 BASIN STORAGE= .2842E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.91	1304.43	211.12	2.24	5.00	1264.11	210.00	2.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7663E+02 EXCESS= .0000E+00 OUTFLOW= .7663E+02 BASIN STORAGE= .2996E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.91	1258.13	211.18	2.16	5.00	1218.71	210.00	2.16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7379E+02 EXCESS= .0000E+00 OUTFLOW= .7379E+02 BASIN STORAGE= .3076E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.92	1241.77	211.03	2.12	5.00	1201.98	210.00	2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7266E+02 EXCESS= .0000E+00 OUTFLOW= .7266E+02 BASIN STORAGE= .3693E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.92	1222.21	211.58	2.10	5.00	1188.22	210.00	2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7186E+02 EXCESS= .0000E+00 OUTFLOW= .7186E+02 BASIN STORAGE= .3533E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.92	1219.66	211.05	2.09	5.00	1180.22	210.00	2.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7130E+02 EXCESS= .0000E+00 OUTFLOW= .7130E+02 BASIN STORAGE= .3770E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.92	1200.01	210.77	2.06	5.00	1165.62	210.00	2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7039E+02 EXCESS= .0000E+00 OUTFLOW= .7039E+02 BASIN STORAGE= .3244E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.3	MANE	.93	1180.81	211.57	2.03	5.00	1146.74	210.00	2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6926E+02 EXCESS= .0000E+00 OUTFLOW= .6926E+02 BASIN STORAGE= .3821E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.38	196.51	212.21	2.35	5.00	181.23	210.00	2.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1110E+02 EXCESS= .0000E+00 OUTFLOW= .1110E+02 BASIN STORAGE= .3478E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.39	190.25	213.06	2.30	5.00	176.75	210.00	2.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1086E+02 EXCESS= .0000E+00 OUTFLOW= .1086E+02 BASIN STORAGE= .4003E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.41	185.31	212.11	2.21	5.00	171.36	215.00	2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1048E+02 EXCESS= .0000E+00 OUTFLOW= .1048E+02 BASIN STORAGE= .3777E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.43	175.11	213.61	2.13	5.00	164.09	210.00	2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1008E+02 EXCESS= .0000E+00 OUTFLOW= .1008E+02 BASIN STORAGE= .3507E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.43	174.19	211.80	2.10	5.00	162.18	215.00	2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9925E+01 EXCESS= .0000E+00 OUTFLOW= .9926E+01 BASIN STORAGE= .2682E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.44	175.03	212.23	2.08	5.00	162.46	215.00	2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9823E+01 EXCESS= .0000E+00 OUTFLOW= .9824E+01 BASIN STORAGE= .3778E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.44	174.53	212.54	2.06	5.00	162.67	215.00	2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9747E+01 EXCESS= .0000E+00 OUTFLOW= .9749E+01 BASIN STORAGE= .3415E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.45	170.21	213.05	2.03	5.00	158.21	215.00	2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9615E+01 EXCESS= .0000E+00 OUTFLOW= .9617E+01 BASIN STORAGE= .2747E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-6	MANE	2.46	164.86	213.70	2.00	5.00	154.64	215.00	2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9462E+01 EXCESS= .0000E+00 OUTFLOW= .9464E+01 BASIN STORAGE= .3579E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.14	278.40	211.40	2.26	5.00	262.51	210.00	2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1570E+02 EXCESS= .0000E+00 OUTFLOW= .1570E+02 BASIN STORAGE= .3444E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.14	278.40	212.26	2.22	5.00	258.52	210.00	2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1539E+02 EXCESS= .0000E+00 OUTFLOW= .1539E+02 BASIN STORAGE= .3869E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.16	264.80	211.58	2.14	5.00	248.04	210.00	2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1480E+02 EXCESS= .0000E+00 OUTFLOW= .1480E+02 BASIN STORAGE= .3358E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.17	253.06	213.12	2.05	5.00	238.68	210.00	2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1424E+02 EXCESS= .0000E+00 OUTFLOW= .1424E+02 BASIN STORAGE= .2739E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.18	251.26	211.57	2.02	5.00	235.15	210.00	2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1403E+02 EXCESS= .0000E+00 OUTFLOW= .1403E+02 BASIN STORAGE= .3585E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.19	252.28	212.01	2.00	5.00	233.59	210.00	2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1388E+02 EXCESS= .0000E+00 OUTFLOW= .1388E+02 BASIN STORAGE= .2874E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.19	250.79	212.33	1.99	5.00	231.96	210.00	1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1376E+02 EXCESS= .0000E+00 OUTFLOW= .1376E+02 BASIN STORAGE= .4159E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.19	244.03	212.85	1.96	5.00	227.96	210.00	1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1358E+02 EXCESS= .0000E+00 OUTFLOW= .1358E+02 BASIN STORAGE= .3414E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

R3-7	MANE	2.20	237.42	211.31	1.93	5.00	224.03	210.00	1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1336E+02 EXCESS= .0000E+00 OUTFLOW= .1336E+02 BASIN STORAGE= .4139E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.72	3864.23	215.89	2.33	5.00	3835.63	215.00	2.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4931E+03 EXCESS= .0000E+00 OUTFLOW= .4931E+03 BASIN STORAGE= .1875E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.72	3782.23	215.72	2.28	5.00	3747.77	215.00	2.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4825E+03 EXCESS= .0000E+00 OUTFLOW= .4825E+03 BASIN STORAGE= .2078E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.73	3634.57	215.94	2.20	5.00	3606.49	215.00	2.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4647E+03 EXCESS= .0000E+00 OUTFLOW= .4647E+03 BASIN STORAGE= .1970E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.75	3493.54	215.42	2.12	5.00	3470.58	215.00	2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4471E+03 EXCESS= .0000E+00 OUTFLOW= .4471E+03 BASIN STORAGE= .1956E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.75	3450.50	215.91	2.08	5.00	3420.60	215.00	2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4404E+03 EXCESS= .0000E+00 OUTFLOW= .4404E+03 BASIN STORAGE= .1916E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.75	3400.67	215.45	2.06	5.00	3376.91	215.00	2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4354E+03 EXCESS= .0000E+00 OUTFLOW= .4354E+03 BASIN STORAGE= .1977E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.76	3382.45	216.00	2.04	5.00	3354.79	215.00	2.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4319E+03 EXCESS= .0000E+00 OUTFLOW= .4319E+03 BASIN STORAGE= .1887E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.76	3339.95	215.52	2.02	5.00	3313.71	215.00	2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4264E+03 EXCESS= .0000E+00 OUTFLOW= .4264E+03 BASIN STORAGE= .1920E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4A	MANE	.76	3280.72	215.68	1.98	5.00	3249.64	215.00	1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4193E+03 EXCESS= .0000E+00 OUTFLOW= .4193E+03 BASIN STORAGE= .2137E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.25	4115.07	218.13	2.33	5.00	4004.70	215.00	2.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5146E+03 EXCESS= .0000E+00 OUTFLOW= .5147E+03 BASIN STORAGE= .6756E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.27	4030.19	217.79	2.28	5.00	3917.28	220.00	2.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5036E+03 EXCESS= .0000E+00 OUTFLOW= .5037E+03 BASIN STORAGE= .6658E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.30	3857.66	218.72	2.19	5.00	3762.95	215.00	2.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4850E+03 EXCESS= .0000E+00 OUTFLOW= .4851E+03 BASIN STORAGE= .5736E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.34	3740.97	217.29	2.11	5.00	3650.08	220.00	2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4669E+03 EXCESS= .0000E+00 OUTFLOW= .4669E+03 BASIN STORAGE= .6462E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.35	3662.87	218.51	2.08	5.00	3569.61	220.00	2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4595E+03 EXCESS= .0000E+00 OUTFLOW= .4596E+03 BASIN STORAGE= .5996E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.36	3632.14	217.22	2.06	5.00	3552.27	220.00	2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4545E+03 EXCESS= .0000E+00 OUTFLOW= .4546E+03 BASIN STORAGE= .5715E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.37	3609.93	217.77	2.04	5.00	3527.18	220.00	2.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4508E+03 EXCESS= .0000E+00 OUTFLOW= .4508E+03 BASIN STORAGE= .6711E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.38	3541.47	218.81	2.01	5.00	3460.73	220.00	2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4450E+03 EXCESS= .0000E+00 OUTFLOW= .4451E+03 BASIN STORAGE= .6470E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.4B	MANE	2.40	3492.54	218.04	1.98	5.00	3410.14	220.00	1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4376E+03 EXCESS= .0000E+00 OUTFLOW= .4376E+03 BASIN STORAGE= .6537E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.73	4329.58	219.79	2.32	5.00	4328.40	220.00	2.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5417E+03 EXCESS= .0000E+00 OUTFLOW= .5417E+03 BASIN STORAGE= .1638E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.74	4246.37	219.85	2.27	5.00	4245.72	220.00	2.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5303E+03 EXCESS= .0000E+00 OUTFLOW= .5303E+03 BASIN STORAGE= .1479E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.75	4076.98	220.15	2.19	5.00	4076.77	220.00	2.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5104E+03 EXCESS= .0000E+00 OUTFLOW= .5104E+03 BASIN STORAGE= .1582E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.76	3953.78	219.58	2.11	5.00	3953.38	220.00	2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4919E+03 EXCESS= .0000E+00 OUTFLOW= .4919E+03 BASIN STORAGE= .1667E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.76	3869.66	219.80	2.07	5.00	3869.09	220.00	2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4835E+03 EXCESS= .0000E+00 OUTFLOW= .4835E+03 BASIN STORAGE= .1511E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.76	3847.81	220.23	2.05	5.00	3846.98	220.00	2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4788E+03 EXCESS= .0000E+00 OUTFLOW= .4788E+03 BASIN STORAGE= .1445E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.77	3820.51	220.05	2.04	5.00	3819.96	220.00	2.04	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4748E+03 EXCESS= .0000E+00 OUTFLOW= .4748E+03 BASIN STORAGE= .1478E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.77	3751.99	220.00	2.01	5.00	3751.99	220.00	2.01	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4683E+03 EXCESS= .0000E+00 OUTFLOW= .4683E+03 BASIN STORAGE= .1494E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5A	MANE	.78	3693.36	220.42	1.98	5.00	3692.55	220.00	1.98	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4609E+03 EXCESS= .0000E+00 OUTFLOW= .4609E+03 BASIN STORAGE= .1640E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.74	5196.11	217.55	2.35	5.00	5068.11	220.00	2.36	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6116E+03 EXCESS= .0000E+00 OUTFLOW= .6116E+03 BASIN STORAGE= .4501E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.75	5086.93	217.60	2.31	5.00	4968.44	220.00	2.31	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5989E+03 EXCESS= .0000E+00 OUTFLOW= .5989E+03 BASIN STORAGE= .5092E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.78	4911.94	217.17	2.22	5.00	4777.88	220.00	2.22	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5769E+03 EXCESS= .0000E+00 OUTFLOW= .5769E+03 BASIN STORAGE= .4736E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.80	4726.18	218.14	2.14	5.00	4620.74	220.00	2.14	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5561E+03 EXCESS= .0000E+00 OUTFLOW= .5562E+03 BASIN STORAGE= .4598E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.82	4632.13	218.06	2.10	5.00	4530.33	220.00	2.10	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5468E+03 EXCESS= .0000E+00 OUTFLOW= .5469E+03 BASIN STORAGE= .4371E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.82	4616.44	216.84	2.08	5.00	4496.99	220.00	2.08	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5416E+03 EXCESS= .0000E+00 OUTFLOW= .5416E+03 BASIN STORAGE= .4646E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.83	4568.68	217.66	2.07	5.00	4473.18	220.00	2.07	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5371E+03 EXCESS= .0000E+00 OUTFLOW= .5371E+03 BASIN STORAGE= .4523E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.84	4504.07	217.05	2.04	5.00	4397.58	220.00	2.04	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5299E+03 EXCESS= .0000E+00 OUTFLOW= .5299E+03 BASIN STORAGE= .4845E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3.5B	MANE	1.85	4408.97	218.43	2.01	5.00	4320.56	220.00	2.01	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5216E+03 EXCESS= .0000E+00 OUTFLOW= .5216E+03 BASIN STORAGE= .4542E-02 PERCENT ERROR= .0

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

APPENDIX B

Hydraulic Calculations and Information

Worksheet for SD - 1

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.90	ft
Diameter	35	in
Discharge	61.00	ft³/s

Results

Diameter	35	in
Normal Depth	2.90	ft
Flow Area	6.61	ft²
Wetted Perimeter	9.11	ft
Hydraulic Radius	0.73	ft
Top Width	0.00	ft
Critical Depth	2.52	ft
Percent Full	100.0	%
Critical Slope	0.00914	ft/ft
Velocity	9.23	ft/s
Velocity Head	1.32	ft
Specific Energy	4.22	ft
Froude Number	0.00	
Maximum Discharge	65.62	ft³/s
Discharge Full	61.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 1

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.90	ft
Critical Depth	2.52	ft
Channel Slope	1.00	%
Critical Slope	0.00914	ft/ft

Messages

Notes

42' RCP

Cross Section for SD - 1

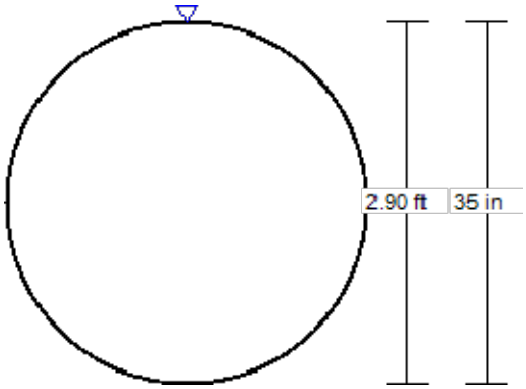
Project Description

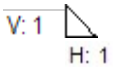
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.90	ft
Diameter	35	in
Discharge	61.00	ft³/s

Cross Section Image





Worksheet for SD - 1A

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.30	ft
Diameter	40	in
Discharge	61.00	ft³/s

Results

Diameter	40	in
Normal Depth	3.30	ft
Flow Area	8.57	ft²
Wetted Perimeter	10.38	ft
Hydraulic Radius	0.83	ft
Top Width	0.00	ft
Critical Depth	2.48	ft
Percent Full	100.0	%
Critical Slope	0.00598	ft/ft
Velocity	7.12	ft/s
Velocity Head	0.79	ft
Specific Energy	4.09	ft
Froude Number	0.00	
Maximum Discharge	65.62	ft³/s
Discharge Full	61.00	ft³/s
Slope Full	0.00500	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 1A

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.30	ft
Critical Depth	2.48	ft
Channel Slope	0.50	%
Critical Slope	0.00598	ft/ft

Messages

Notes

42' RCP

Cross Section for SD - 1A

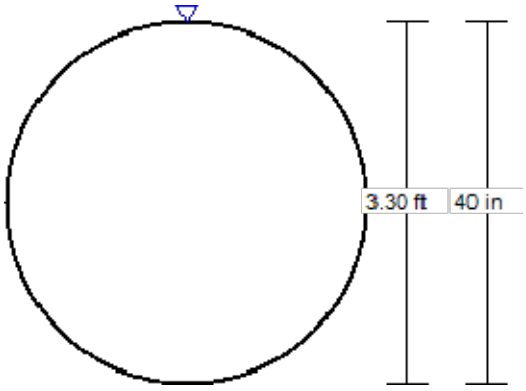
Project Description

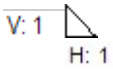
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.30	ft
Diameter	40	in
Discharge	61.00	ft³/s

Cross Section Image





Worksheet for SD - 1B

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.53	ft
Diameter	42	in
Discharge	73.00	ft³/s

Results

Diameter	42	in
Normal Depth	3.53	ft
Flow Area	9.81	ft²
Wetted Perimeter	11.10	ft
Hydraulic Radius	0.88	ft
Top Width	0.00	ft
Critical Depth	2.67	ft
Percent Full	100.0	%
Critical Slope	0.00591	ft/ft
Velocity	7.44	ft/s
Velocity Head	0.86	ft
Specific Energy	4.39	ft
Froude Number	0.00	
Maximum Discharge	78.53	ft³/s
Discharge Full	73.00	ft³/s
Slope Full	0.00500	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 1B

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.53	ft
Critical Depth	2.67	ft
Channel Slope	0.50	%
Critical Slope	0.00591	ft/ft

Messages

Notes

42' RCP

Cross Section for SD - 1B

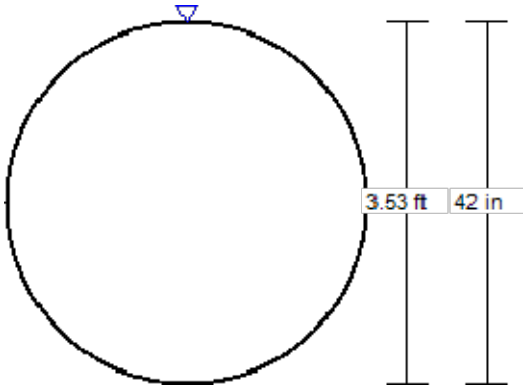
Project Description

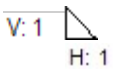
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.53	ft
Diameter	42	in
Discharge	73.00	ft³/s

Cross Section Image





Worksheet for SD - 2

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	1.04	ft
Diameter	13	in
Discharge	8.00	ft³/s

Results

Diameter	13	in
Normal Depth	1.04	ft
Flow Area	0.86	ft²
Wetted Perimeter	3.28	ft
Hydraulic Radius	0.26	ft
Top Width	0.00	ft
Critical Depth	1.02	ft
Percent Full	100.0	%
Critical Slope	0.03565	ft/ft
Velocity	9.34	ft/s
Velocity Head	1.36	ft
Specific Energy	2.40	ft
Froude Number	0.00	
Maximum Discharge	8.60	ft³/s
Discharge Full	8.00	ft³/s
Slope Full	0.04002	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 2

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.04	ft
Critical Depth	1.02	ft
Channel Slope	4.00	%
Critical Slope	0.03565	ft/ft

Messages

Notes

24" RCP

Cross Section for SD - 2

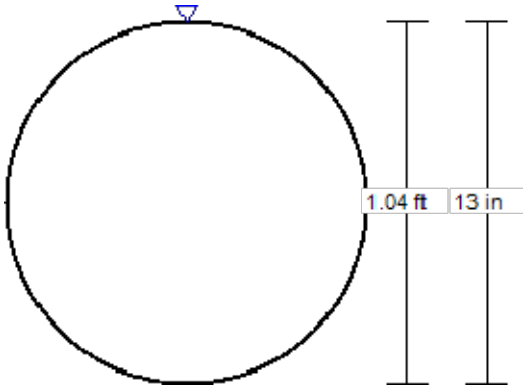
Project Description

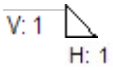
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	1.04	ft
Diameter	13	in
Discharge	8.00	ft³/s

Cross Section Image





Worksheet for SD - 2A

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	0.62	ft
Diameter	7	in
Discharge	2.00	ft³/s

Results

Diameter	7	in
Normal Depth	0.62	ft
Flow Area	0.30	ft²
Wetted Perimeter	1.95	ft
Hydraulic Radius	0.16	ft
Top Width	0.00	ft
Critical Depth	0.60	ft
Percent Full	100.0	%
Critical Slope	0.03507	ft/ft
Velocity	6.60	ft/s
Velocity Head	0.68	ft
Specific Energy	1.30	ft
Froude Number	0.00	
Maximum Discharge	2.15	ft³/s
Discharge Full	2.00	ft³/s
Slope Full	0.03994	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 2A

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.62	ft
Critical Depth	0.60	ft
Channel Slope	4.00	%
Critical Slope	0.03507	ft/ft

Messages

Notes

24" RCP

Cross Section for SD - 2A

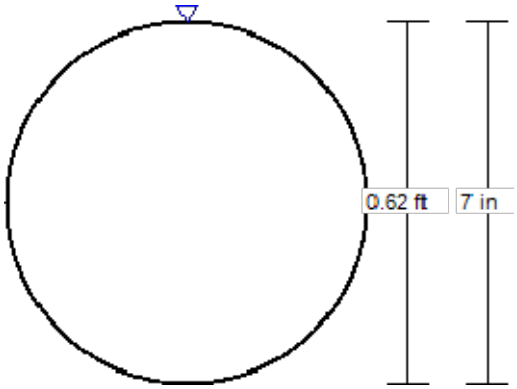
Project Description

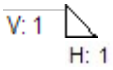
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	0.62	ft
Diameter	7	in
Discharge	2.00	ft³/s

Cross Section Image





Worksheet for SD - 3

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.81	ft
Diameter	34	in
Discharge	56.00	ft³/s

Results

Diameter	34	in
Normal Depth	2.81	ft
Flow Area	6.20	ft²
Wetted Perimeter	8.83	ft
Hydraulic Radius	0.70	ft
Top Width	0.00	ft
Critical Depth	2.44	ft
Percent Full	100.0	%
Critical Slope	0.00916	ft/ft
Velocity	9.03	ft/s
Velocity Head	1.27	ft
Specific Energy	4.08	ft
Froude Number	0.00	
Maximum Discharge	60.24	ft³/s
Discharge Full	56.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 3

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.81	ft
Critical Depth	2.44	ft
Channel Slope	1.00	%
Critical Slope	0.00916	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 3

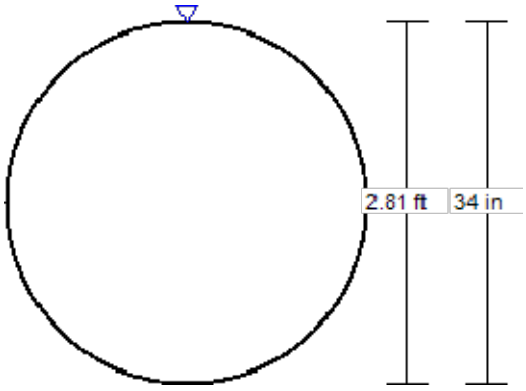
Project Description

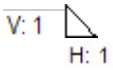
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.81	ft
Diameter	34	in
Discharge	56.00	ft³/s

Cross Section Image





Worksheet for SD - 4

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	1.62	ft
Diameter	19	in
Discharge	13.00	ft³/s

Results

Diameter	19	in
Normal Depth	1.62	ft
Flow Area	2.07	ft²
Wetted Perimeter	5.10	ft
Hydraulic Radius	0.41	ft
Top Width	0.00	ft
Critical Depth	1.36	ft
Percent Full	100.0	%
Critical Slope	0.00968	ft/ft
Velocity	6.27	ft/s
Velocity Head	0.61	ft
Specific Energy	2.24	ft
Froude Number	0.00	
Maximum Discharge	13.98	ft³/s
Discharge Full	13.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 4

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.62	ft
Critical Depth	1.36	ft
Channel Slope	1.00	%
Critical Slope	0.00968	ft/ft

Messages

Notes

30" RCP

Cross Section for SD - 4

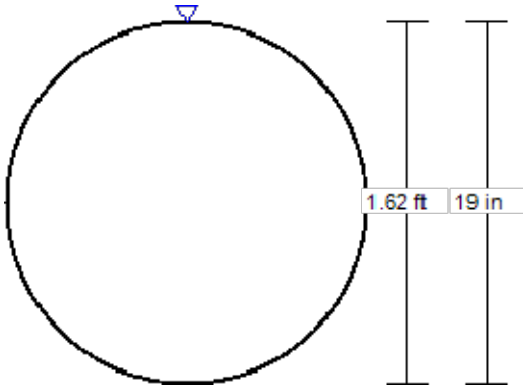
Project Description

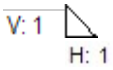
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	1.62	ft
Diameter	19	in
Discharge	13.00	ft³/s

Cross Section Image





Worksheet for SD - 5

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.67	ft
Diameter	32	in
Discharge	49.00	ft³/s

Results

Diameter	32	in
Normal Depth	2.67	ft
Flow Area	5.61	ft²
Wetted Perimeter	8.40	ft
Hydraulic Radius	0.67	ft
Top Width	0.00	ft
Critical Depth	2.31	ft
Percent Full	100.0	%
Critical Slope	0.00920	ft/ft
Velocity	8.74	ft/s
Velocity Head	1.19	ft
Specific Energy	3.86	ft
Froude Number	0.00	
Maximum Discharge	52.71	ft³/s
Discharge Full	49.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 5

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.67	ft
Critical Depth	2.31	ft
Channel Slope	1.00	%
Critical Slope	0.00920	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 5

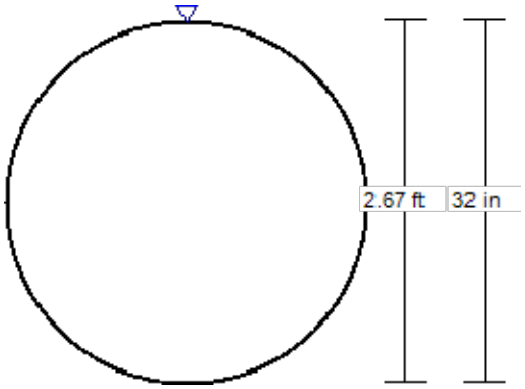
Project Description

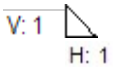
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.67	ft
Diameter	32	in
Discharge	49.00	ft³/s

Cross Section Image





Worksheet for SD - 6

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.92	ft
Diameter	35	in
Discharge	62.00	ft³/s

Results

Diameter	35	in
Normal Depth	2.92	ft
Flow Area	6.69	ft²
Wetted Perimeter	9.17	ft
Hydraulic Radius	0.73	ft
Top Width	0.00	ft
Critical Depth	2.54	ft
Percent Full	100.0	%
Critical Slope	0.00914	ft/ft
Velocity	9.26	ft/s
Velocity Head	1.33	ft
Specific Energy	4.25	ft
Froude Number	0.00	
Maximum Discharge	66.69	ft³/s
Discharge Full	62.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 6

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.92	ft
Critical Depth	2.54	ft
Channel Slope	1.00	%
Critical Slope	0.00914	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 6

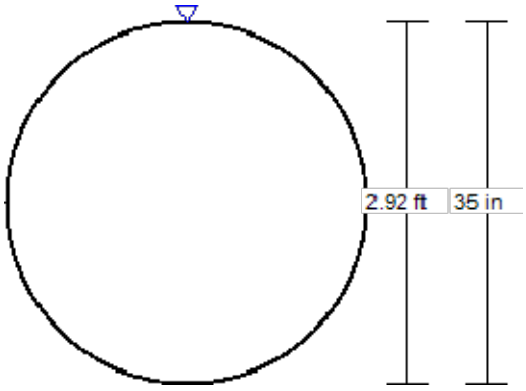
Project Description

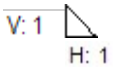
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.92	ft
Diameter	35	in
Discharge	62.00	ft³/s

Cross Section Image





Cross Section for SD - 7

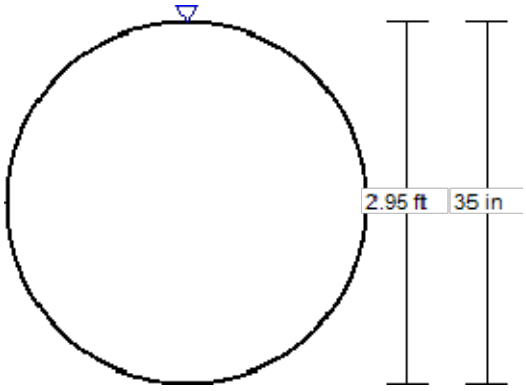
Project Description

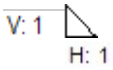
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.95	ft
Diameter	35	in
Discharge	64.00	ft³/s

Cross Section Image





Worksheet for SD - 7

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.95	ft
Diameter	35	in
Discharge	64.00	ft³/s

Results

Diameter	35	in
Normal Depth	2.95	ft
Flow Area	6.85	ft²
Wetted Perimeter	9.28	ft
Hydraulic Radius	0.74	ft
Top Width	0.00	ft
Critical Depth	2.57	ft
Percent Full	100.0	%
Critical Slope	0.00913	ft/ft
Velocity	9.34	ft/s
Velocity Head	1.36	ft
Specific Energy	4.31	ft
Froude Number	0.00	
Maximum Discharge	68.85	ft³/s
Discharge Full	64.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 7

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.95	ft
Critical Depth	2.57	ft
Channel Slope	1.00	%
Critical Slope	0.00913	ft/ft

Messages

Notes

42" RCP

Worksheet for SD - 8

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	3.90	ft
Diameter	47	in
Discharge	268.00	ft³/s

Results

Diameter	47	in
Normal Depth	3.90	ft
Flow Area	11.93	ft²
Wetted Perimeter	12.24	ft
Hydraulic Radius	0.97	ft
Top Width	0.00	ft
Critical Depth	3.86	ft
Percent Full	100.0	%
Critical Slope	0.03690	ft/ft
Velocity	22.47	ft/s
Velocity Head	7.84	ft
Specific Energy	11.74	ft
Froude Number	0.00	
Maximum Discharge	288.29	ft³/s
Discharge Full	268.00	ft³/s
Slope Full	0.04000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 8

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.90	ft
Critical Depth	3.86	ft
Channel Slope	4.00	%
Critical Slope	0.03690	ft/ft

Messages

Notes

54" RCP

Cross Section for SD - 8

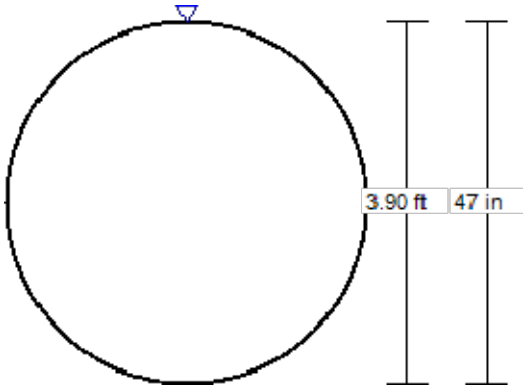
Project Description

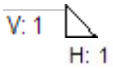
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	3.90	ft
Diameter	47	in
Discharge	268.00	ft³/s

Cross Section Image





Worksheet for SD - 9

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.85	ft
Diameter	46	in
Discharge	130.00	ft³/s

Results

Diameter	46	in
Normal Depth	3.85	ft
Flow Area	11.66	ft²
Wetted Perimeter	12.10	ft
Hydraulic Radius	0.96	ft
Top Width	0.00	ft
Critical Depth	3.41	ft
Percent Full	100.0	%
Critical Slope	0.00896	ft/ft
Velocity	11.15	ft/s
Velocity Head	1.93	ft
Specific Energy	5.78	ft
Froude Number	0.00	
Maximum Discharge	139.83	ft³/s
Discharge Full	129.99	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 9

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.85	ft
Critical Depth	3.41	ft
Channel Slope	1.00	%
Critical Slope	0.00896	ft/ft

Messages

Notes

54" RCP

Cross Section for SD - 9

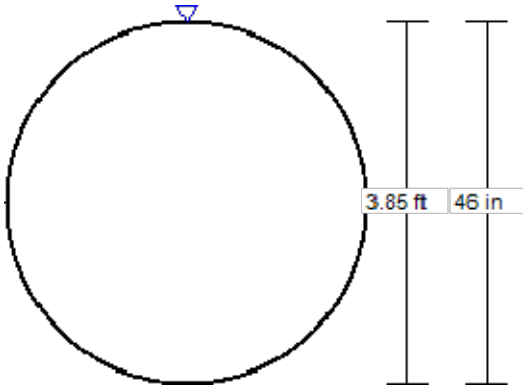
Project Description

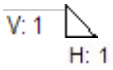
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.85	ft
Diameter	46	in
Discharge	130.00	ft³/s

Cross Section Image





Worksheet for SD - 10

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.45	ft
Diameter	29	in
Discharge	39.00	ft³/s

Results

Diameter	29	in
Normal Depth	2.45	ft
Flow Area	4.73	ft²
Wetted Perimeter	7.71	ft
Hydraulic Radius	0.61	ft
Top Width	0.00	ft
Critical Depth	2.11	ft
Percent Full	100.0	%
Critical Slope	0.00927	ft/ft
Velocity	8.25	ft/s
Velocity Head	1.06	ft
Specific Energy	3.51	ft
Froude Number	0.00	
Maximum Discharge	41.95	ft³/s
Discharge Full	39.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 10

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.45	ft
Critical Depth	2.11	ft
Channel Slope	1.00	%
Critical Slope	0.00927	ft/ft

Messages

Notes

36" RCP

Cross Section for SD - 10

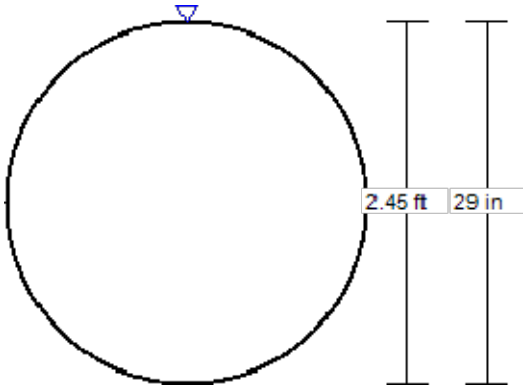
Project Description

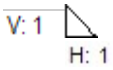
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.45	ft
Diameter	29	in
Discharge	39.00	ft³/s

Cross Section Image





Worksheet for SD - 11

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.18	ft
Diameter	38	in
Discharge	78.00	ft³/s

Results

Diameter	38	in
Normal Depth	3.18	ft
Flow Area	7.95	ft²
Wetted Perimeter	9.99	ft
Hydraulic Radius	0.80	ft
Top Width	0.00	ft
Critical Depth	2.78	ft
Percent Full	100.0	%
Critical Slope	0.00907	ft/ft
Velocity	9.81	ft/s
Velocity Head	1.50	ft
Specific Energy	4.68	ft
Froude Number	0.00	
Maximum Discharge	83.91	ft³/s
Discharge Full	78.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 11

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.18	ft
Critical Depth	2.78	ft
Channel Slope	1.00	%
Critical Slope	0.00907	ft/ft

Messages

Notes

(2) 48" RCP

Cross Section for SD - 11

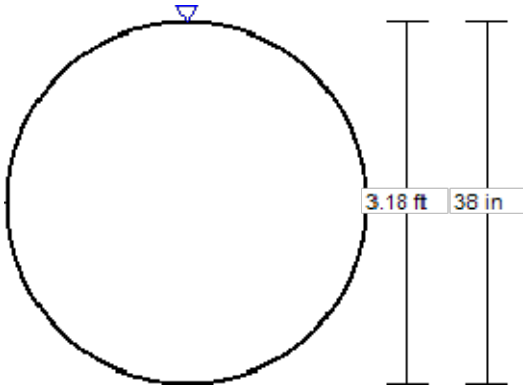
Project Description

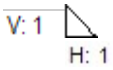
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.18	ft
Diameter	38	in
Discharge	78.00	ft³/s

Cross Section Image





Worksheet for SD - 12

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.51	ft
Diameter	42	in
Discharge	101.00	ft³/s

Results

Diameter	42	in
Normal Depth	3.51	ft
Flow Area	9.65	ft²
Wetted Perimeter	11.01	ft
Hydraulic Radius	0.88	ft
Top Width	0.00	ft
Critical Depth	3.08	ft
Percent Full	100.0	%
Critical Slope	0.00901	ft/ft
Velocity	10.47	ft/s
Velocity Head	1.70	ft
Specific Energy	5.21	ft
Froude Number	0.00	
Maximum Discharge	108.65	ft³/s
Discharge Full	101.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 12

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.51	ft
Critical Depth	3.08	ft
Channel Slope	1.00	%
Critical Slope	0.00901	ft/ft

Messages

Notes

48" RCP

Cross Section for SD - 12

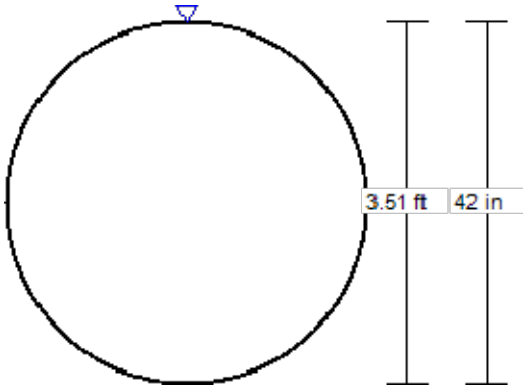
Project Description

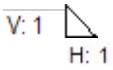
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.51	ft
Diameter	42	in
Discharge	101.00	ft³/s

Cross Section Image





Worksheet for SD - 13

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.83	ft
Diameter	34	in
Discharge	57.00	ft³/s

Results

Diameter	34	in
Normal Depth	2.83	ft
Flow Area	6.28	ft²
Wetted Perimeter	8.89	ft
Hydraulic Radius	0.71	ft
Top Width	0.00	ft
Critical Depth	2.45	ft
Percent Full	100.0	%
Critical Slope	0.00916	ft/ft
Velocity	9.07	ft/s
Velocity Head	1.28	ft
Specific Energy	4.11	ft
Froude Number	0.00	
Maximum Discharge	61.32	ft³/s
Discharge Full	57.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 13

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.83	ft
Critical Depth	2.45	ft
Channel Slope	1.00	%
Critical Slope	0.00916	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 13

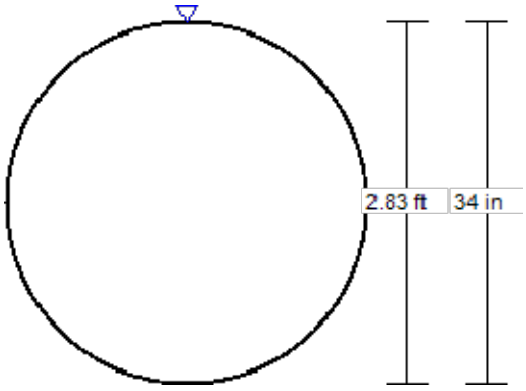
Project Description

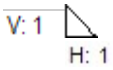
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.83	ft
Diameter	34	in
Discharge	57.00	ft³/s

Cross Section Image





Worksheet for SD - 14

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.77	ft
Diameter	33	in
Discharge	54.00	ft³/s

Results

Diameter	33	in
Normal Depth	2.77	ft
Flow Area	6.03	ft²
Wetted Perimeter	8.71	ft
Hydraulic Radius	0.69	ft
Top Width	0.00	ft
Critical Depth	2.40	ft
Percent Full	100.0	%
Critical Slope	0.00917	ft/ft
Velocity	8.95	ft/s
Velocity Head	1.24	ft
Specific Energy	4.02	ft
Froude Number	0.00	
Maximum Discharge	58.09	ft³/s
Discharge Full	54.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 14

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.77	ft
Critical Depth	2.40	ft
Channel Slope	1.00	%
Critical Slope	0.00917	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 14

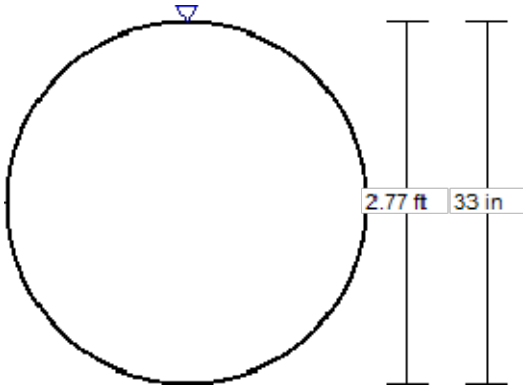
Project Description

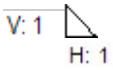
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.77	ft
Diameter	33	in
Discharge	54.00	ft³/s

Cross Section Image





Worksheet for SD - 15

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.70	%
Normal Depth	3.82	ft
Diameter	46	in
Discharge	244.00	ft³/s

Results

Diameter	46	in
Normal Depth	3.82	ft
Flow Area	11.45	ft²
Wetted Perimeter	11.99	ft
Hydraulic Radius	0.95	ft
Top Width	0.00	ft
Critical Depth	3.77	ft
Percent Full	100.0	%
Critical Slope	0.03392	ft/ft
Velocity	21.31	ft/s
Velocity Head	7.06	ft
Specific Energy	10.88	ft
Froude Number	0.00	
Maximum Discharge	262.47	ft³/s
Discharge Full	244.00	ft³/s
Slope Full	0.03700	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 15

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.82	ft
Critical Depth	3.77	ft
Channel Slope	3.70	%
Critical Slope	0.03392	ft/ft

Messages

Notes

60" RCP

Cross Section for SD - 15

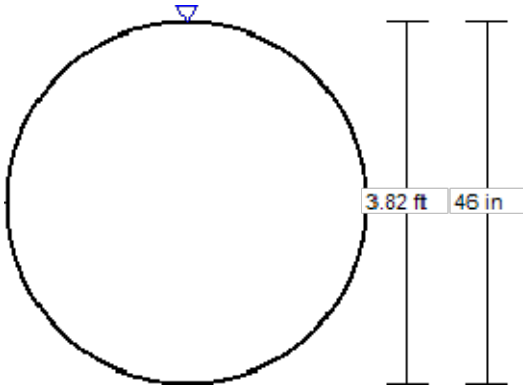
Project Description

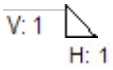
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.70	%
Normal Depth	3.82	ft
Diameter	46	in
Discharge	244.00	ft³/s

Cross Section Image





Worksheet for SD - 16

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.70	%
Normal Depth	2.93	ft
Diameter	35	in
Discharge	121.00	ft³/s

Results

Diameter	35	in
Normal Depth	2.93	ft
Flow Area	6.77	ft²
Wetted Perimeter	9.22	ft
Hydraulic Radius	0.73	ft
Top Width	0.00	ft
Critical Depth	2.90	ft
Percent Full	100.0	%
Critical Slope	0.03369	ft/ft
Velocity	17.89	ft/s
Velocity Head	4.97	ft
Specific Energy	7.91	ft
Froude Number	0.00	
Maximum Discharge	130.16	ft³/s
Discharge Full	121.00	ft³/s
Slope Full	0.03700	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 16

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.93	ft
Critical Depth	2.90	ft
Channel Slope	3.70	%
Critical Slope	0.03369	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 16

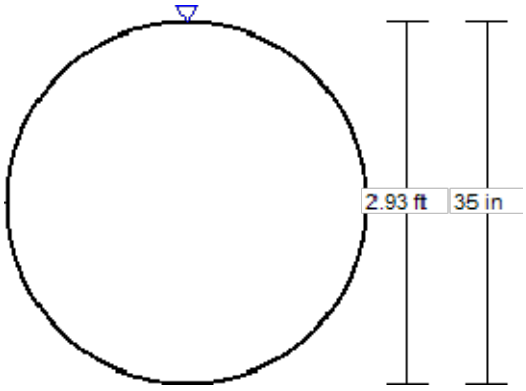
Project Description

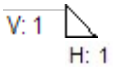
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.70	%
Normal Depth	2.93	ft
Diameter	35	in
Discharge	121.00	ft³/s

Cross Section Image





Worksheet for SD - 17

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	4.19	ft
Diameter	50	in
Discharge	115.00	ft³/s

Results

Diameter	50	in
Normal Depth	4.19	ft
Flow Area	13.79	ft²
Wetted Perimeter	13.17	ft
Hydraulic Radius	1.05	ft
Top Width	0.00	ft
Critical Depth	3.21	ft
Percent Full	100.0	%
Critical Slope	0.00573	ft/ft
Velocity	8.34	ft/s
Velocity Head	1.08	ft
Specific Energy	5.27	ft
Froude Number	0.00	
Maximum Discharge	123.71	ft³/s
Discharge Full	115.00	ft³/s
Slope Full	0.00500	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 17

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.19	ft
Critical Depth	3.21	ft
Channel Slope	0.50	%
Critical Slope	0.00573	ft/ft

Messages

Notes

30" RCP

Cross Section for SD - 17

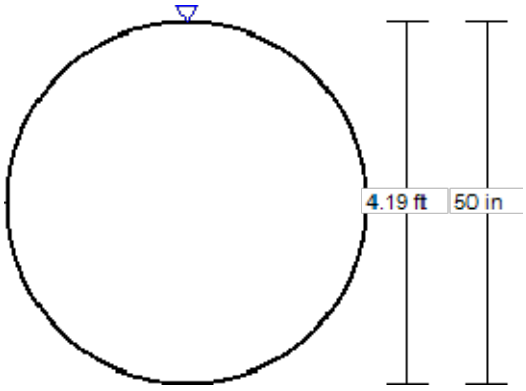
Project Description

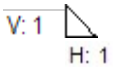
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	4.19	ft
Diameter	50	in
Discharge	115.00	ft³/s

Cross Section Image





Worksheet for SD - 18

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	2.49	ft
Diameter	30	in
Discharge	81.00	ft³/s

Results

Diameter	30	in
Normal Depth	2.49	ft
Flow Area	4.86	ft²
Wetted Perimeter	7.82	ft
Hydraulic Radius	0.62	ft
Top Width	0.00	ft
Critical Depth	2.46	ft
Percent Full	100.0	%
Critical Slope	0.03649	ft/ft
Velocity	16.66	ft/s
Velocity Head	4.31	ft
Specific Energy	6.80	ft
Froude Number	0.00	
Maximum Discharge	87.13	ft³/s
Discharge Full	81.00	ft³/s
Slope Full	0.04000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 18

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.49	ft
Critical Depth	2.46	ft
Channel Slope	4.00	%
Critical Slope	0.03649	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 18

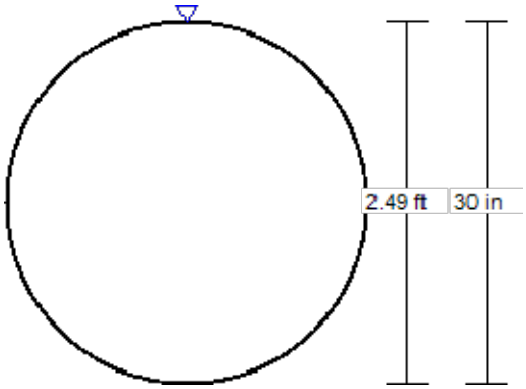
Project Description

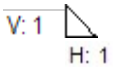
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	2.49	ft
Diameter	30	in
Discharge	81.00	ft³/s

Cross Section Image





Worksheet for SD - 18A

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	2.56	ft
Diameter	31	in
Discharge	87.00	ft³/s

Results

Diameter	31	in
Normal Depth	2.56	ft
Flow Area	5.13	ft²
Wetted Perimeter	8.03	ft
Hydraulic Radius	0.64	ft
Top Width	0.00	ft
Critical Depth	2.52	ft
Percent Full	100.0	%
Critical Slope	0.03652	ft/ft
Velocity	16.96	ft/s
Velocity Head	4.47	ft
Specific Energy	7.03	ft
Froude Number	0.00	
Maximum Discharge	93.57	ft³/s
Discharge Full	86.99	ft³/s
Slope Full	0.04001	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 18A

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.56	ft
Critical Depth	2.52	ft
Channel Slope	4.00	%
Critical Slope	0.03652	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 18A

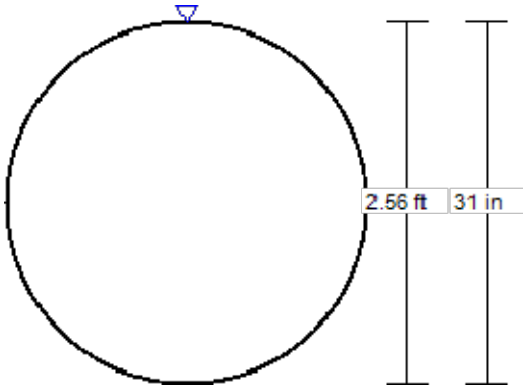
Project Description

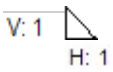
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	2.56	ft
Diameter	31	in
Discharge	87.00	ft³/s

Cross Section Image





Worksheet for SD - 19

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.40	ft
Diameter	41	in
Discharge	66.00	ft³/s

Results

Diameter	41	in
Normal Depth	3.40	ft
Flow Area	9.10	ft²
Wetted Perimeter	10.69	ft
Hydraulic Radius	0.85	ft
Top Width	0.00	ft
Critical Depth	2.56	ft
Percent Full	100.0	%
Critical Slope	0.00595	ft/ft
Velocity	7.26	ft/s
Velocity Head	0.82	ft
Specific Energy	4.22	ft
Froude Number	0.00	
Maximum Discharge	71.00	ft³/s
Discharge Full	66.00	ft³/s
Slope Full	0.00500	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 19

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.40	ft
Critical Depth	2.56	ft
Channel Slope	0.50	%
Critical Slope	0.00595	ft/ft

Messages

Notes

48" RCP

Cross Section for SD - 19

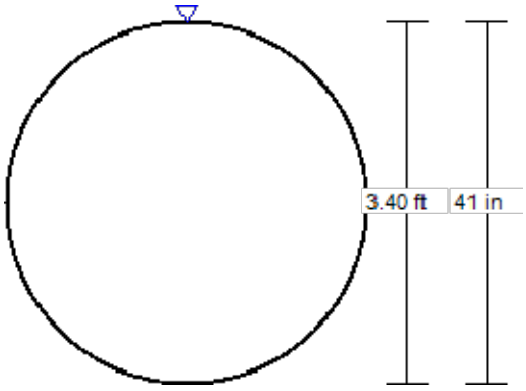
Project Description

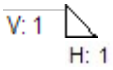
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.40	ft
Diameter	41	in
Discharge	66.00	ft³/s

Cross Section Image





Cross Section for SD - 19A

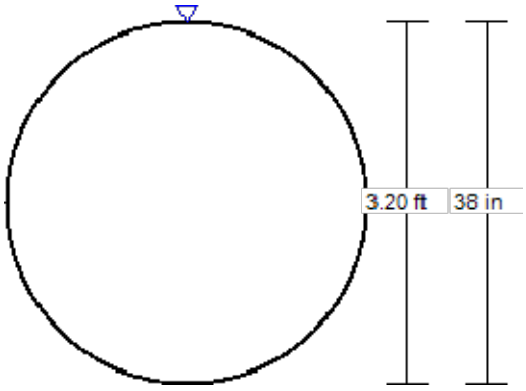
Project Description

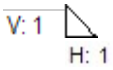
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.20	ft
Diameter	38	in
Discharge	56.00	ft³/s

Cross Section Image





Worksheet for SD - 19A

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50	%
Normal Depth	3.20	ft
Diameter	38	in
Discharge	56.00	ft³/s

Results

Diameter	38	in
Normal Depth	3.20	ft
Flow Area	8.04	ft²
Wetted Perimeter	10.05	ft
Hydraulic Radius	0.80	ft
Top Width	0.00	ft
Critical Depth	2.40	ft
Percent Full	100.0	%
Critical Slope	0.00602	ft/ft
Velocity	6.96	ft/s
Velocity Head	0.75	ft
Specific Energy	3.95	ft
Froude Number	0.00	
Maximum Discharge	60.24	ft³/s
Discharge Full	56.00	ft³/s
Slope Full	0.00500	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 19A

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.20	ft
Critical Depth	2.40	ft
Channel Slope	0.50	%
Critical Slope	0.00602	ft/ft

Messages

Notes

48" RCP

Worksheet for SD - 20

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.00	%
Normal Depth	2.17	ft
Diameter	26	in
Discharge	74.00	ft³/s

Results

Diameter	26	in
Normal Depth	2.17	ft
Flow Area	3.68	ft²
Wetted Perimeter	6.80	ft
Hydraulic Radius	0.54	ft
Top Width	0.00	ft
Critical Depth	2.16	ft
Percent Full	100.0	%
Critical Slope	0.06609	ft/ft
Velocity	20.09	ft/s
Velocity Head	6.27	ft
Specific Energy	8.44	ft
Froude Number	0.00	
Maximum Discharge	79.61	ft³/s
Discharge Full	74.01	ft³/s
Slope Full	0.06999	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 20

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.17	ft
Critical Depth	2.16	ft
Channel Slope	7.00	%
Critical Slope	0.06609	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 20

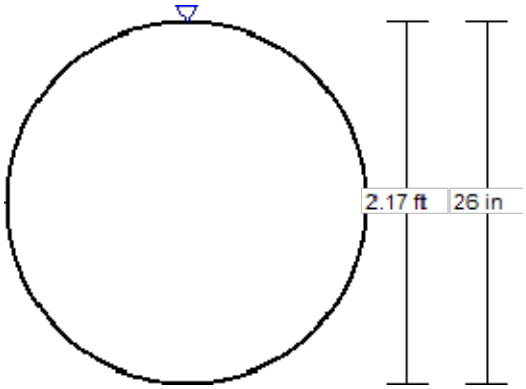
Project Description

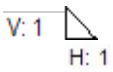
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.00	%
Normal Depth	2.17	ft
Diameter	26	in
Discharge	74.00	ft³/s

Cross Section Image





Worksheet for SD - 21

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.60	%
Normal Depth	1.48	ft
Diameter	18	in
Discharge	24.00	ft³/s

Results

Diameter	18	in
Normal Depth	1.48	ft
Flow Area	1.72	ft²
Wetted Perimeter	4.65	ft
Hydraulic Radius	0.37	ft
Top Width	0.00	ft
Critical Depth	1.47	ft
Percent Full	100.0	%
Critical Slope	0.05168	ft/ft
Velocity	13.94	ft/s
Velocity Head	3.02	ft
Specific Energy	4.50	ft
Froude Number	0.00	
Maximum Discharge	25.83	ft³/s
Discharge Full	24.01	ft³/s
Slope Full	0.05596	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 21

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.48	ft
Critical Depth	1.47	ft
Channel Slope	5.60	%
Critical Slope	0.05168	ft/ft

Messages

Notes

30" RCP

Cross Section for SD - 21

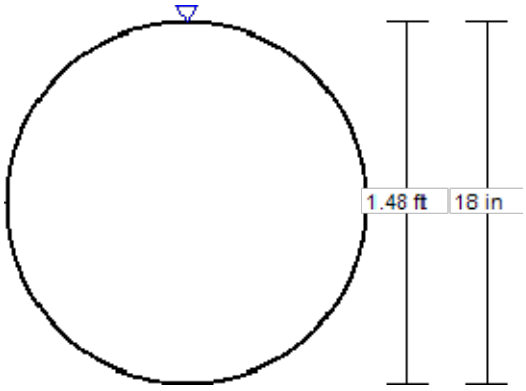
Project Description

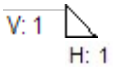
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.60	%
Normal Depth	1.48	ft
Diameter	18	in
Discharge	24.00	ft³/s

Cross Section Image





Worksheet for SD - 21A

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.60	%
Normal Depth	1.18	ft
Diameter	14	in
Discharge	13.00	ft³/s

Results

Diameter	14	in
Normal Depth	1.18	ft
Flow Area	1.09	ft²
Wetted Perimeter	3.70	ft
Hydraulic Radius	0.29	ft
Top Width	0.00	ft
Critical Depth	1.16	ft
Percent Full	100.0	%
Critical Slope	0.05142	ft/ft
Velocity	11.96	ft/s
Velocity Head	2.22	ft
Specific Energy	3.40	ft
Froude Number	0.00	
Maximum Discharge	13.98	ft³/s
Discharge Full	13.00	ft³/s
Slope Full	0.05600	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 21A

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.18	ft
Critical Depth	1.16	ft
Channel Slope	5.60	%
Critical Slope	0.05142	ft/ft

Messages

Notes

30" RCP

Cross Section for SD - 21A

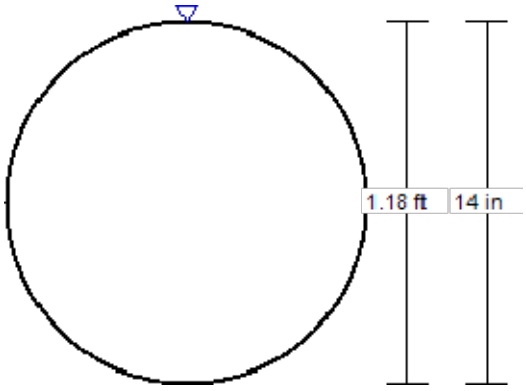
Project Description

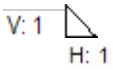
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.60	%
Normal Depth	1.18	ft
Diameter	14	in
Discharge	13.00	ft³/s

Cross Section Image





Worksheet for SD - 22

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	1.62	ft
Diameter	19	in
Discharge	13.00	ft³/s

Results

Diameter	19	in
Normal Depth	1.62	ft
Flow Area	2.07	ft²
Wetted Perimeter	5.10	ft
Hydraulic Radius	0.41	ft
Top Width	0.00	ft
Critical Depth	1.36	ft
Percent Full	100.0	%
Critical Slope	0.00968	ft/ft
Velocity	6.27	ft/s
Velocity Head	0.61	ft
Specific Energy	2.24	ft
Froude Number	0.00	
Maximum Discharge	13.98	ft³/s
Discharge Full	13.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 22

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.62	ft
Critical Depth	1.36	ft
Channel Slope	1.00	%
Critical Slope	0.00968	ft/ft

Messages

Notes

30" RCP

Cross Section for SD - 22

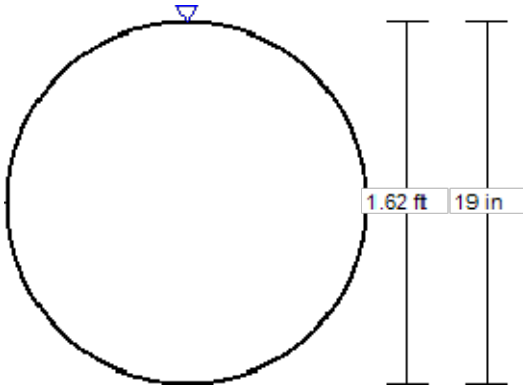
Project Description

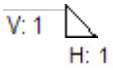
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	1.62	ft
Diameter	19	in
Discharge	13.00	ft³/s

Cross Section Image





Worksheet for SD - 23

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.71	ft
Diameter	33	in
Discharge	51.00	ft³/s

Results

Diameter	33	in
Normal Depth	2.71	ft
Flow Area	5.78	ft²
Wetted Perimeter	8.52	ft
Hydraulic Radius	0.68	ft
Top Width	0.00	ft
Critical Depth	2.35	ft
Percent Full	100.0	%
Critical Slope	0.00919	ft/ft
Velocity	8.82	ft/s
Velocity Head	1.21	ft
Specific Energy	3.92	ft
Froude Number	0.00	
Maximum Discharge	54.86	ft³/s
Discharge Full	51.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 23

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.71	ft
Critical Depth	2.35	ft
Channel Slope	1.00	%
Critical Slope	0.00919	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 23

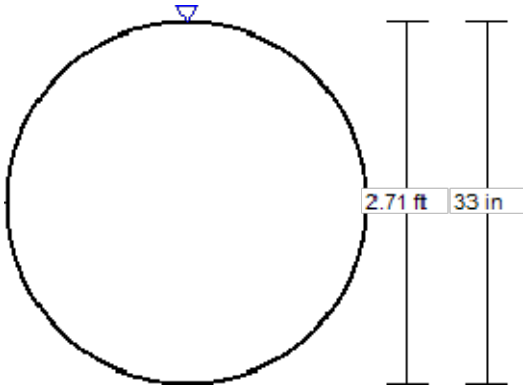
Project Description

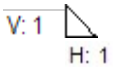
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.71	ft
Diameter	33	in
Discharge	51.00	ft³/s

Cross Section Image





Worksheet for SD - 23A

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.41	ft
Diameter	29	in
Discharge	37.00	ft³/s

Results

Diameter	29	in
Normal Depth	2.41	ft
Flow Area	4.54	ft²
Wetted Perimeter	7.56	ft
Hydraulic Radius	0.60	ft
Top Width	0.00	ft
Critical Depth	2.06	ft
Percent Full	100.0	%
Critical Slope	0.00929	ft/ft
Velocity	8.14	ft/s
Velocity Head	1.03	ft
Specific Energy	3.44	ft
Froude Number	0.00	
Maximum Discharge	39.80	ft³/s
Discharge Full	37.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 23A

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.41	ft
Critical Depth	2.06	ft
Channel Slope	1.00	%
Critical Slope	0.00929	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 23A

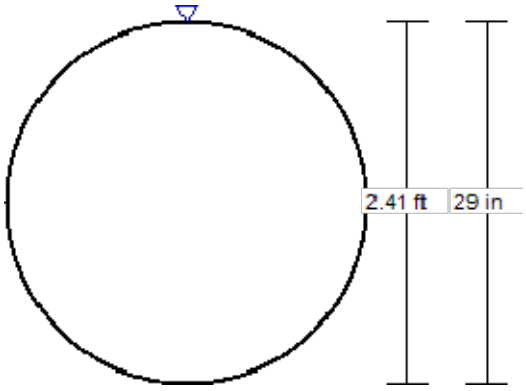
Project Description

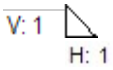
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.41	ft
Diameter	29	in
Discharge	37.00	ft³/s

Cross Section Image





Worksheet for SD - 24

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.51	ft
Diameter	42	in
Discharge	101.00	ft³/s

Results

Diameter	42	in
Normal Depth	3.51	ft
Flow Area	9.65	ft²
Wetted Perimeter	11.01	ft
Hydraulic Radius	0.88	ft
Top Width	0.00	ft
Critical Depth	3.08	ft
Percent Full	100.0	%
Critical Slope	0.00901	ft/ft
Velocity	10.47	ft/s
Velocity Head	1.70	ft
Specific Energy	5.21	ft
Froude Number	0.00	
Maximum Discharge	108.65	ft³/s
Discharge Full	101.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 24

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.51	ft
Critical Depth	3.08	ft
Channel Slope	1.00	%
Critical Slope	0.00901	ft/ft

Messages

Notes

48" RCP

Cross Section for SD - 24

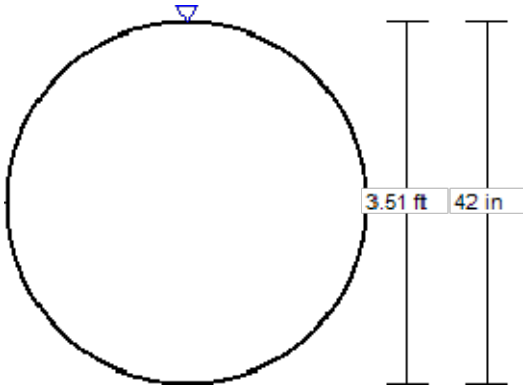
Project Description

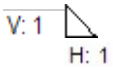
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.51	ft
Diameter	42	in
Discharge	101.00	ft³/s

Cross Section Image





Worksheet for SD - 25

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.40	%
Height	6.00	ft
Bottom Width	6.00	ft
Discharge	240.00	ft³/s

Results

Normal Depth	1.35	ft
Flow Area	8.10	ft²
Wetted Perimeter	8.70	ft
Hydraulic Radius	0.93	ft
Top Width	6.00	ft
Critical Depth	3.68	ft
Percent Full	22.5	%
Critical Slope	0.00464	ft/ft
Velocity	29.64	ft/s
Velocity Head	13.65	ft
Specific Energy	15.00	ft
Froude Number	4.50	
Discharge Full	1466.78	ft³/s
Slope Full	2.76399	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	22.49	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 25

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.35	ft
Critical Depth	3.68	ft
Channel Slope	7.40	%
Critical Slope	0.00464	ft/ft

Messages

Notes

8'X6' RCB

Cross Section for SD - 25

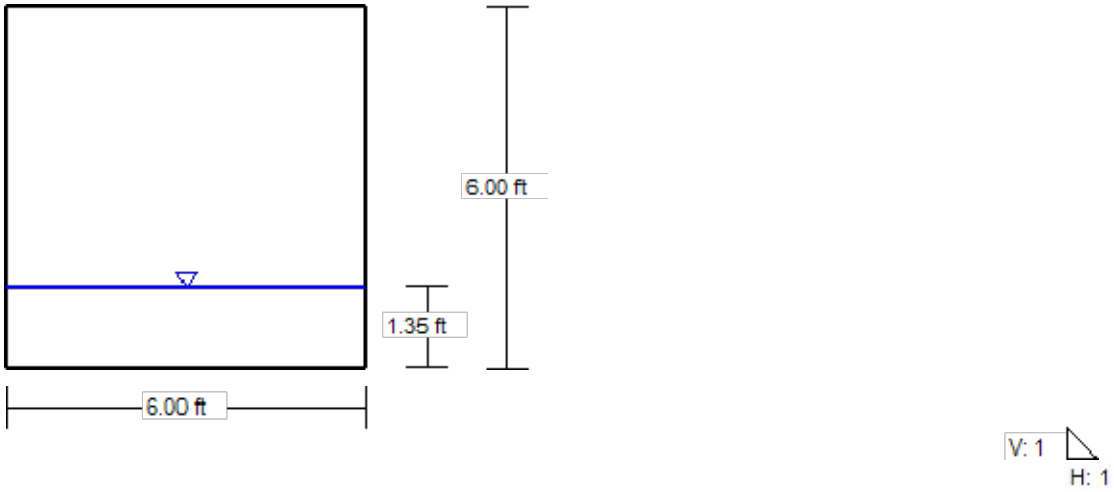
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.40	%
Normal Depth	1.35	ft
Height	6.00	ft
Bottom Width	6.00	ft
Discharge	240.00	ft³/s

Cross Section Image



Worksheet for SD - 26

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.40	%
Height	6.00	ft
Bottom Width	6.00	ft
Discharge	311.00	ft³/s

Results

Normal Depth	1.61	ft
Flow Area	9.69	ft²
Wetted Perimeter	9.23	ft
Hydraulic Radius	1.05	ft
Top Width	6.00	ft
Critical Depth	4.37	ft
Percent Full	26.9	%
Critical Slope	0.00499	ft/ft
Velocity	32.11	ft/s
Velocity Head	16.02	ft
Specific Energy	17.64	ft
Froude Number	4.46	
Discharge Full	1466.78	ft³/s
Slope Full	1.64603	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	26.90	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 26

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.61	ft
Critical Depth	4.37	ft
Channel Slope	7.40	%
Critical Slope	0.00499	ft/ft

Messages

Notes

8'X6' RCB

Cross Section for SD - 26

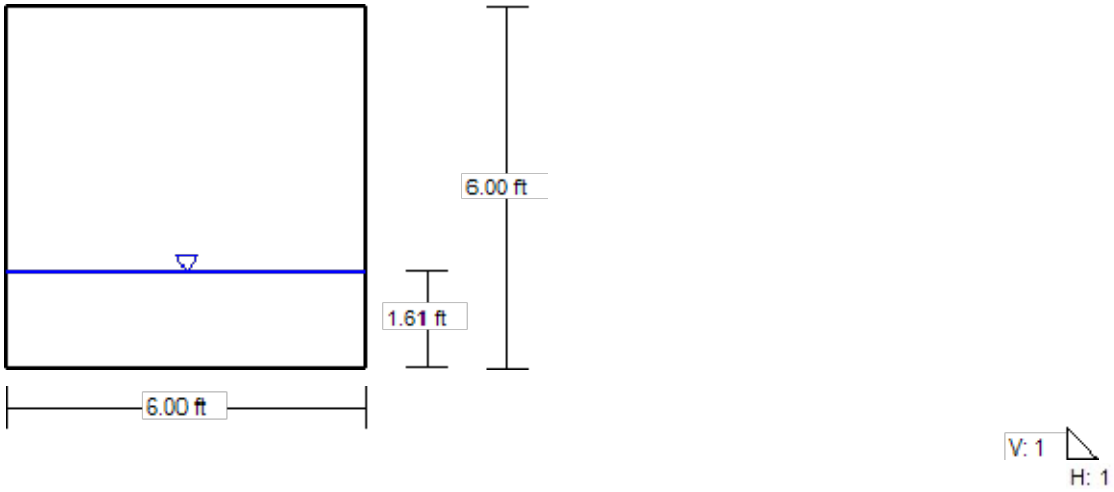
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	7.40	%
Normal Depth	1.61	ft
Height	6.00	ft
Bottom Width	6.00	ft
Discharge	311.00	ft³/s

Cross Section Image



Worksheet for SD - 28

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.00	%
Normal Depth	2.63	ft
Diameter	32	in
Discharge	81.00	ft³/s

Results

Diameter	32	in
Normal Depth	2.63	ft
Flow Area	5.42	ft²
Wetted Perimeter	8.25	ft
Hydraulic Radius	0.66	ft
Top Width	0.00	ft
Critical Depth	2.57	ft
Percent Full	100.0	%
Critical Slope	0.02677	ft/ft
Velocity	14.95	ft/s
Velocity Head	3.48	ft
Specific Energy	6.10	ft
Froude Number	0.00	
Maximum Discharge	87.13	ft³/s
Discharge Full	81.00	ft³/s
Slope Full	0.03000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 28

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.63	ft
Critical Depth	2.57	ft
Channel Slope	3.00	%
Critical Slope	0.02677	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 28

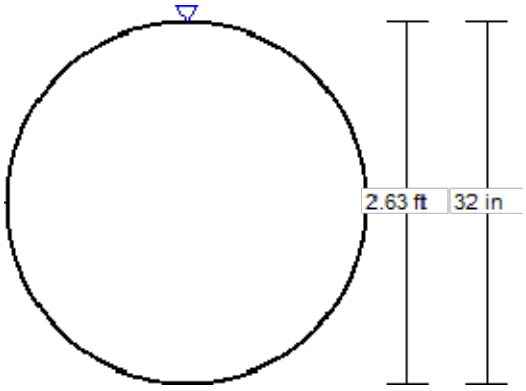
Project Description

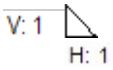
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.00	%
Normal Depth	2.63	ft
Diameter	32	in
Discharge	81.00	ft³/s

Cross Section Image





Worksheet for SD - 29

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	5.00	ft
Height	5.00	ft
Bottom Width	6.00	ft
Discharge	421.67	ft³/s

Results

Flow Area	30.00	ft²
Wetted Perimeter	22.00	ft
Hydraulic Radius	1.36	ft
Top Width	6.00	ft
Critical Depth	5.35	ft
Percent Full	100.0	%
Critical Slope	0.00552	ft/ft
Velocity	14.06	ft/s
Velocity Head	3.07	ft
Specific Energy	8.07	ft
Froude Number	1.11	
Discharge Full	421.67	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 29

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	5.00	ft
Critical Depth	5.35	ft
Channel Slope	1.00	%
Critical Slope	0.00552	ft/ft

Messages

Notes

6'X6' RCB

Cross Section for SD - 29

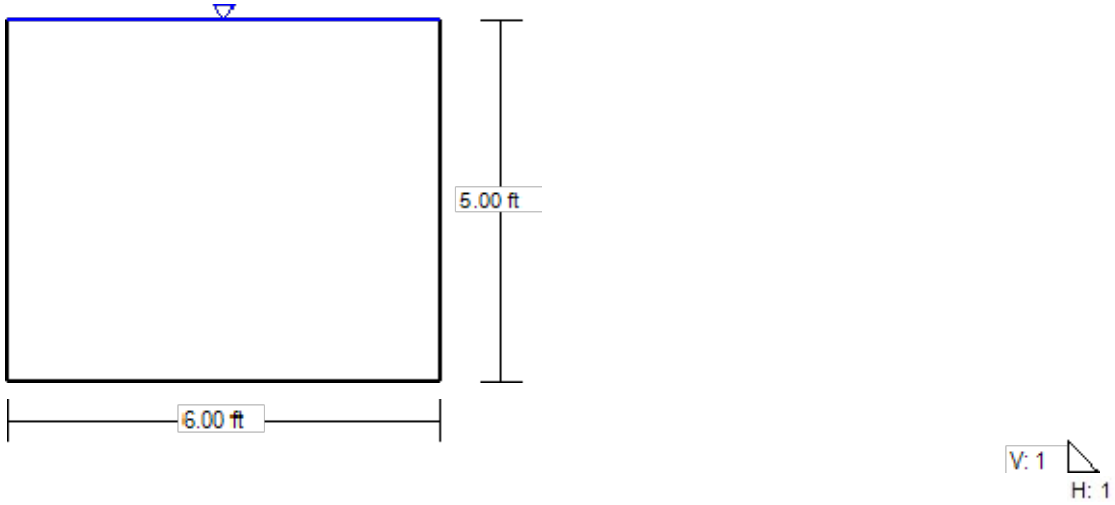
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	5.00	ft
Height	5.00	ft
Bottom Width	6.00	ft
Discharge	421.67	ft³/s

Cross Section Image



Worksheet for SD - 30

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	6.00	ft
Height	6.00	ft
Bottom Width	7.00	ft
Discharge	511.95	ft³/s

Results

Flow Area	42.00	ft²
Wetted Perimeter	26.00	ft
Hydraulic Radius	1.62	ft
Top Width	7.00	ft
Critical Depth	5.50	ft
Percent Full	100.0	%
Critical Slope	0.00491	ft/ft
Velocity	12.19	ft/s
Velocity Head	2.31	ft
Specific Energy	8.31	ft
Froude Number	0.88	
Discharge Full	511.95	ft³/s
Slope Full	0.00600	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 30

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.00	ft
Critical Depth	5.50	ft
Channel Slope	0.60	%
Critical Slope	0.00491	ft/ft

Messages

Notes

7'X6' RCB

Cross Section for SD - 30

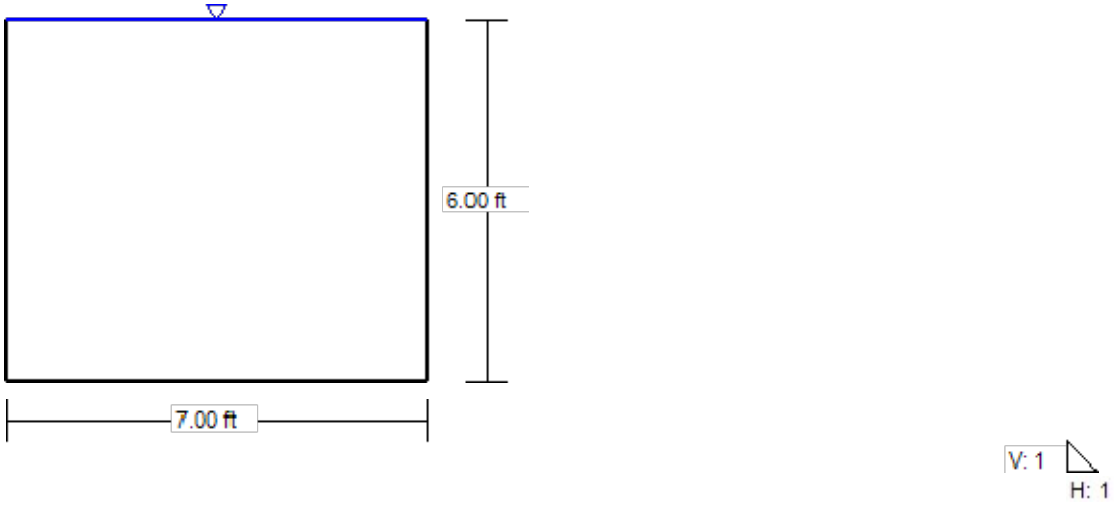
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	6.00	ft
Height	6.00	ft
Bottom Width	7.00	ft
Discharge	511.95	ft³/s

Cross Section Image



Worksheet for SD - 31

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	6.00	ft
Height	6.00	ft
Bottom Width	8.00	ft
Discharge	608.73	ft³/s

Results

Flow Area	48.00	ft²
Wetted Perimeter	28.00	ft
Hydraulic Radius	1.71	ft
Top Width	8.00	ft
Critical Depth	5.65	ft
Percent Full	100.0	%
Critical Slope	0.00447	ft/ft
Velocity	12.68	ft/s
Velocity Head	2.50	ft
Specific Energy	8.50	ft
Froude Number	0.91	
Discharge Full	608.73	ft³/s
Slope Full	0.00600	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 31

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.00	ft
Critical Depth	5.65	ft
Channel Slope	0.60	%
Critical Slope	0.00447	ft/ft

Messages

Notes

8'X6' RCB

Cross Section for SD - 31

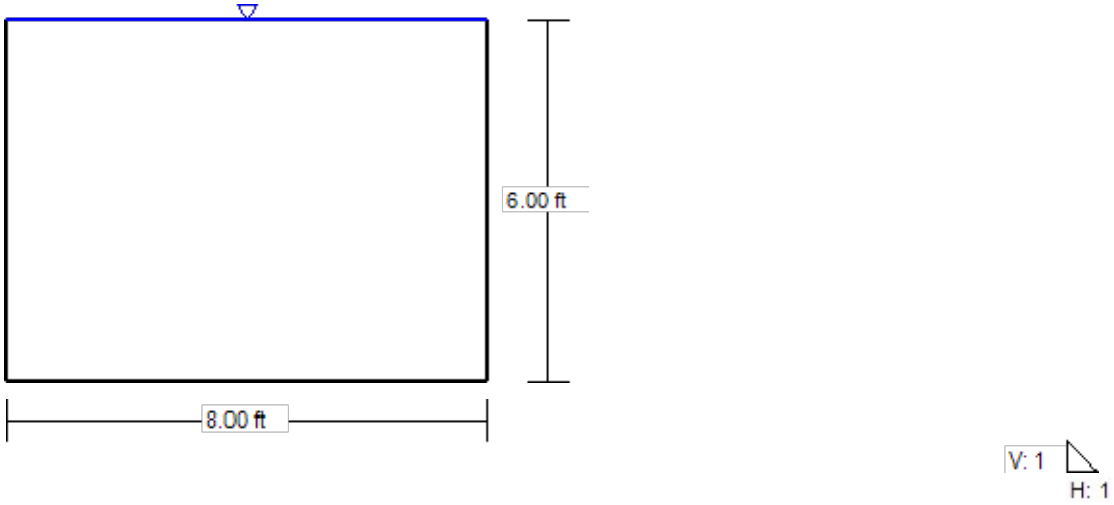
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	6.00	ft
Height	6.00	ft
Bottom Width	8.00	ft
Discharge	608.73	ft³/s

Cross Section Image



Worksheet for SD - 32

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	6.00	ft
Height	6.00	ft
Bottom Width	10.00	ft
Discharge	807.75	ft³/s

Results

Flow Area	60.00	ft²
Wetted Perimeter	32.00	ft
Hydraulic Radius	1.88	ft
Top Width	10.00	ft
Critical Depth	5.88	ft
Percent Full	100.0	%
Critical Slope	0.00385	ft/ft
Velocity	13.46	ft/s
Velocity Head	2.82	ft
Specific Energy	8.82	ft
Froude Number	0.97	
Discharge Full	807.75	ft³/s
Slope Full	0.00600	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 32

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.00	ft
Critical Depth	5.88	ft
Channel Slope	0.60	%
Critical Slope	0.00385	ft/ft

Messages

Notes

10'X6' RCB

Cross Section for SD - 32

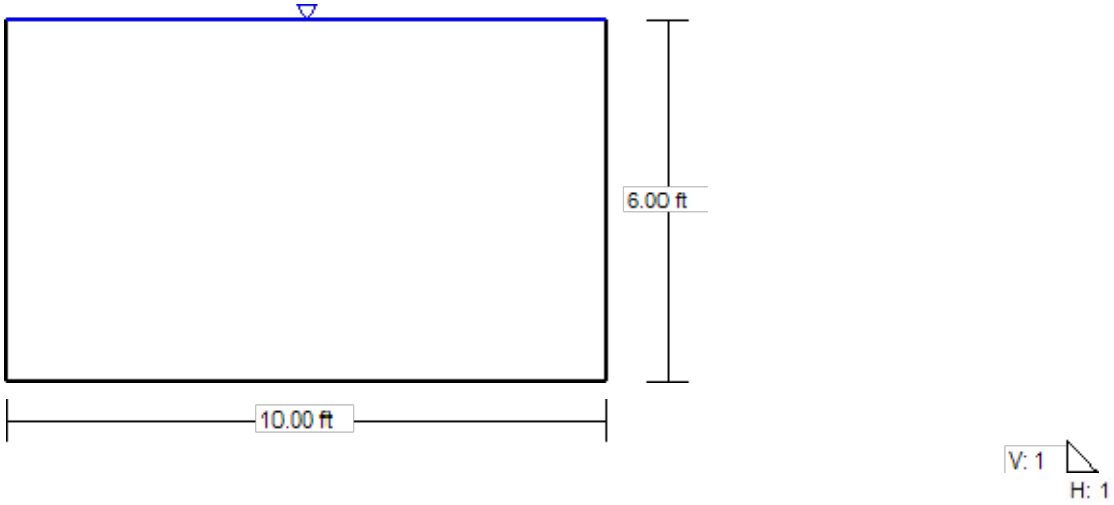
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	6.00	ft
Height	6.00	ft
Bottom Width	10.00	ft
Discharge	807.75	ft³/s

Cross Section Image



Worksheet for SD - 33

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	7.00	ft
Height	7.00	ft
Bottom Width	10.00	ft
Discharge	1003.01	ft³/s

Results

Flow Area	70.00	ft²
Wetted Perimeter	34.00	ft
Hydraulic Radius	2.06	ft
Top Width	10.00	ft
Critical Depth	6.79	ft
Percent Full	100.0	%
Critical Slope	0.00408	ft/ft
Velocity	14.33	ft/s
Velocity Head	3.19	ft
Specific Energy	10.19	ft
Froude Number	0.95	
Discharge Full	1003.01	ft³/s
Slope Full	0.00600	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 33

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.00	ft
Critical Depth	6.79	ft
Channel Slope	0.60	%
Critical Slope	0.00408	ft/ft

Messages

Notes

10'X7' RCB

Cross Section for SD - 33

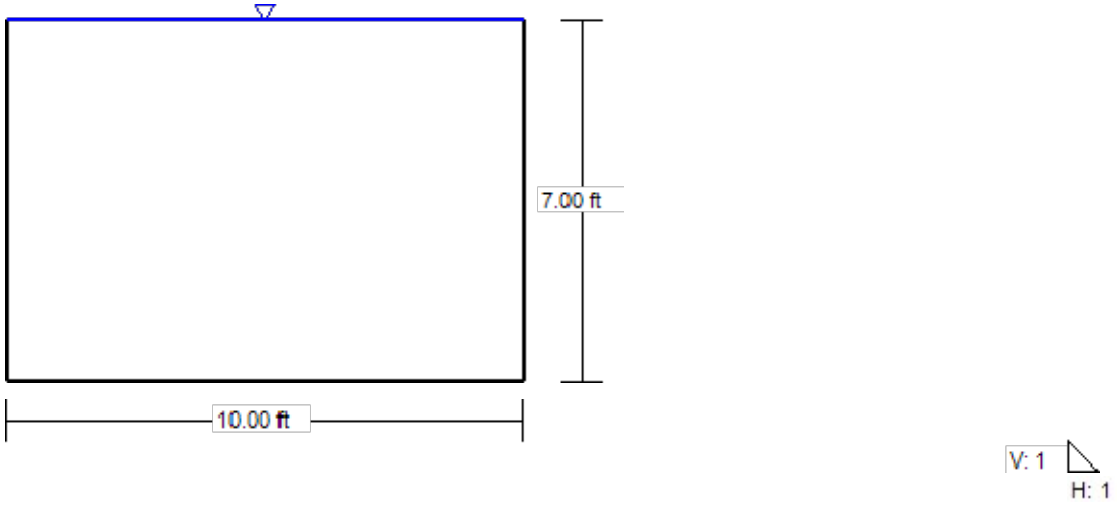
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.60	%
Normal Depth	7.00	ft
Height	7.00	ft
Bottom Width	10.00	ft
Discharge	1003.01	ft³/s

Cross Section Image



Worksheet for SD - 34

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	6.60	%
Normal Depth	2.36	ft
Diameter	28	in
Discharge	90.00	ft³/s

Results

Diameter	28	in
Normal Depth	2.36	ft
Flow Area	4.36	ft²
Wetted Perimeter	7.40	ft
Hydraulic Radius	0.59	ft
Top Width	0.00	ft
Critical Depth	2.34	ft
Percent Full	100.0	%
Critical Slope	0.06222	ft/ft
Velocity	20.64	ft/s
Velocity Head	6.62	ft
Specific Energy	8.97	ft
Froude Number	0.00	
Maximum Discharge	96.81	ft³/s
Discharge Full	90.00	ft³/s
Slope Full	0.06600	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 34

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.36	ft
Critical Depth	2.34	ft
Channel Slope	6.60	%
Critical Slope	0.06222	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 34

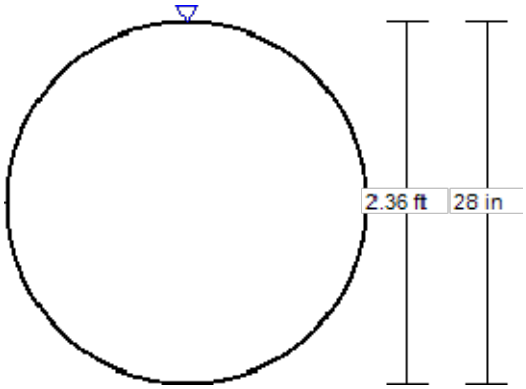
Project Description

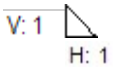
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	6.60	%
Normal Depth	2.36	ft
Diameter	28	in
Discharge	90.00	ft³/s

Cross Section Image





Worksheet for SD - 35

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.95	ft
Diameter	35	in
Discharge	64.00	ft³/s

Results

Diameter	35	in
Normal Depth	2.95	ft
Flow Area	6.85	ft²
Wetted Perimeter	9.28	ft
Hydraulic Radius	0.74	ft
Top Width	0.00	ft
Critical Depth	2.57	ft
Percent Full	100.0	%
Critical Slope	0.00913	ft/ft
Velocity	9.34	ft/s
Velocity Head	1.36	ft
Specific Energy	4.31	ft
Froude Number	0.00	
Maximum Discharge	68.85	ft³/s
Discharge Full	64.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 35

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.95	ft
Critical Depth	2.57	ft
Channel Slope	1.00	%
Critical Slope	0.00913	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 35

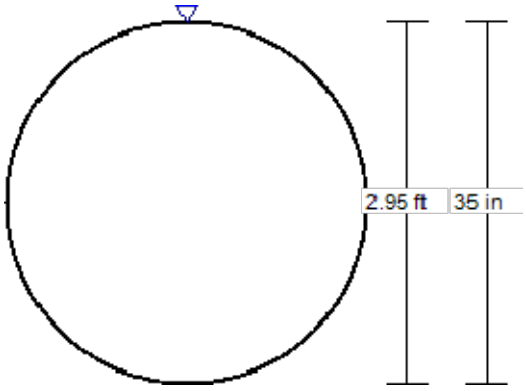
Project Description

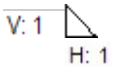
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.95	ft
Diameter	35	in
Discharge	64.00	ft³/s

Cross Section Image





Worksheet for SD - 36

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.00	%
Height	6.00	ft
Bottom Width	6.00	ft
Discharge	375.00	ft³/s

Results

Normal Depth	2.55	ft
Flow Area	15.30	ft²
Wetted Perimeter	11.10	ft
Hydraulic Radius	1.38	ft
Top Width	6.00	ft
Critical Depth	4.95	ft
Percent Full	42.5	%
Critical Slope	0.00530	ft/ft
Velocity	24.52	ft/s
Velocity Head	9.34	ft
Specific Energy	11.89	ft
Froude Number	2.71	
Discharge Full	933.92	ft³/s
Slope Full	0.18606	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	42.49	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 36

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.55	ft
Critical Depth	4.95	ft
Channel Slope	3.00	%
Critical Slope	0.00530	ft/ft

Messages

Notes

8'X6' RCB

Cross Section for SD - 36

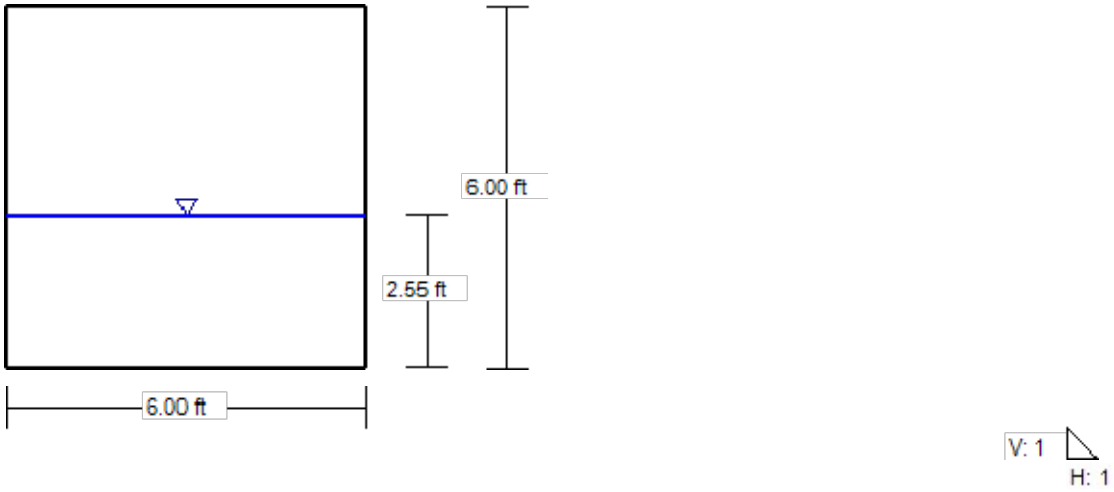
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	3.00	%
Normal Depth	2.55	ft
Height	6.00	ft
Bottom Width	6.00	ft
Discharge	375.00	ft³/s

Cross Section Image



Worksheet for SD - 37

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.39	%
Normal Depth	5.50	ft
Diameter	66	in
Discharge	209.70	ft³/s

Results

Discharge	209.70	ft³/s
Normal Depth	5.50	ft
Flow Area	23.76	ft²
Wetted Perimeter	17.28	ft
Hydraulic Radius	1.38	ft
Top Width	0.00	ft
Critical Depth	4.05	ft
Percent Full	100.0	%
Critical Slope	0.00489	ft/ft
Velocity	8.83	ft/s
Velocity Head	1.21	ft
Specific Energy	6.71	ft
Froude Number	0.00	
Maximum Discharge	225.58	ft³/s
Discharge Full	209.70	ft³/s
Slope Full	0.00390	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 37

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.50	ft
Critical Depth	4.05	ft
Channel Slope	0.39	%
Critical Slope	0.00489	ft/ft

Messages

Notes

EX 66" RCP

Cross Section for SD - 37

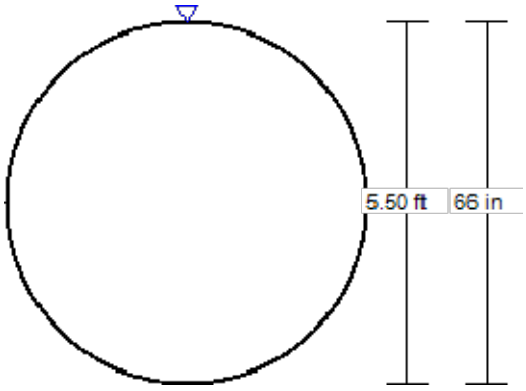
Project Description

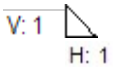
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.39	%
Normal Depth	5.50	ft
Diameter	66	in
Discharge	209.70	ft³/s

Cross Section Image





Worksheet for SD - 51

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.26	ft
Diameter	39	in
Discharge	83.00	ft³/s

Results

Diameter	39	in
Normal Depth	3.26	ft
Flow Area	8.33	ft²
Wetted Perimeter	10.23	ft
Hydraulic Radius	0.81	ft
Top Width	0.00	ft
Critical Depth	2.85	ft
Percent Full	100.0	%
Critical Slope	0.00906	ft/ft
Velocity	9.97	ft/s
Velocity Head	1.54	ft
Specific Energy	4.80	ft
Froude Number	0.00	
Maximum Discharge	89.28	ft³/s
Discharge Full	83.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 51

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.26	ft
Critical Depth	2.85	ft
Channel Slope	1.00	%
Critical Slope	0.00906	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 51

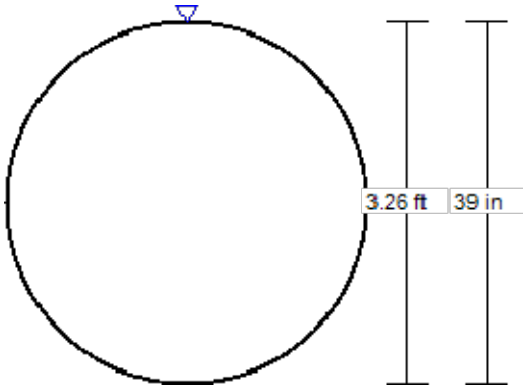
Project Description

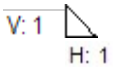
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.26	ft
Diameter	39	in
Discharge	83.00	ft³/s

Cross Section Image





Worksheet for SD - 52

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.63	ft
Diameter	44	in
Discharge	111.00	ft³/s

Results

Diameter	44	in
Normal Depth	3.63	ft
Flow Area	10.36	ft²
Wetted Perimeter	11.41	ft
Hydraulic Radius	0.91	ft
Top Width	0.00	ft
Critical Depth	3.20	ft
Percent Full	100.0	%
Critical Slope	0.00899	ft/ft
Velocity	10.72	ft/s
Velocity Head	1.78	ft
Specific Energy	5.42	ft
Froude Number	0.00	
Maximum Discharge	119.41	ft³/s
Discharge Full	111.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 52

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.63	ft
Critical Depth	3.20	ft
Channel Slope	1.00	%
Critical Slope	0.00899	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 52

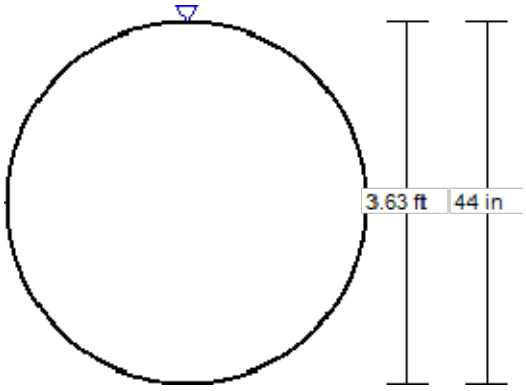
Project Description

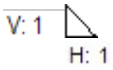
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.63	ft
Diameter	44	in
Discharge	111.00	ft³/s

Cross Section Image





Worksheet for SD - 53

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.63	ft
Diameter	32	in
Discharge	47.00	ft³/s

Results

Diameter	32	in
Normal Depth	2.63	ft
Flow Area	5.44	ft²
Wetted Perimeter	8.27	ft
Hydraulic Radius	0.66	ft
Top Width	0.00	ft
Critical Depth	2.27	ft
Percent Full	100.0	%
Critical Slope	0.00922	ft/ft
Velocity	8.64	ft/s
Velocity Head	1.16	ft
Specific Energy	3.79	ft
Froude Number	0.00	
Maximum Discharge	50.56	ft³/s
Discharge Full	47.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 53

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.63	ft
Critical Depth	2.27	ft
Channel Slope	1.00	%
Critical Slope	0.00922	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 53

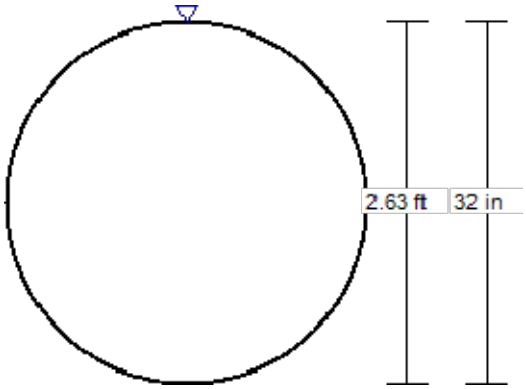
Project Description

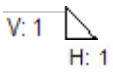
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.63	ft
Diameter	32	in
Discharge	47.00	ft³/s

Cross Section Image





Worksheet for SD - 54

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.17	ft
Diameter	38	in
Discharge	77.00	ft³/s

Results

Diameter	38	in
Normal Depth	3.17	ft
Flow Area	7.87	ft²
Wetted Perimeter	9.95	ft
Hydraulic Radius	0.79	ft
Top Width	0.00	ft
Critical Depth	2.77	ft
Percent Full	100.0	%
Critical Slope	0.00908	ft/ft
Velocity	9.78	ft/s
Velocity Head	1.49	ft
Specific Energy	4.65	ft
Froude Number	0.00	
Maximum Discharge	82.83	ft³/s
Discharge Full	77.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 54

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.17	ft
Critical Depth	2.77	ft
Channel Slope	1.00	%
Critical Slope	0.00908	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 54

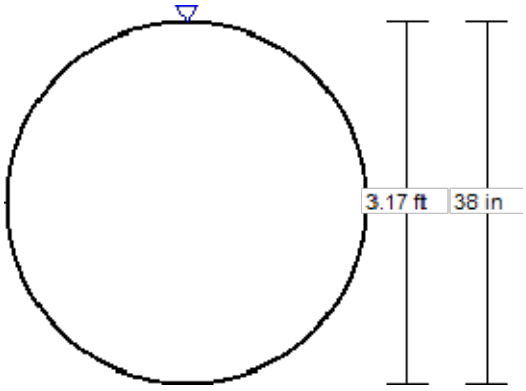
Project Description

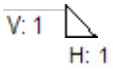
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	3.17	ft
Diameter	38	in
Discharge	77.00	ft³/s

Cross Section Image





Worksheet for SD - 55

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.81	ft
Diameter	34	in
Discharge	56.00	ft³/s

Results

Diameter	34	in
Normal Depth	2.81	ft
Flow Area	6.20	ft²
Wetted Perimeter	8.83	ft
Hydraulic Radius	0.70	ft
Top Width	0.00	ft
Critical Depth	2.44	ft
Percent Full	100.0	%
Critical Slope	0.00916	ft/ft
Velocity	9.03	ft/s
Velocity Head	1.27	ft
Specific Energy	4.08	ft
Froude Number	0.00	
Maximum Discharge	60.24	ft³/s
Discharge Full	56.00	ft³/s
Slope Full	0.01000	ft/ft
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
Average End Depth Over Rise	0.00	%

Worksheet for SD - 55

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.81	ft
Critical Depth	2.44	ft
Channel Slope	1.00	%
Critical Slope	0.00916	ft/ft

Messages

Notes

42" RCP

Cross Section for SD - 55

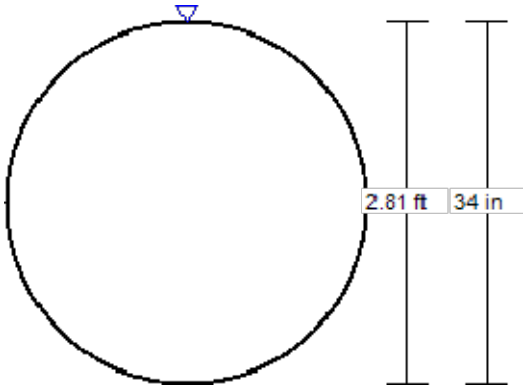
Project Description

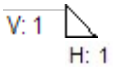
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00	%
Normal Depth	2.81	ft
Diameter	34	in
Discharge	56.00	ft³/s

Cross Section Image





Worksheet for SD - 56

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	5.00	%
Height	9.00	ft
Bottom Width	18.00	ft
Discharge	923.00	ft³/s

Results

Normal Depth	1.62	ft
Flow Area	29.21	ft²
Wetted Perimeter	21.25	ft
Hydraulic Radius	1.37	ft
Top Width	18.00	ft
Critical Depth	4.34	ft
Percent Full	18.0	%
Critical Slope	0.00255	ft/ft
Velocity	31.60	ft/s
Velocity Head	15.52	ft
Specific Energy	17.14	ft
Froude Number	4.37	
Discharge Full	8612.57	ft³/s
Slope Full	4.35341	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	18.03	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 56

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.62	ft
Critical Depth	4.34	ft
Channel Slope	5.00	%
Critical Slope	0.00255	ft/ft

Messages

Notes

8'X6' RCB

Cross Section for SD - 56

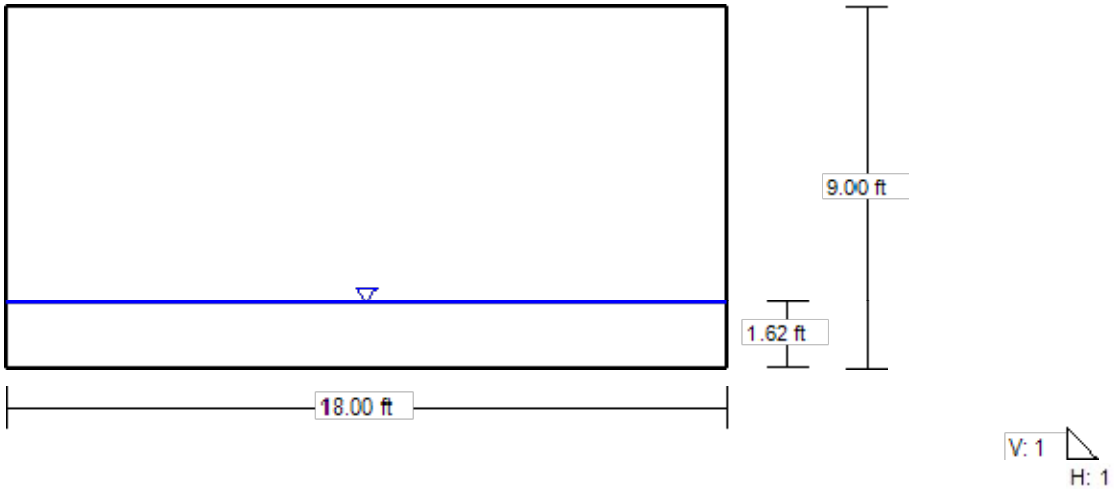
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

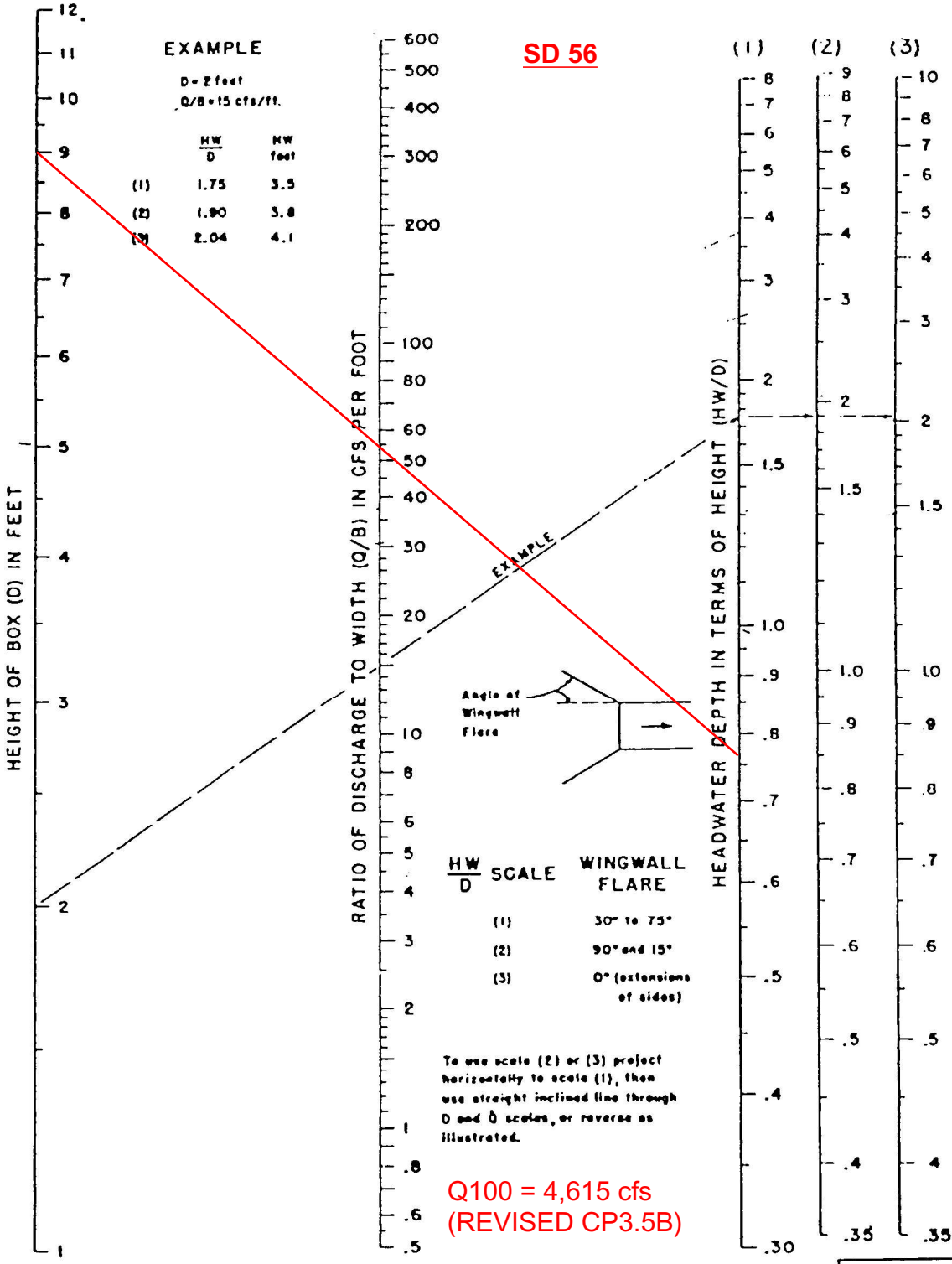
Input Data

Roughness Coefficient	0.013	
Channel Slope	5.00	%
Normal Depth	1.62	ft
Height	9.00	ft
Bottom Width	18.00	ft
Discharge	923.00	ft³/s

Cross Section Image



NOMOGRAPH – INLET CONTROL BOX CULVERT



SD 56

Q100 = 4,615 cfs
(REVISED CP3.5B)

HW/D = 0.78 (2 ft FREEBOARD)
Q/B = 51.3 (5 BARRELS)
(5) 18'x9' RCB

Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS No.5, 1985

FIGURE 1004

Worksheet for SD - 58

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Height	9.00	ft
Bottom Width	18.00	ft
Discharge	923.00	ft³/s

Results

Normal Depth	1.74	ft
Flow Area	31.38	ft²
Wetted Perimeter	21.49	ft
Hydraulic Radius	1.46	ft
Top Width	18.00	ft
Critical Depth	4.34	ft
Percent Full	19.4	%
Critical Slope	0.00255	ft/ft
Velocity	29.42	ft/s
Velocity Head	13.45	ft
Specific Energy	15.19	ft
Froude Number	3.93	
Discharge Full	7703.31	ft³/s
Slope Full	2.78504	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	19.37	%
Downstream Velocity	Infinity	ft/s

Worksheet for SD - 58

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.74	ft
Critical Depth	4.34	ft
Channel Slope	4.00	%
Critical Slope	0.00255	ft/ft

Messages

Notes

8'X6' RCB

Cross Section for SD - 58

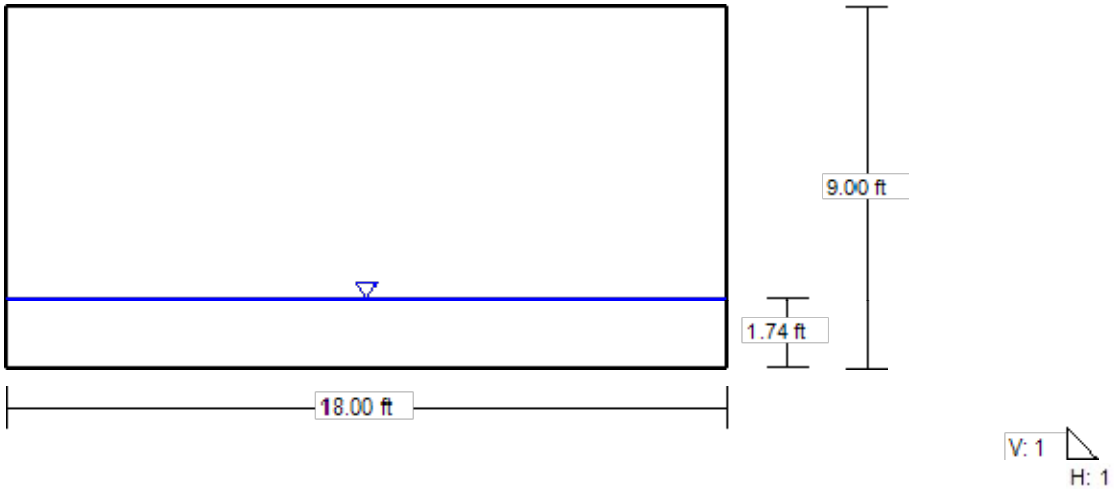
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

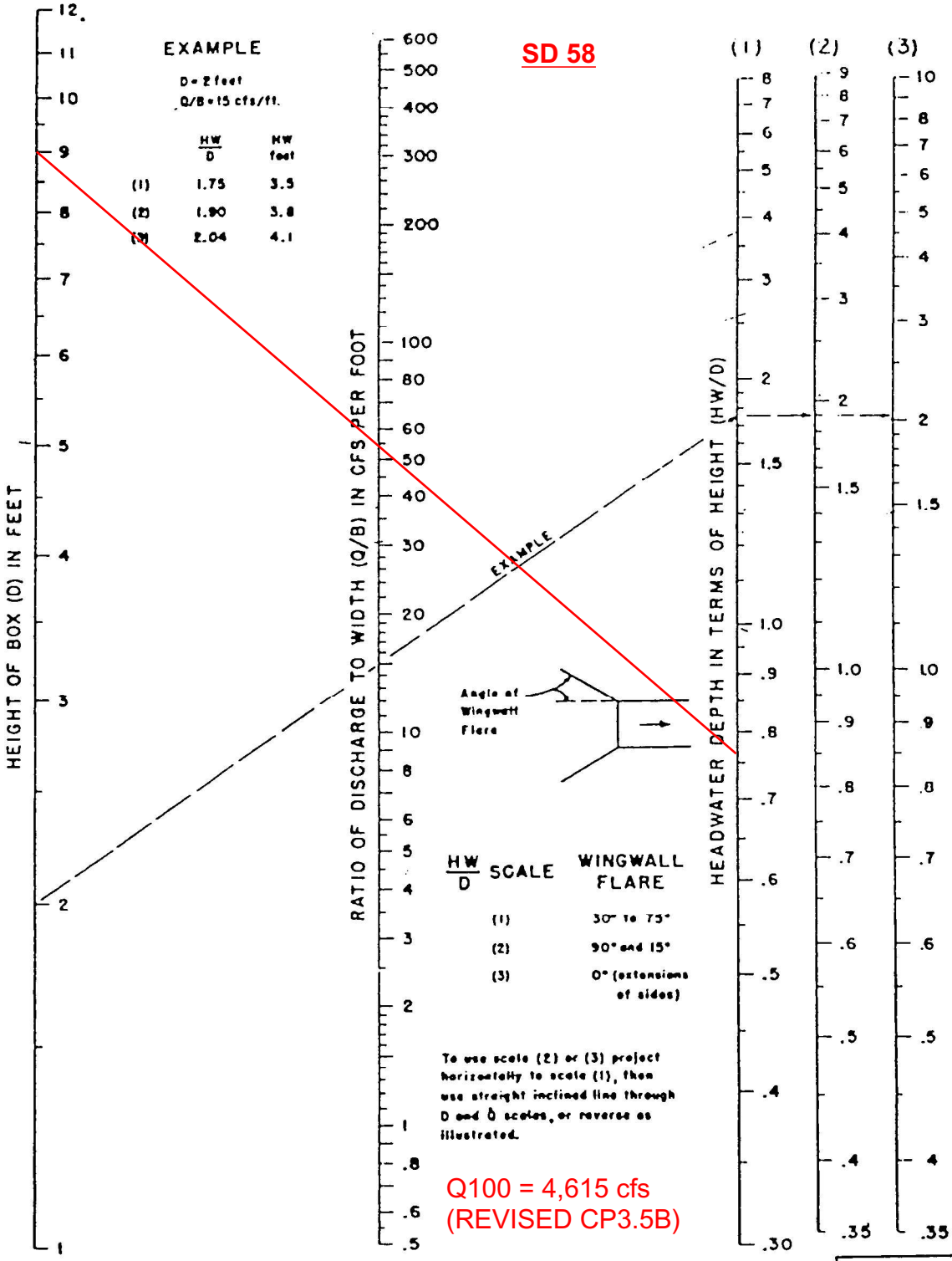
Input Data

Roughness Coefficient	0.013	
Channel Slope	4.00	%
Normal Depth	1.74	ft
Height	9.00	ft
Bottom Width	18.00	ft
Discharge	923.00	ft³/s

Cross Section Image



NOMOGRAPH – INLET CONTROL BOX CULVERT



SD 58

Q100 = 4,615 cfs
(REVISED CP3.5B)

HW/D = 0.78 (2 ft FREEBOARD)
Q/B = 51.3 (5 BARRELS)
(5) 18'x9' RCB

Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS No.5, 1985

FIGURE 1004

HYDRAULIC MODEL FOR EXISTING STORM DRAIN IN SKY VISTA DR AND FAR HILLS (REFERENCED FROM V25 SKY VISTA W/ REVISIONS)

```
                                                                    Far_Hills.WSW
T1 Far Hills Avenue RCB                                                    0
T2 Foxhill to Sky Vista
T3 Mainline
SO  21752.3803415.300  5                          3421.300
R   22095.8003427.240  5      .013                                  .000    .000 1
JX  22095.8103427.241  5  7   .013  111.000         3427.240         45.000      .000
R   22505.9903441.500  5      .013                                  .000    .000 1
R   23128.9603487.929  5      .013                                  .000    .000 1
JX  23128.9703487.930  5  8   .013  105.000         3490.430         90.0         .000
R   23166.1203490.700  5      .013                                  .000    .000 1
R   23636.2103525.800  5      .013                                  .000    .000 1
R   23836.9303536.700  5      .013                                13.180    .000 1
R   24167.4603545.380  5      .013                                  .000    .000 1
JX  24167.4703545.381  1  5 9.013  375.000   59.0003545.7803546.280  0.0-45.0    .000  <-- V29 CP12
R   24167.4803545.382  1      .013                                  .000  15.000 1
R   24170.4273545.446  1      .013                                  .000  15.000 1
R   24173.3803545.510  1      .013                                  .000  15.000 1
R   24176.3203545.574  1      .013                                  .000    .000 1
R   24204.2703546.170  1      .013                                42.140    .000 1
R   24288.1903546.590  1      .013                                  .000    .000 1
JX  24288.2003546.591  1  2   .013    7.00          3546.590        -45.000      .000
R   24351.1003546.909  1      .013                                  .000    .000 1
R   24530.5103547.809  1      .013                                  .000    .000 1
JX  24530.5203547.810  1  2   .013    7.00          3547.810         45.000      .000
R   24882.4003549.569  1      .013                                  .000    .000 1
JX  24882.4103549.570  1  7   .013   90.00          3549.570         45.000      .000  <-- V29 CP11
R   25070.5003550.509  1      .013                                  .000    .000 1
JX  25070.5103550.510  1  3   .013   65.00          3552.580         45.000      .000  <-- V29 B
R   25319.3103551.750  1      .013                                  .000    .000 1
R   25566.3103552.990  1      .013                                  .000    .000 1
R   25683.2703553.569  1      .013                                 5.500    .000 1
JX  25683.2803553.570  4      .013                                    .000      .000
R   25683.2903553.571  4      .013                                  .000 -45.000 1
R   25721.7503555.560  4      .013                                  .000 -45.000 1
R   25755.9703557.330  4      .013                                  .000    .000 1
SH  25755.9703557.330  4                          3557.330
CD   1  3   0    .000   6.000    6.000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   1    .000   3.000     .000  .000  .000   .00
CD   4  4   1    .000   4.000     .000  .000  .000   .00
CD   5  3   0    .000   6.000    8.000  .000  .000   .00
CD   6  3   0    .000   6.000    6.000  .000  .000   .00
CD   7  4   1    .000   3.500     .000  .000  .000   .00
CD   8  4   1    .000   3.000     .000  .000  .000   .00
CD   9  4   1    .000   5.500     .000  .000  .000   .00

CD  10  4   1    .000   4.500     .000  .000  .000   .00

Q           181.000   .0  <-- V25 CP1
```

FILE: Far_Hills.WSW W S P G W - EDIT LISTING - Version 14.10 Date:12-22-2020 Time: 9:33:55

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	.000	6.000	6.000	.000	.000	.00										
CD	2	4	1		2.000														
CD	3	4	1		3.000														
CD	4	4	1		4.000														
CD	5	3	0	.000	6.000	8.000	.000	.000	.00										
CD	6	3	0	.000	6.000	6.000	.000	.000	.00										
CD	7	4	1		3.500														
CD	8	4	1		3.000														
CD	9	4	1		5.500														
CD	10	4	1		4.500														

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
Far Hills Avenue RCB

HEADING LINE NO 2 IS -
Foxhill to Sky Vista

HEADING LINE NO 3 IS -
Mainline

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	21752.380	3415.300	5	3421.300

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	22095.800	3427.240	5	.013	.000	.000	.000	1

ELEMENT NO 3 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	22095.810	3427.241	5	7	0	.013	111.000	.000	3427.240	.000	45.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	22505.990	3441.500	5	.013	.000	.000	.000	1

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	23128.960	3487.929	5	.013	.000	.000	.000	1

ELEMENT NO 6 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	23128.970	3487.930	5	8	0	.013	105.000	.000	3490.430	.000	90.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	23166.120	3490.700	5	.013	.000	.000	.000	1

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	23636.210	3525.800	5	.013	.000	.000	.000	1

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	23836.930	3536.700	5	.013	872.560	13.180	.000	1

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24167.460	3545.380	5	.013	.000	.000	.000	1

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 11 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	24167.470	3545.381	1	5	9	.013	375.000	59.000	3545.780	3546.280	.000	-45.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24167.480	3545.382	1	.013	.000	.000	15.000	1

ELEMENT NO 13 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24170.430	3545.446	1	.013	.000	.000	15.000	1

ELEMENT NO 14 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24173.380	3545.510	1	.013	.000	.000	15.000	1

ELEMENT NO 15 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24176.320	3545.574	1	.013	.000	.000	.000	1

ELEMENT NO 16 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24204.270	3546.170	1	.013	38.001	42.140	.000	1

ELEMENT NO 17 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24288.190	3546.590	1	.013	.000	.000	.000	1

ELEMENT NO 18 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	24288.200	3546.591	1	2	0	.013	7.000	.000	3546.590	.000	-45.000	.000

RADIUS	ANGLE
.000	.000

```
ELEMENT NO  19 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             24351.100 3546.909    1              .013                           .000     .000      .000     1
ELEMENT NO  20 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             24530.510 3547.809    1              .013                           .000     .000      .000     1
                                                  W S P G W                                                                PAGE NO   4
                         WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO  21 IS A JUNCTION         *         *     *     *                *                   *                *
                   U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                             24530.520 3547.810    1     2     0   .013     7.000      .000  3547.810      .000  45.000     .000
                                                                                                RADIUS    ANGLE
                                                                                                  .000    .000
ELEMENT NO  22 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             24882.400 3549.569    1              .013                           .000     .000      .000     1
ELEMENT NO  23 IS A JUNCTION         *         *     *     *                *                   *                *
                   U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                             24882.410 3549.570    1     7     0   .013    90.000      .000  3549.570      .000  45.000     .000
                                                                                                RADIUS    ANGLE
                                                                                                  .000    .000
ELEMENT NO  24 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             25070.500 3550.509    1              .013                           .000     .000      .000     1
ELEMENT NO  25 IS A JUNCTION         *         *     *     *                *                   *                *
                   U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                             25070.510 3550.510    1     3     0   .013    65.000      .000  3552.580      .000  45.000     .000
                                                                                                RADIUS    ANGLE
                                                                                                  .000    .000
ELEMENT NO  26 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             25319.310 3551.750    1              .013                           .000     .000      .000     1
ELEMENT NO  27 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             25566.310 3552.990    1              .013                           .000     .000      .000     1
ELEMENT NO  28 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             25683.270 3553.569    1              .013                       1218.410    5.500      .000     1
                                                  W S P G W                                                                PAGE NO   5
                         WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO  29 IS A JUNCTION         *         *     *     *                *                   *                *
                   U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                             25683.280 3553.570    4     0     0   .013      .000      .000      .000      .000    .000     .000
                                                                                                RADIUS    ANGLE
                                                                                                  .000    .000
ELEMENT NO  30 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             25683.290 3553.571    4              .013                           .000     .000   -45.000     1
ELEMENT NO  31 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             25721.750 3555.560    4              .013                           .000     .000   -45.000     1
ELEMENT NO  32 IS A REACH            *         *     *
                   U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                             25755.970 3557.330    4              .013                           .000     .000      .000     1
ELEMENT NO  33 IS A SYSTEM HEADWORKS                 *                      *
                   U/S DATA   STATION    INVERT  SECT                                      W S ELEV
                             25755.970 3557.330    4                                      3557.330
```

Far Hills Avenue RCB
Foxhill to Sky Vista
Mainline

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
21752.380	3415.300	3.844	3419.144	1000.00	32.52	16.42	3435.57	.00	6.00	8.00	6.000	8.000	.00	0 .0
343.420	.0348					.0311	10.68	3.84	2.92	3.77	.013	.00	.00	BOX
22095.800	3427.240	4.024	3431.264	1000.00	31.06	14.98	3446.25	.00	6.00	8.00	6.000	8.000	.00	0 .0
JUNCT STR	.1000					.0361	.00	4.02	2.73		.013	.00	.00	BOX
22095.810	3427.241	3.194	3430.435	889.00	34.79	18.79	3449.23	.00	6.00	8.00	6.000	8.000	.00	0 .0
140.625	.0348					.0458	6.43	3.19	3.43	3.46	.013	.00	.00	BOX
22236.440	3432.129	3.060	3435.189	889.00	36.31	20.48	3455.67	.00	6.00	8.00	6.000	8.000	.00	0 .0
111.389	.0348					.0519	5.78	3.06	3.66	3.46	.013	.00	.00	BOX
22347.820	3436.002	2.918	3438.919	889.00	38.09	22.53	3461.44	.00	6.00	8.00	6.000	8.000	.00	0 .0
86.650	.0348					.0592	5.13	2.92	3.93	3.46	.013	.00	.00	BOX
22434.470	3439.014	2.782	3441.796	889.00	39.95	24.78	3466.57	.00	6.00	8.00	6.000	8.000	.00	0 .0
71.516	.0348					.0676	4.83	2.78	4.22	3.46	.013	.00	.00	BOX
22505.990	3441.500	2.652	3444.152	889.00	41.90	27.26	3471.41	.00	6.00	8.00	6.000	8.000	.00	0 .0
4.570	.0745					.0721	.33	2.65	4.53	2.62	.013	.00	.00	BOX
22510.560	3441.841	2.653	3444.493	889.00	41.89	27.25	3471.74	.00	6.00	8.00	6.000	8.000	.00	0 .0
337.691	.0745					.0676	22.82	2.65	4.53	2.62	.013	.00	.00	BOX
22848.250	3467.008	2.782	3469.791	889.00	39.94	24.77	3494.56	.00	6.00	8.00	6.000	8.000	.00	0 .0
137.805	.0745					.0592	8.15	2.78	4.22	2.62	.013	.00	.00	BOX

Far Hills Avenue RCB
Foxhill to Sky Vista
Mainline

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
22986.060	3477.279	2.918	3480.197	889.00	38.08	22.52	3502.72	.00	6.00	8.00	6.000	8.000	.00	0 .0
83.996	.0745					.0519	4.36	2.92	3.93	2.62	.013	.00	.00	BOX
23070.050	3483.539	3.060	3486.599	889.00	36.31	20.47	3507.07	.00	6.00	8.00	6.000	8.000	.00	0 .0
58.906	.0745					.0455	2.68	3.06	3.66	2.62	.013	.00	.00	BOX
23128.960	3487.929	3.210	3491.139	889.00	34.62	18.61	3509.75	.00	6.00	8.00	6.000	8.000	.00	0 .0
JUNCT STR	.1000					.0562	.00	3.21	3.41		.013	.00	.00	BOX
23128.970	3487.930	2.452	3490.382	784.00	39.96	24.79	3515.18	.00	6.00	8.00	6.000	8.000	.00	0 .0
37.148	.0746					.0695	2.58	2.45	4.50	2.40	.013	.00	.00	BOX
23166.120	3490.700	2.462	3493.162	784.00	39.80	24.60	3517.76	.00	6.00	8.00	6.000	8.000	.00	0 .0
166.076	.0747					.0662	11.00	2.46	4.47	2.40	.013	.00	.00	BOX
23332.200	3503.100	2.540	3505.640	784.00	38.59	23.12	3528.76	.00	6.00	8.00	6.000	8.000	.00	0 .0
129.406	.0747					.0594	7.68	2.54	4.27	2.40	.013	.00	.00	BOX
23461.600	3512.763	2.664	3515.426	784.00	36.79	21.02	3536.45	.00	6.00	8.00	6.000	8.000	.00	0 .0
78.436	.0747					.0520	4.08	2.66	3.97	2.40	.013	.00	.00	BOX

23540.040	3518.619	2.794	3521.413	784.00	35.08	19.11	3540.52	.00	6.00	8.00	6.000	8.000	.00	0	.0	
54.891	.0747					.0455	2.50	2.79	3.70	2.40	.013	.00	.00	BOX		
23594.930	3522.718	2.930	3525.648	784.00	33.45	17.37	3543.02	.00	6.00	8.00	6.000	8.000	.00	0	.0	
41.281	.0747					.0399	1.65	2.93	3.44	2.40	.013	.00	.00	BOX		

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
23636.210	3525.800	3.073	3528.873	784.00	31.89	15.79	3544.67	.29	6.00	8.00	6.000	8.000	.00	0	.0	
52.432	.0543					.0355	1.86	3.36	3.21	2.68	.013	.00	.00	BOX		
23688.640	3528.647	3.186	3531.833	784.00	30.76	14.70	3546.53	.27	6.00	8.00	6.000	8.000	.00	0	.0	
52.189	.0543					.0317	1.65	3.46	3.04	2.68	.013	.00	.00	BOX		
23740.830	3531.482	3.341	3534.823	784.00	29.33	13.36	3548.18	.24	6.00	8.00	6.000	8.000	.00	0	.0	
39.707	.0543					.0278	1.10	3.59	2.83	2.68	.013	.00	.00	BOX		
23780.540	3533.638	3.504	3537.142	784.00	27.97	12.15	3549.29	.22	6.00	8.00	6.000	8.000	.00	0	.0	
31.256	.0543					.0245	.76	3.73	2.63	2.68	.013	.00	.00	BOX		
23811.800	3535.335	3.675	3539.010	784.00	26.67	11.04	3550.05	.20	6.00	8.00	6.000	8.000	.00	0	.0	
25.133	.0543					.0215	.54	3.88	2.45	2.68	.013	.00	.00	BOX		
23836.930	3536.700	3.855	3540.555	784.00	25.42	10.04	3550.59	.00	6.00	8.00	6.000	8.000	.00	0	.0	
33.051	.0263					.0198	.65	3.85	2.28	3.49	.013	.00	.00	BOX		
23869.980	3537.568	3.907	3541.475	784.00	25.09	9.77	3551.25	.00	6.00	8.00	6.000	8.000	.00	0	.0	
87.174	.0263					.0183	1.59	3.91	2.24	3.49	.013	.00	.00	BOX		
23957.160	3539.858	4.097	3543.955	784.00	23.92	8.88	3552.84	.00	6.00	8.00	6.000	8.000	.00	0	.0	
59.707	.0263					.0161	.96	4.10	2.08	3.49	.013	.00	.00	BOX		
24016.870	3541.426	4.297	3545.723	784.00	22.80	8.08	3553.80	.00	6.00	8.00	6.000	8.000	.00	0	.0	
43.410	.0263					.0142	.62	4.30	1.94	3.49	.013	.00	.00	BOX		

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
24060.280	3542.565	4.507	3547.073	784.00	21.74	7.34	3554.41	.00	6.00	8.00	6.000	8.000	.00	0	.0	
32.541	.0263					.0125	.41	4.51	1.80	3.49	.013	.00	.00	BOX		
24092.820	3543.420	4.727	3548.147	784.00	20.73	6.67	3554.82	.00	6.00	8.00	6.000	8.000	.00	0	.0	
24.715	.0263					.0110	.27	4.73	1.68	3.49	.013	.00	.00	BOX		
24117.530	3544.069	4.958	3549.027	784.00	19.77	6.07	3555.09	.00	6.00	8.00	6.000	8.000	.00	0	.0	
18.764	.0263					.0098	.18	4.96	1.56	3.49	.013	.00	.00	BOX		
24136.290	3544.562	5.200	3549.761	784.00	18.85	5.52	3555.28	.00	6.00	8.00	6.000	8.000	.00	0	.0	
14.047	.0263					.0086	.12	5.20	1.46	3.49	.013	.00	.00	BOX		
24150.340	3544.930	5.454	3550.384	784.00	17.97	5.01	3555.40	.00	6.00	8.00	6.000	8.000	.00	0	.0	
10.184	.0263					.0076	.08	5.45	1.36	3.49	.013	.00	.00	BOX		

---------- WARNING - Flow depth near top of box conduit ----------

24160.530	3545.198	5.720	3550.917	784.00	17.13	4.56	3555.48	.00	6.00	8.00	6.000	8.000	.00	0	.0		
6.936	.0263					.0086	.06	5.72	1.26	3.49	.013	.00	.00	BOX			

---------- WARNING - Flow depth near top of box conduit ----------

24167.460	3545.380	6.000	3551.380	784.00	16.33	4.14	3555.52	.00	6.00	8.00	6.000	8.000	.00	0	.0		
JUNCT STR	.1250					.0042	.00	6.00	1.18		.013	.00	.00	BOX			

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
24167.470	3545.381	10.708	3556.090	350.00	9.72	1.47	3557.56	.00	4.73	6.00	6.000	6.000	.00	0 .0
24167.480	3545.382	10.854	3556.236	350.00	9.72	1.47	3557.70	.00	4.73	6.00	6.000	6.000	.00	0 .0
2.947	.0217					.0042	.01	10.85	.70	2.73	.013	.00	.00	BOX
24170.430	3545.446	10.948	3556.394	350.00	9.72	1.47	3557.86	.00	4.73	6.00	6.000	6.000	.00	0 .0
2.953	.0217					.0042	.01	10.95	.70	2.73	.013	.00	.00	BOX
24173.380	3545.510	11.043	3556.552	350.00	9.72	1.47	3558.02	.00	4.73	6.00	6.000	6.000	.00	0 .0
2.939	.0218					.0042	.01	11.04	.70	2.73	.013	.00	.00	BOX
24176.320	3545.574	11.064	3556.638	350.00	9.72	1.47	3558.11	.00	4.73	6.00	6.000	6.000	.00	0 .0
27.949	.0213					.0042	.12	.00	.70	2.75	.013	.00	.00	BOX
24204.270	3546.170	10.860	3557.030	350.00	9.72	1.47	3558.50	.00	4.73	6.00	6.000	6.000	.00	0 .0
83.920	.0050					.0042	.35	10.86	.70	4.79	.013	.00	.00	BOX
24288.190	3546.590	10.867	3557.457	350.00	9.72	1.47	3558.93	.00	4.73	6.00	6.000	6.000	.00	0 .0
JUNCT STR	.1000					.0040	.00	10.87	.70		.013	.00	.00	BOX
24288.200	3546.591	10.973	3557.564	343.00	9.53	1.41	3558.97	.00	4.66	6.00	6.000	6.000	.00	0 .0
62.900	.0051					.0040	.25	10.97	.69	4.70	.013	.00	.00	BOX
24351.100	3546.909	10.980	3557.889	343.00	9.53	1.41	3559.30	.00	4.66	6.00	6.000	6.000	.00	0 .0
179.410	.0050					.0040	.73	10.98	.69	4.71	.013	.00	.00	BOX
24530.510	3547.809	10.876	3558.685	343.00	9.53	1.41	3560.09	.00	4.66	6.00	6.000	6.000	.00	0 .0
JUNCT STR	.1000					.0039	.00	10.88	.69		.013	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
24530.520	3547.810	10.980	3558.790	336.00	9.33	1.35	3560.14	.00	4.60	6.00	6.000	6.000	.00	0 .0
351.881	.0050					.0039	1.37	10.98	.67	4.64	.013	.00	.00	BOX
24882.400	3549.569	10.655	3560.224	336.00	9.33	1.35	3561.58	.00	4.60	6.00	6.000	6.000	.00	0 .0
JUNCT STR	.1000					.0021	.00	10.65	.67		.013	.00	.00	BOX
24882.410	3549.570	11.395	3560.965	246.00	6.83	.73	3561.69	.00	3.74	6.00	6.000	6.000	.00	0 .0
188.090	.0050					.0021	.39	11.40	.49	3.64	.013	.00	.00	BOX
25070.500	3550.509	10.884	3561.393	246.00	6.83	.73	3562.12	.00	3.74	6.00	6.000	6.000	.00	0 .0
JUNCT STR	.1000					.0011	.00	10.88	.49		.013	.00	.00	BOX
25070.510	3550.510	11.184	3561.694	181.00	5.03	.39	3562.09	.00	3.05	6.00	6.000	6.000	.00	0 .0

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        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
  248.801    .0050                                          .0011      .28    11.18     .36    2.89    .013       .00   .00  BOX
         |         |        |         |         |              |         |       |        |        |       |       |      |
25319.310  3551.750   10.244  3561.994    181.00    5.03     .39  3562.39     .00    3.05     6.00    6.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
  247.000    .0050                                          .0011      .28    10.24     .36    2.88    .013       .00   .00  BOX
         |         |        |         |         |              |         |       |        |        |       |       |      |
25566.310  3552.990    9.302  3562.292    181.00    5.03     .39  3562.68     .00    3.05     6.00    6.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
  116.959    .0050                                          .0011      .13      .00     .36    2.90    .013       .00   .00  BOX
         |         |        |         |         |              |         |       |        |        |       |       |      |
25683.270  3553.569    8.893  3562.462    181.00    5.03     .39  3562.85     .00    3.05     6.00    6.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
JUNCT STR   .1000                                          .0085      .00    8.89     .36             .013       .00   .00  BOX
                      -------------------- WARNING - Junction Analysis - Change in Channel Type ---------------
↑ FILE: Far_Hills.WSW                        W S P G W - CIVILDESIGN Version 14.08                                    PAGE    7
                              Program Package Serial Number: 3074
                                                  WATER SURFACE PROFILE LISTING                    Date:12-22-2020  Time: 9:34: 1
                         Far Hills Avenue RCB
                           Foxhill to Sky Vista
                             Mainline
******************************************************************************************************************** ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-    -|
 L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
         |         |        |         |         |              |         |       |        |        |       |       |      |
25683.280  3553.570    6.722  3560.292    181.00   14.40    3.22  3563.51     .00    3.78      .00    4.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
         |         |        |         |         |              |         |       |        |        |       |       |      |
25683.290  3553.571    7.361  3560.932    181.00   14.40    3.22  3564.15     .00    3.78      .00    4.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   38.461    .0517                                          .0159      .61     7.36     .00    2.13    .013       .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
25721.750  3555.560    6.622  3562.182    181.00   14.40    3.22  3565.40     .00    3.78      .00    4.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   34.221    .0517                                          .0159      .54     6.62     .00    2.13    .013       .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
25755.970  3557.330    5.556  3562.886    181.00   14.40    3.22  3566.11     .00    3.78      .00    4.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
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V29 B SD LATERAL HYDRAULIC MODEL

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                                                                                V30-S.WSW
T1 Sky Vista Drive Improvements Phase I (62025-203)                                                    0
T2 Far Hills to Redpoint - V29B SD LATERAL
T3 Lateral at V30-S
SO   1000.0003552.580  1                          3561.690
R    1024.6603555.780  1      .013                                  .000  45.000 1
R    1066.6603556.620  1      .013                                  .000    .000 1
SH   1066.6603556.620  1                          3556.620
CD   1  4   1    .000   3.000     .000  .000  .000   .00
Q            65.000   .0
```

FILE: V30-S.WSW W S P G W - EDIT LISTING - Version 14.10 Date:12-26-2020 Time: 3:35:18

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		3.000														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
Sky Vista Drive Improvements Phase I (62025-203)
HEADING LINE NO 2 IS -
Far Hills to Redpoint - V29B SD LATERAL
HEADING LINE NO 3 IS -
Lateral at V30-S

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	3552.580	1	3561.690

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1024.660	3555.780	1	.013	.000	.000	45.000	1

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1066.660	3556.620	1	.013	.000	.000	.000	1

ELEMENT NO 4 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1066.660	3556.620	1	3556.620

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:12-26-2020 Time: 3:35:24

Sky Vista Drive Improvements Phase I (62025-203)
Far Hills to Redpoint - V29B SD LATERAL
Lateral at V30-S

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	3552.580	9.110	3561.690	65.00	9.20	1.31	3563.00	.00	2.59	.00	3.000	.000	.00	1 .0
24.660	.1298					.0095	.23	9.11	.00	1.07	.013	.00	.00	PIPE
1024.660	3555.780	6.405	3562.185	65.00	9.20	1.31	3563.50	.00	2.59	.00	3.000	.000	.00	1 .0
42.000	.0200					.0095	.40	6.40	.00	1.83	.013	.00	.00	PIPE
1066.660	3556.620	6.029	3562.649	65.00	9.20	1.31	3563.96	.00	2.59	.00	3.000	.000	.00	1 .0

V29 CP11 SD LATERAL HYDRAULIC MODEL

V30-U.WSW

```
T1 Sky Vista Drive Improvements Phase I (62025-203)                                                    0
T2 Far Hills to Redpoint - V29 CP11
T3 Lateral at V30-U
SO   1000.0003551.570  1                          3560.965
R    1037.8203553.350  1      .013                                .000  45.000 1
R    1065.8203553.630  1      .013                                .000    .000 1
SH   1065.8203553.630  1                          3553.630
CD   1  4   1    .000   3.500     .000  .000  .000   .00
Q            90.000   .0
```

FILE: V30-U.WSW W S P G W - EDIT LISTING - Version 14.10 Date:12-26-2020 Time: 3:47:48

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		3.500														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
Sky Vista Drive Improvements Phase I (62025-203)
HEADING LINE NO 2 IS -
Far Hills to Redpoint - V29 CP11
HEADING LINE NO 3 IS -
Lateral at V30-U

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	3551.570	1	3560.965

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1037.820	3553.350	1	.013	.000	.000	45.000	1

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1065.820	3553.630	1	.013	.000	.000	.000	1

ELEMENT NO 4 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1065.820	3553.630	1	3553.630

Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING Date:12-26-2020 Time: 3:47:52
Sky Vista Drive Improvements Phase I (62025-203)
Far Hills to Redpoint - V29 CP11
Lateral at V30-U

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	3551.570	9.395	3560.965	90.00	9.35	1.36	3562.32	.00	2.94	.00	3.500	.000	.00	1 .0
37.820	.0471					.0080	.30	9.40	.00	1.57	.013	.00	.00	PIPE
1037.820	3553.350	8.187	3561.537	90.00	9.35	1.36	3562.90	.00	2.94	.00	3.500	.000	.00	1 .0
28.000	.0100					.0080	.22	8.19	.00	2.58	.013	.00	.00	PIPE
1065.820	3553.630	8.199	3561.829	90.00	9.35	1.36	3563.19	.00	2.94	.00	3.500	.000	.00	1 .0

Worksheet for Sky Vista (V29 STA2)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.65	%
Discharge	13.00	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+29.70	0.72

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+29.70, 0.72)	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	0.47	ft
Elevation Range	0.00 to 0.72 ft	
Flow Area	2.83	ft²
Wetted Perimeter	16.94	ft
Hydraulic Radius	0.17	ft
Top Width	16.43	ft
Normal Depth	0.47	ft

Worksheet for Sky Vista (V29 STA2)

Results

Critical Depth		0.57	ft
Critical Slope		0.00641	ft/ft
Velocity		4.59	ft/s
Velocity Head		0.33	ft
Specific Energy		0.80	ft
Froude Number		1.95	
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	0.47	ft
Critical Depth	0.57	ft
Channel Slope	2.65	%
Critical Slope	0.00641	ft/ft

Cross Section for Sky Vista (V29 STA2)

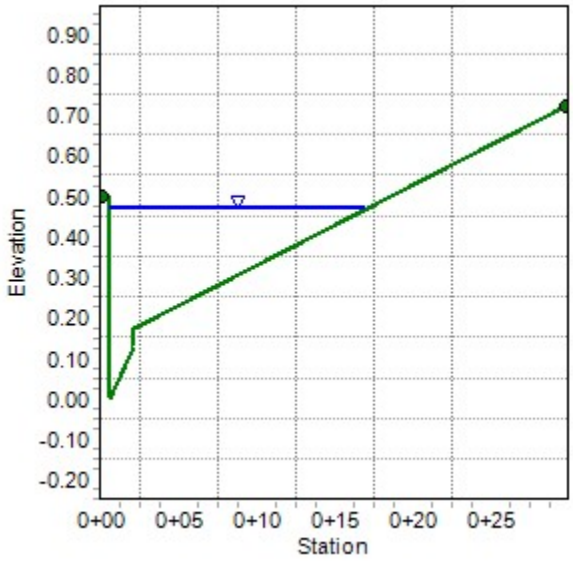
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.65	%
Normal Depth	0.47	ft
Discharge	13.00	ft³/s

Cross Section Image



ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: SUMMERLIN V29 MASTER DRAINAGE STUDY
By: MASIH EDALAT
Date: 12/26/2020

Drop Inlet Sizing on a Continuous Grade

5' TYPE CM2
DI #13

Known:

Q_s=	Street Flow	13.0	cfs
S_o=	Longitudinal Slope	0.0265	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	4.59	fps
D=	Flow Depth	0.47	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Grate Width	1.5	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	5.0	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = 1-0.09*(V_s-V_o) if V_s>V_o; else R_f=1	1.00	
	V_o= Splash over velocity=p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3†	5.02	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.23	
	Q_w= Frontal flow=A_w*V_s	2.95	cfs
	Q_x= Side flow = Q_s-Q_w	10.05	cfs
R_s=	Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/(S_x*(L_g*(1-C_{fg}/100))$^{2.3}$))	0.01	
Q_{ig}=	Flow intercepted = [R_f*E_o+R_s*(1-E_o)]*Q_s	3.1	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.085	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.285	ft/ft
L_t=	Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*S_e)$^{0.6}$	31.16	ft
Q_{ic}=	Flow intercepted = (1-(1-(L_c*(1-C_{fc}/100))/L_t)$^{1.8}$)*Q_s	1.8	cfs

Total Inlet Calculations

Q_{ti}=	**Total flow intercepted = Q_{ig}+Q_{ic}**	**5**	**cfs**
Q_{tq}=	**Flow bypass = Q_s-Q_{ti}**	**8**	**cfs**
q=	Interception per unit ratio = Q_{ti}/L_g	0.98	cfs/ft

5 CFS IS INTERCEPTED BY EX 5' TYPE CM2 DI, 8 CFS BYPASS

Worksheet for Sky Vista (V29 STA2) Cont.

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.65	%
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+29.70	0.72

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+29.70, 0.72)	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	0.41	ft
Elevation Range	0.00 to 0.72 ft	
Flow Area	1.96	ft²
Wetted Perimeter	13.97	ft
Hydraulic Radius	0.14	ft
Top Width	13.51	ft
Normal Depth	0.41	ft

Worksheet for Sky Vista (V29 STA2) Cont.

Results

Critical Depth		0.49	ft
Critical Slope		0.00682	ft/ft
Velocity		4.08	ft/s
Velocity Head		0.26	ft
Specific Energy		0.67	ft
Froude Number		1.89	
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	0.41	ft
Critical Depth	0.49	ft
Channel Slope	2.65	%
Critical Slope	0.00682	ft/ft

Cross Section for Sky Vista (V29 STA2) Cont.

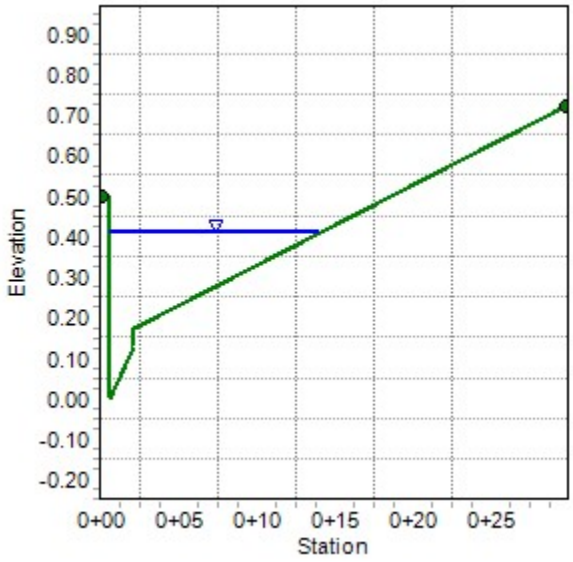
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.65	%
Normal Depth	0.41	ft
Discharge	8.00	ft³/s

Cross Section Image



ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: SUMMERLIN V29 MASTER DRAINAGE STUDY
By: MASIH EDALAT
Date: 12/26/2020

Drop Inlet Sizing on a Continuous Grade

12.5' TYPE CM2
DI #4

Known:

Q_s=	Street Flow	8.0	cfs
S_o=	Longitudinal Slope	0.0265	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	4.08	fps
D=	Flow Depth	0.41	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Grate Width	1.5	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	10.0	ft
L_c=	Length of Curb Opening	12.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = 1-0.09*(V_s-V_o) if V_s>V_o; else R_f=1	1.00	
	V_o= Splash over velocity=p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3†	9.86	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.28	
	Q_w= Frontal flow=A_w*V_s	2.25	cfs
	Q_x= Side flow = Q_s-Q_w	5.75	cfs
R_s=	Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/(S_x*(L_g*(1-C_{fg}/100))$^{2.3}$))	0.30	
Q_{ig}=	Flow intercepted = [R_f*E_o+R_s*(1-E_o)]*Q_s	4.0	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

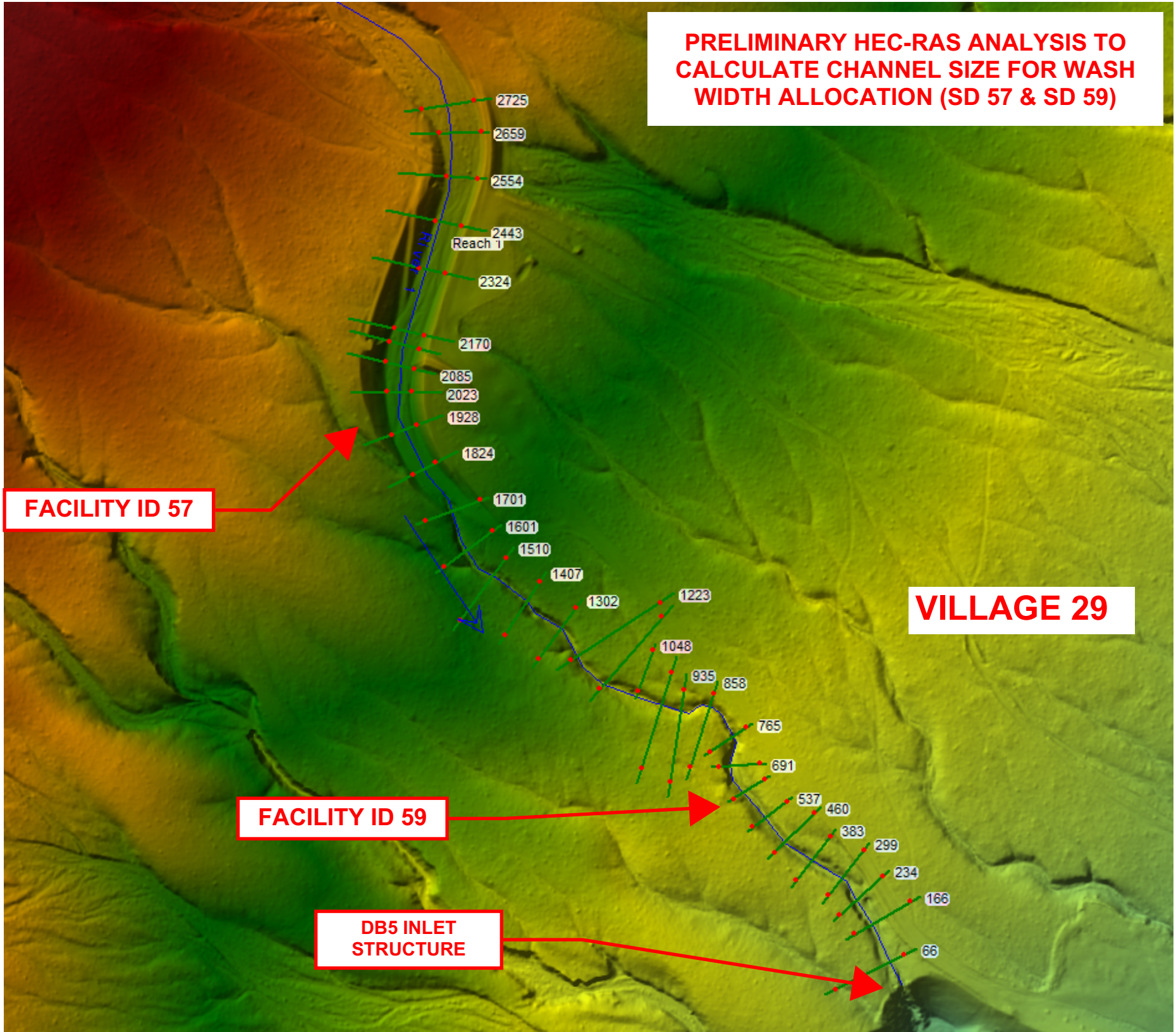
Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.100	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.285	ft/ft
L_t=	Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*S_e)$^{0.6}$	22.96	ft
Q_{ic}=	Flow intercepted = (1-(1-(L_c*(1-C_{fc}/100))/L_t)$^{1.8}$)*Q_s	3.5	cfs

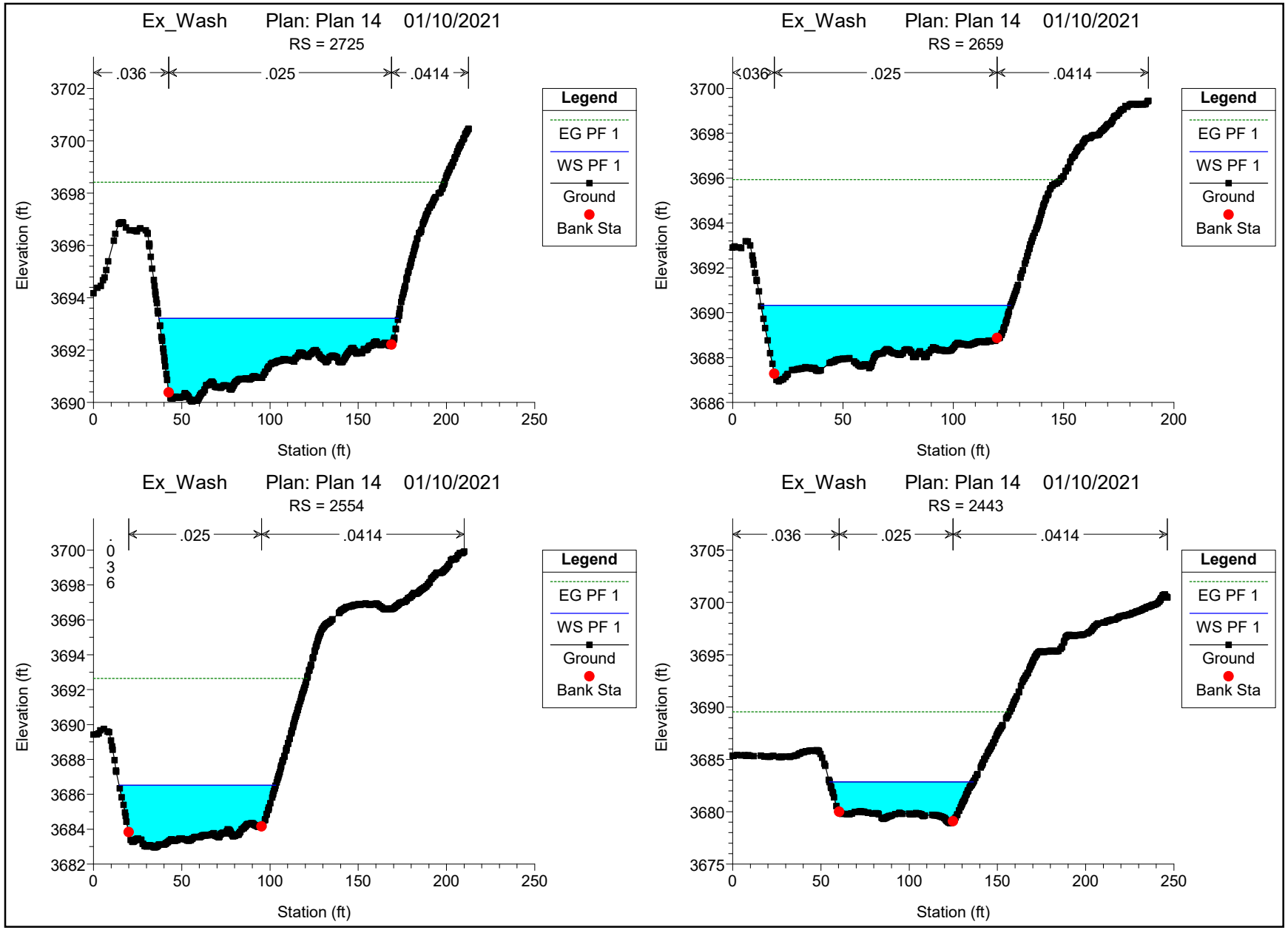
Total Inlet Calculations

Q_{ti}=	**Total flow intercepted = Q_{ig}+Q_{ic}**	**7.5**	**cfs**
Q_{tq}=	**Flow bypass = Q_s-Q_{ti}**	**0.5**	**cfs**
q=	Interception per unit ratio = Q_{ti}/L_g	0.60	cfs/ft

8 CFS IS INTERCEPTED BY EX 12.5' TYPE CM2 DI


PRELIMINARY HEC-RAS ANALYSIS TO CALCULATE CHANNEL SIZE FOR WASH WIDTH ALLOCATION (SD 57 & SD 59)
2725
2659
2554
2443
Reach 1
2324
2170
2085
2023
1928
1824
1701
1601
1510
1407
1302
1223
1048
935
858
765
691
537
460
383
299
234
166
66
FACILITY ID 57
FACILITY ID 59
DB5 INLET STRUCTURE
VILLAGE 29

HEC-RAS PROFILE OUTPUT TABLE											
River Sta	Q Total	Min Ch El	W.S. Elev	Vel Chnl	Flow Area	Top Width	Froude # Chl	Max Chl Dpth	Vel Left	Vel Right	Required Freeboard
	(cfs)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft/s)	(ft/s)	(ft)
2725	4590	3690.04	3693.22	18.43	254.45	135.68	2.34	3.18	9.56	4.79	1.68
2659	4590	3686.94	3690.33	19.2	247.67	113.19	2.23	3.39	9.59	6.18	1.72
2554	4590	3682.97	3686.51	20.11	239.62	88.72	2.06	3.54	7.65	6.82	1.77
2443	4590	3678.91	3682.85	21.28	233.53	81.48	2.11	3.94	8.53	8.82	1.84
2324	4590	3675.44	3679.2	21.7	229.83	80.68	2.15	3.76	8.45	9.01	1.84
2170	4590	3671.18	3674.62	21.14	228.72	88.3	2.22	3.44	7.17	8.16	1.80
2136	4590	3670.39	3673.91	20.48	237.06	86.98	2.09	3.52	7.13	7.69	1.78
2085	4590	3669.32	3673.03	19.61	249.59	85.33	1.93	3.71	7.19	7.8	1.76
2023	4590	3667.34	3671.92	19.34	263.31	82.49	1.81	4.58	8.64	8.29	1.80
1928	4590	3665.6	3669.87	19.3	256.05	81.41	1.81	4.27	6.87	6.89	1.78
1824	4590	3664.19	3668.33	18.64	268.14	76.96	1.66	4.14	7.51	7.13	1.75
1701	4590	3656.97	3658.44	25.89	180.04	125.86	3.77	1.46	9.14	9.14	1.73
1601	4590	3652.58	3654.49	19.79	236.67	127.65	2.52	1.91	6.99	6.99	1.61
1510	4590	3648.33	3650.24	19.81	236.42	127.64	2.53	1.91	7	7	1.61
1407	4590	3642.05	3643.83	21.26	219.97	127.12	2.81	1.78	7.51	7.51	1.64
1302	4590	3633.21	3634.82	23.47	198.95	126.46	3.26	1.61	8.29	8.29	1.69
1223	4590	3629.34	3631.19	20.44	229.04	127.41	2.65	1.85	7.22	7.22	1.63
1130	4590	3625.44	3627.42	19.13	244.97	127.91	2.4	1.98	6.76	6.76	1.60
1048	4590	3620.97	3622.83	20.36	229.88	127.43	2.63	1.86	7.19	7.19	1.63
984	4590	3619.25	3621.39	17.62	266.38	128.57	2.12	2.14	6.22	6.22	1.57
935	4590	3617.59	3619.71	17.78	263.94	128.5	2.15	2.12	6.28	6.28	1.57
858	4590	3612.56	3614.36	20.98	222.98	127.22	2.75	1.8	7.41	7.41	1.64
765	4590	3605.3	3606.96	22.78	205.04	126.65	3.12	1.66	8.05	8.05	1.67
691	4590	3603.88	3606.07	17.24	272.42	128.76	2.05	2.19	6.09	6.09	1.56
616	4590	3599.64	3601.53	20	234.12	127.57	2.56	1.89	7.06	7.06	1.62
537	4590	3596.63	3598.65	18.71	250.59	128.08	2.32	2.02	6.61	6.61	1.59
460	4590	3593.88	3595.94	18.34	255.79	128.24	2.25	2.06	6.48	6.48	1.58
383	4590	3590.74	3592.75	18.77	249.75	128.05	2.33	2.01	6.63	6.63	1.59
299	4590	3587.47	3589.49	18.71	250.59	128.08	2.32	2.02	6.61	6.61	1.59
234	4590	3583.89	3585.78	20.05	233.56	127.55	2.57	1.89	7.08	7.08	1.62
166	4590	3581.48	3583.52	18.53	253.03	128.16	2.29	2.04	6.55	6.55	1.59
66	4590	3578.44	3580.62	17.32	271.19	128.72	2.07	2.18	6.12	6.12	1.56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Station (ft)
Legend
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WS PF 1
Ground
Bank Sta
Ex_Wash Plan: Plan 14 01/10/2021
RS = 2659
.036
.025
.0414
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Ex_Wash Plan: Plan 14 01/10/2021
RS = 2554
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.025
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Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Ex_Wash Plan: Plan 14 01/10/2021
RS = 2443
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Station (ft)
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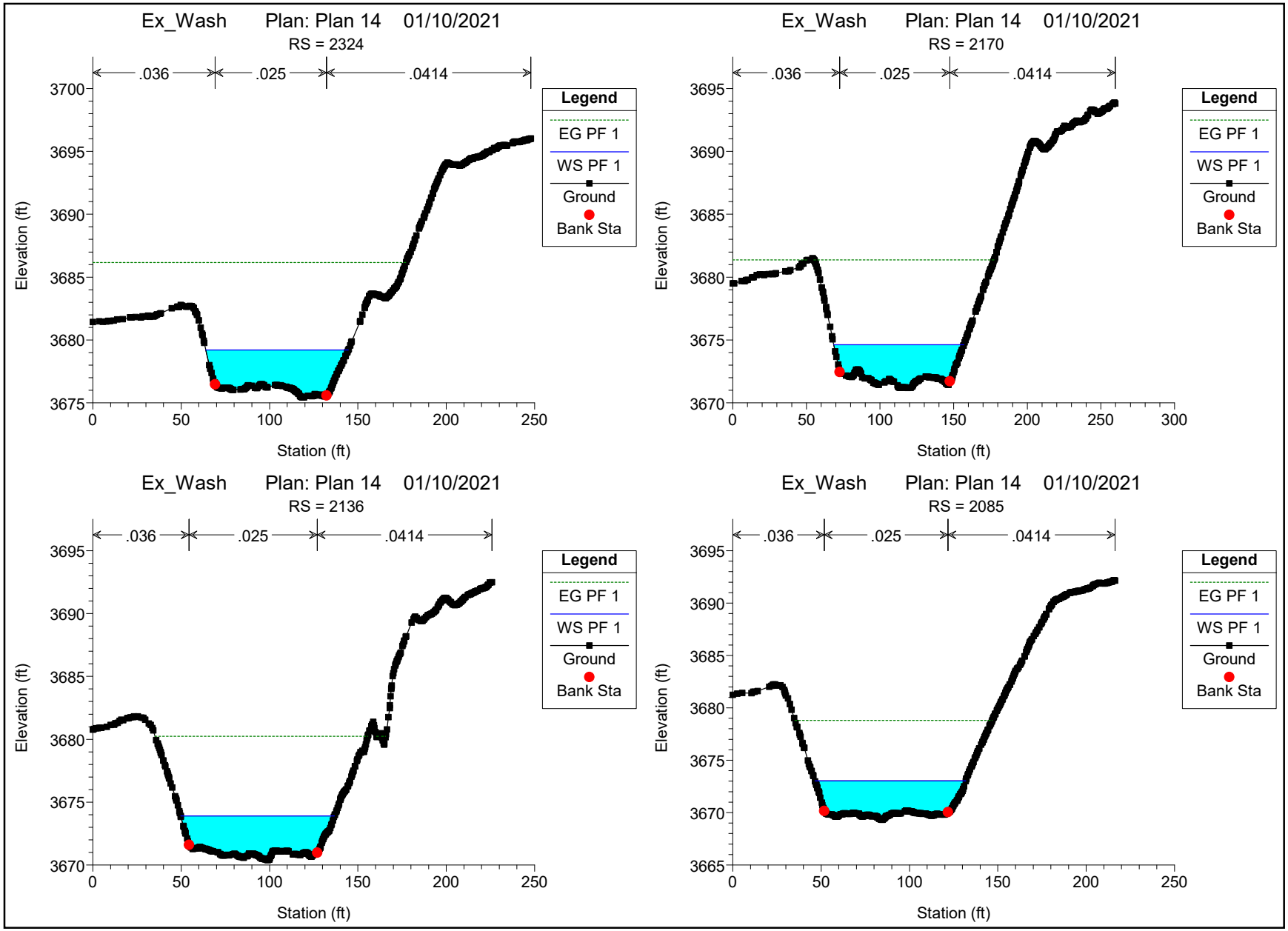
WS PF 1
Ground
Bank Sta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Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
RS = 2170
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.025
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
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.025
.0414
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
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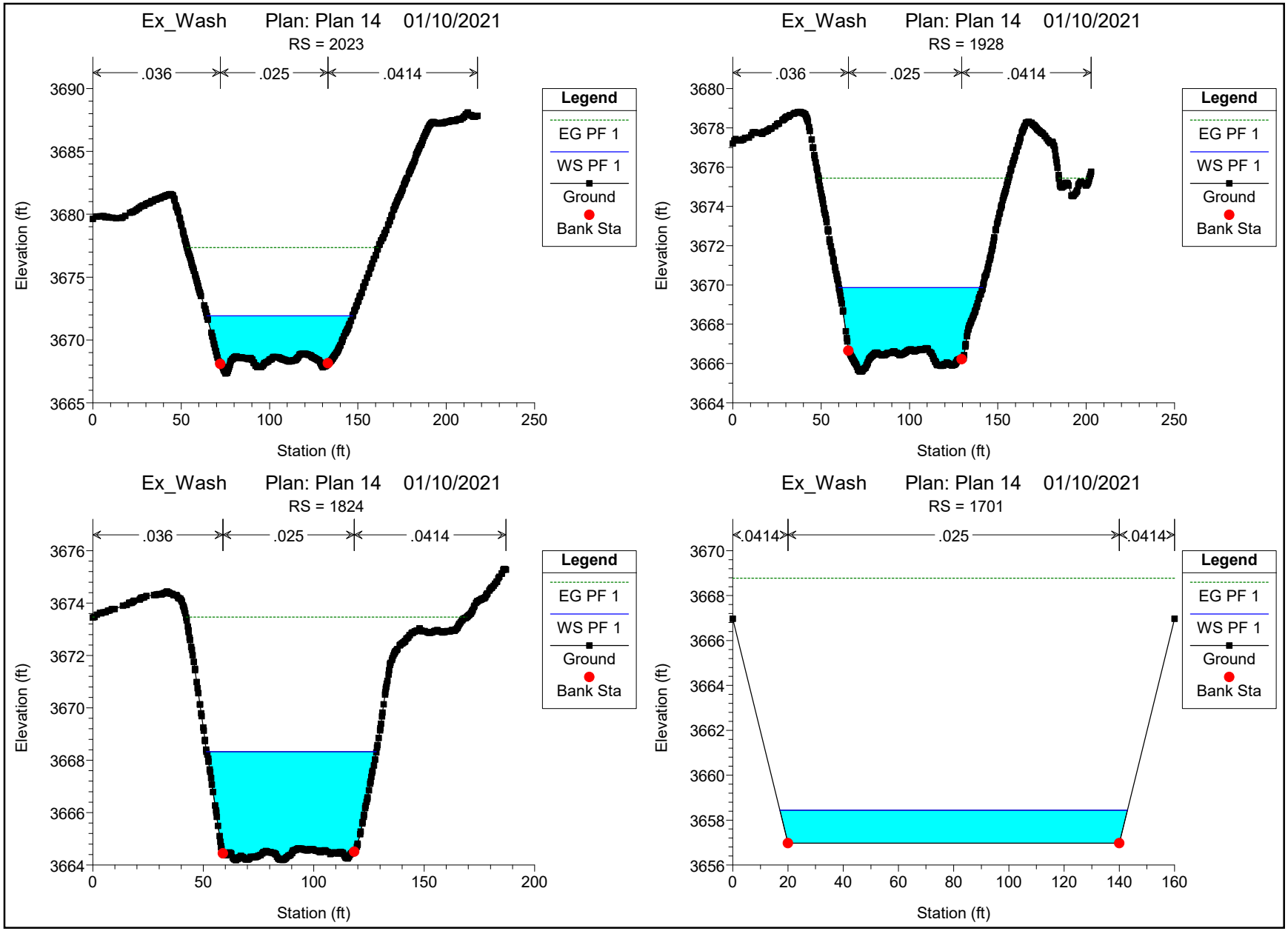
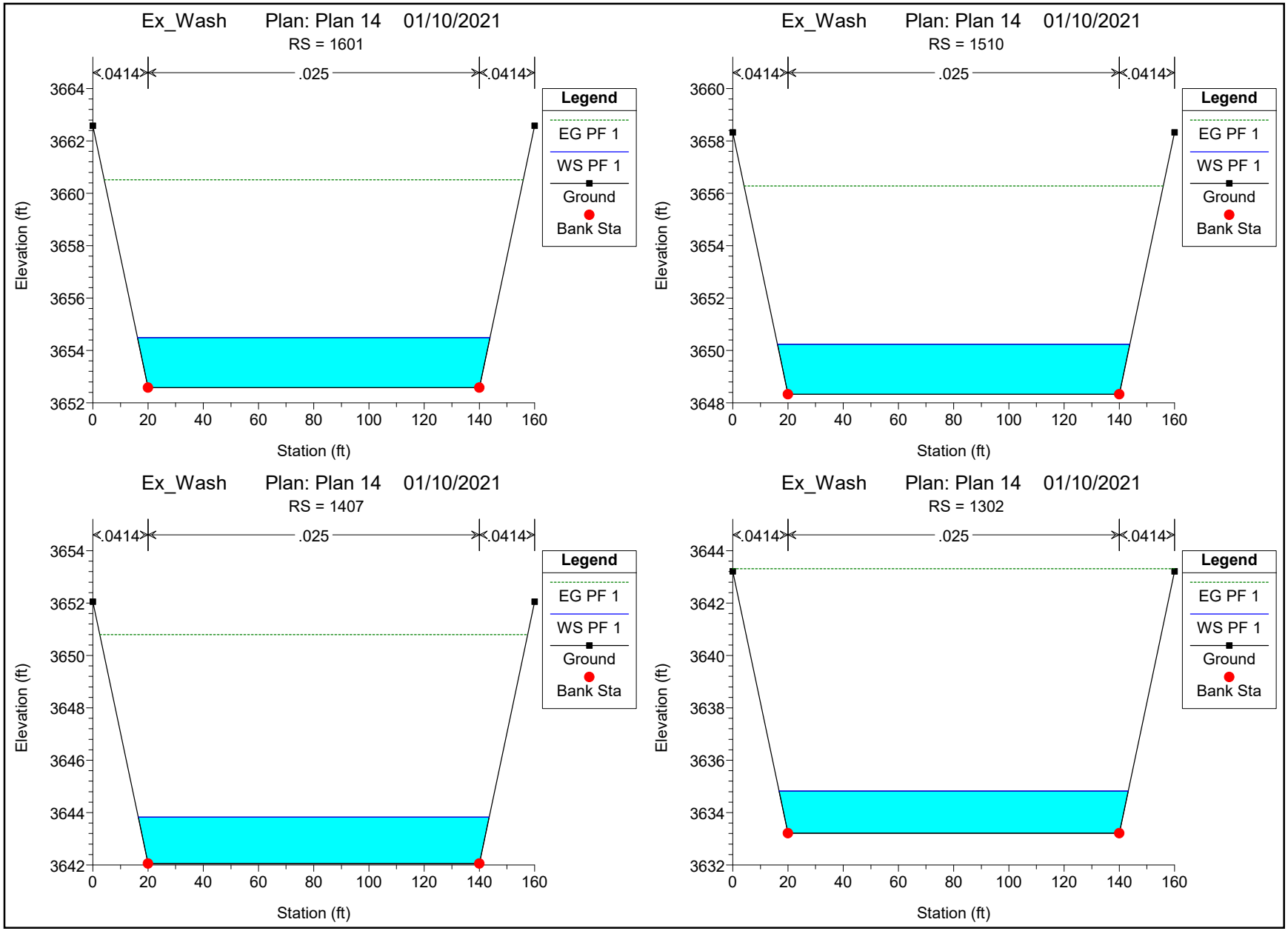
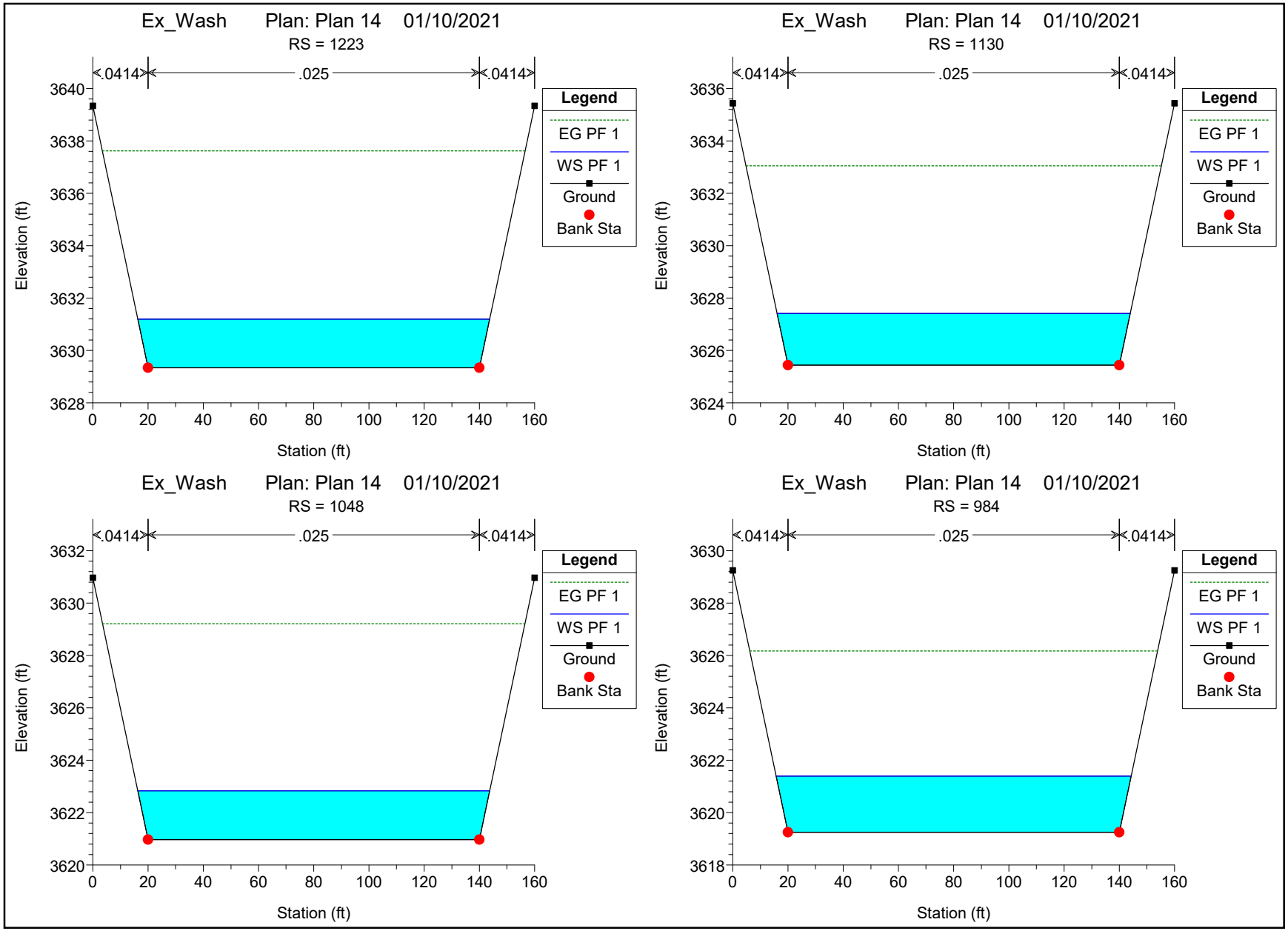
.025
.0414
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Ex_Wash Plan: Plan 14 01/10/2021
RS = 2023
.036
.025
.0414
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1928
.036
.025
.0414
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1824
.036
.025
.0414
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1701
.0414
.025
.0414
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta


Ex_Wash Plan: Plan 14 01/10/2021
RS = 1601
.0414
.025
.0414
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1510
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1407
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1302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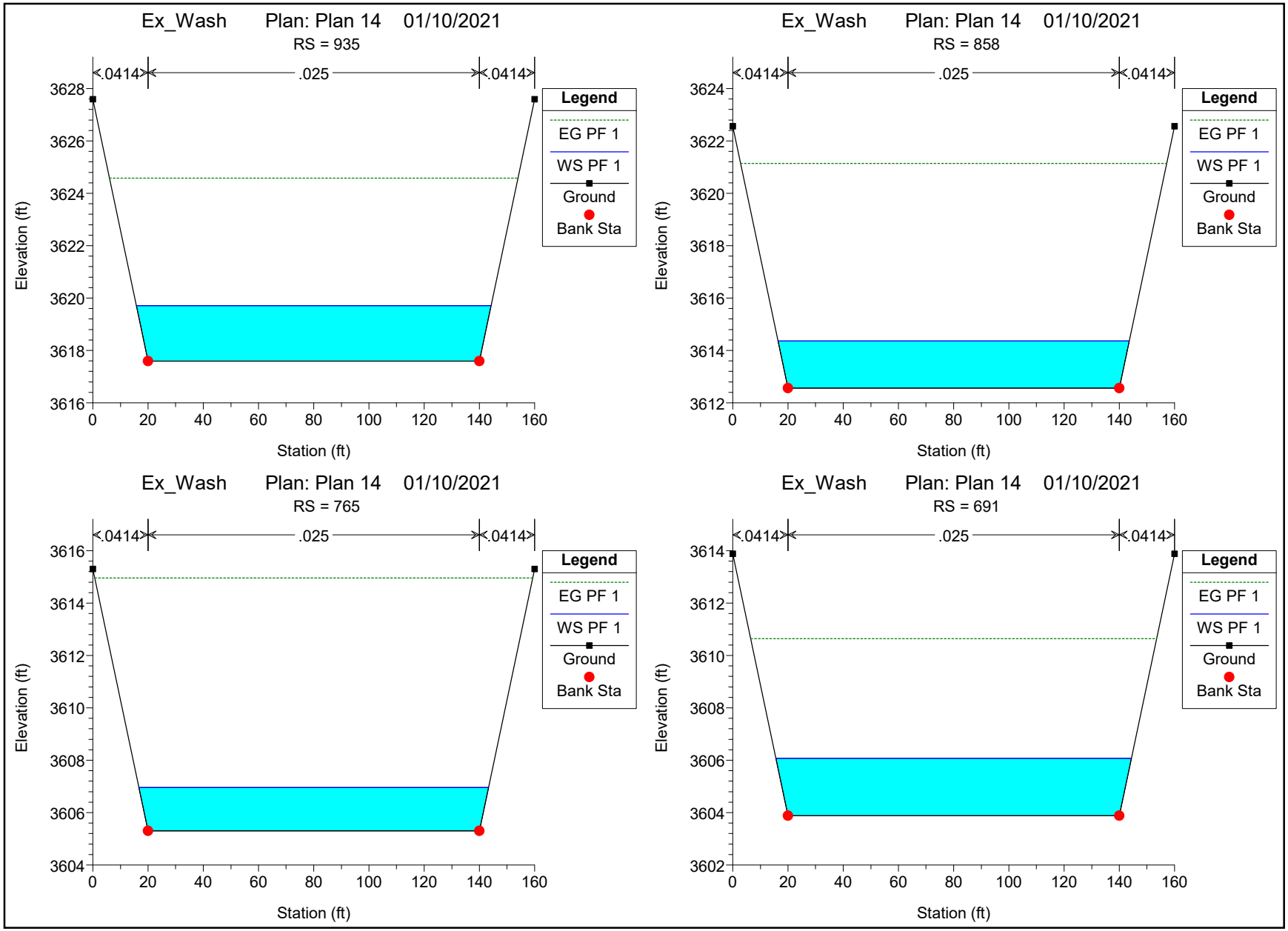
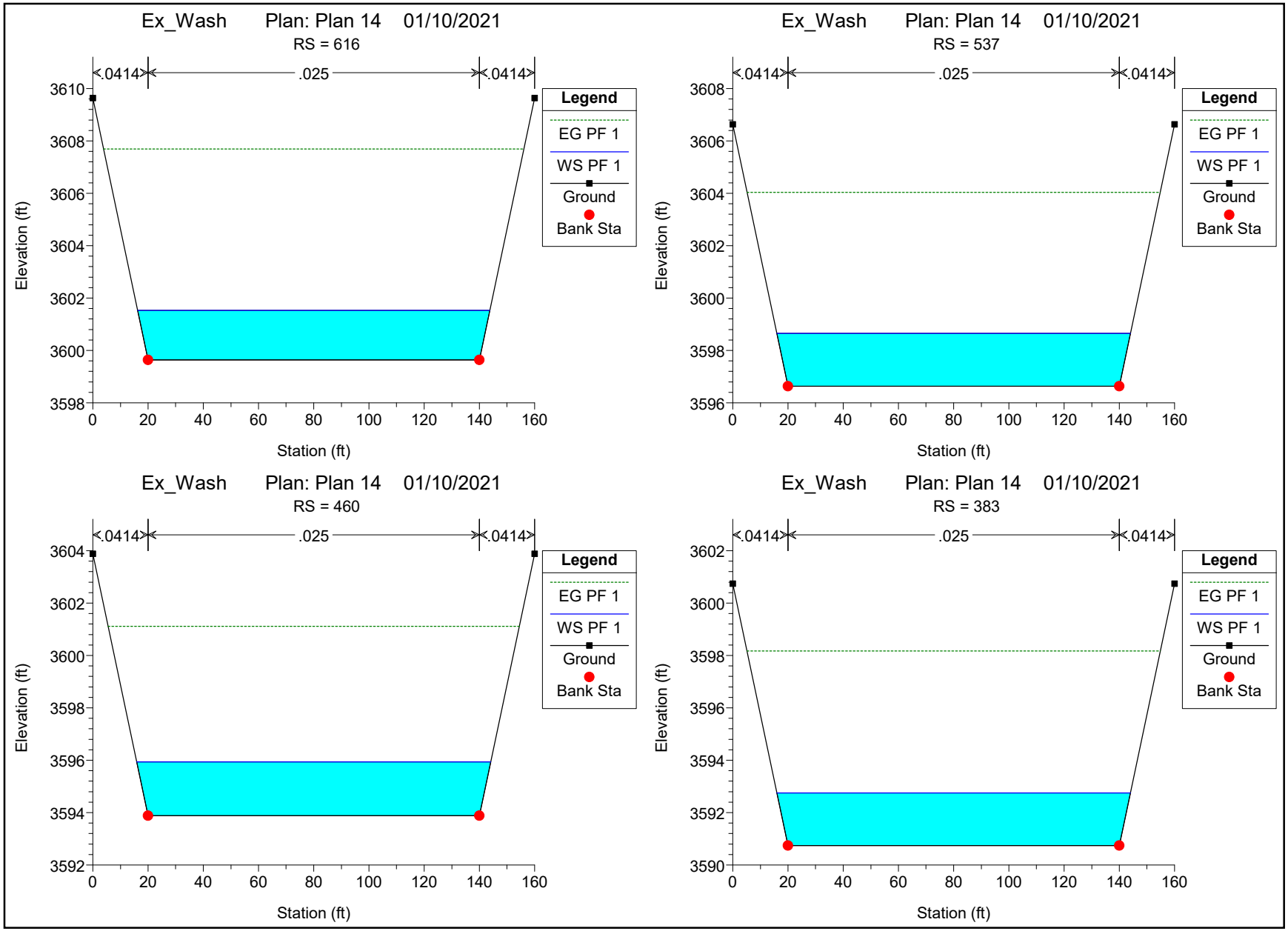
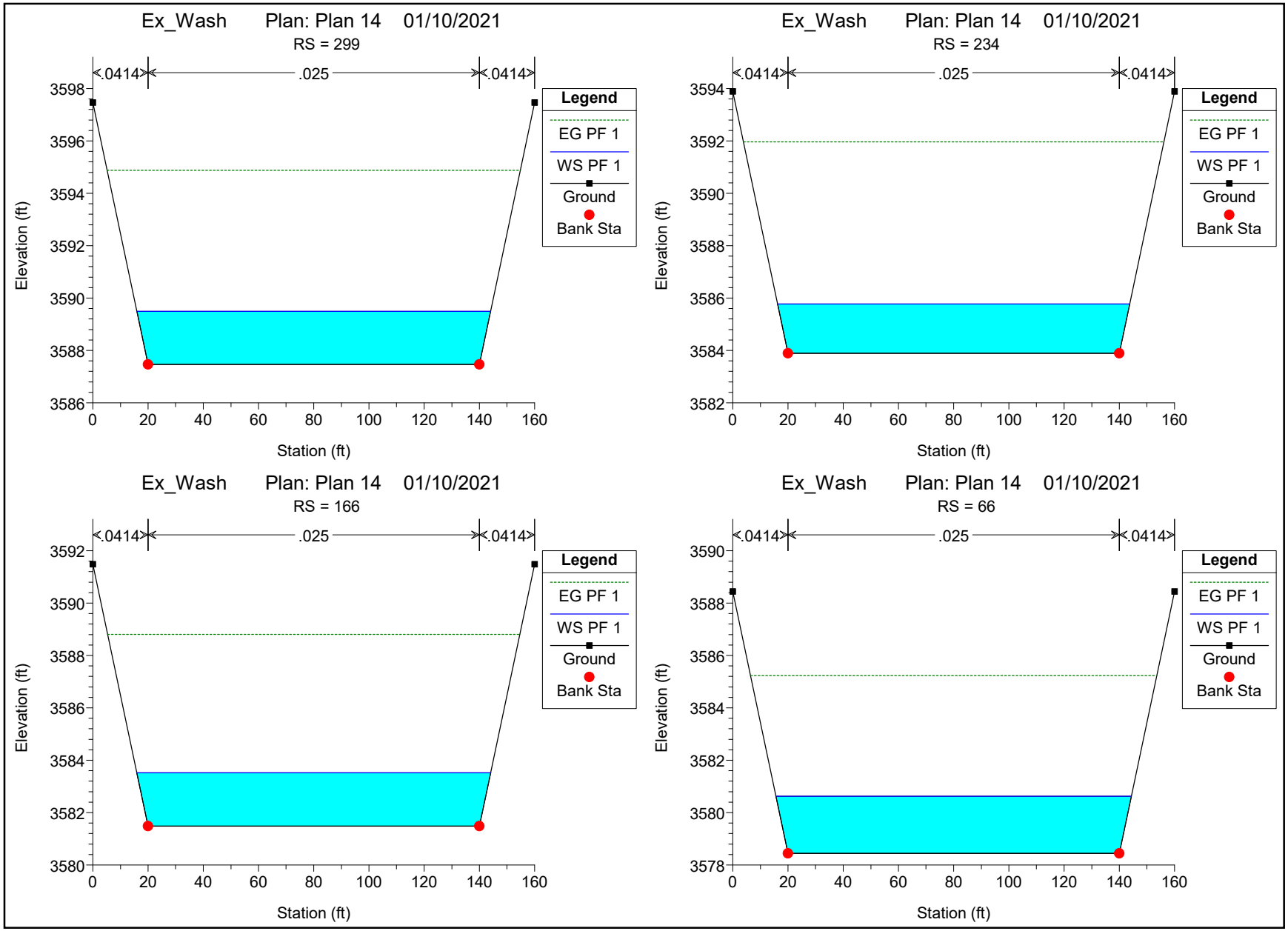
RS = 1223
.0414
.025
.0414
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1130
Ex_Wash Plan: Plan 14 01/10/2021
RS = 1048
Ex_Wash Plan: Plan 14 01/10/2021
RS = 984


Ex_Wash Plan: Plan 14 01/10/2021
RS = 935
.0414
.025
.0414
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
RS = 858
Ex_Wash Plan: Plan 14 01/10/2021
RS = 765
Ex_Wash Plan: Plan 14 01/10/2021
RS = 691


Ex_Wash Plan: Plan 14 01/10/2021
RS = 616
.0414
.025
.0414
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
RS = 537
Ex_Wash Plan: Plan 14 01/10/2021
RS = 460
Ex_Wash Plan: Plan 14 01/10/2021
RS = 383


Ex_Wash Plan: Plan 14 01/10/2021
RS = 299
.0414
.025
.0414
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Ex_Wash Plan: Plan 14 01/10/2021
RS = 234
Ex_Wash Plan: Plan 14 01/10/2021
RS = 166
Ex_Wash Plan: Plan 14 01/10/2021
RS = 66

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: Ex_Wash
Project File : Ex_Wash.prj
Run Date and Time: 01/10/2021 11:24:52 PM

Project in English units

PLAN DATA

Plan Title: Plan 14
Plan File : f:\Projects\600\62029-300\Division\Fctl\Calcs\Hydrualics\Wash\HEC-RAS\North Wash\190918 Proposed Cond HEC_RAS\Ex_Wash.p14

Geometry Title: Geometry
Geometry File : f:\Projects\600\62029-300\Division\Fctl\Calcs\Hydrualics\Wash\HEC-RAS\North Wash\190918 Proposed Cond HEC_RAS\Ex_Wash.g01

Flow Title : Steady_4590cfs
Flow File : f:\Projects\600\62029-300\Division\Fctl\Calcs\Hydrualics\Wash\HEC-RAS\North Wash\190918 Proposed Cond HEC_RAS\Ex_Wash.f03

Plan Summary Information:
Number of: Cross Sections = 32 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Steady_4590cfs
Flow File : f:\Projects\600\62029-300\Division\Fctl\Calcs\Hydrualics\Wash\HEC-RAS\North Wash\190918 Proposed Cond HEC_RAS\Ex_Wash.f03

Flow Data (cfs)

River	Reach	RS	PF 1
River 1	Reach 1	2725	4590

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
River 1	Reach 1	PF 1	Normal S = 0.04	Normal S = 0.037

GEOMETRY DATA

Geometry Title: Geometry
Geometry File : f:\Projects\600\62029-300\Division\Fctl\Calcs\Hydrualics\Wash\HEC-RAS\North Wash\190918 Proposed Cond HEC_RAS\Ex_Wash.g01

CROSS SECTION

RIVER: River 1

REACH: Reach 1 RS: 2725

INPUT
Description:
Station Elevation Data num= 495

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3694.17	2.2	3694.38	4.2	3694.45	5.3	3694.67	6.3	3694.78
7.3	3695.06	8.3	3695.39	11.5	3696.18	12.3	3696.44	14.4	3696.82
14.9	3696.85	15.4	3696.88	16.4	3696.89	16.7	3696.86	18.4	3696.69
20.4	3696.58	23.2	3696.57	23.5	3696.57	23.7	3696.56	24.5	3696.53
24.6	3696.54	26.3	3696.64	26.5	3696.65	29.6	3696.58	30.6	3696.48
30.7	3696.44	31.5	3696.07	31.6	3696.05	31.6	3696.02	31.73	3695.964
32.4	3695.57	33.3	3695.11	34.2	3694.68	34.6	3694.45	35	3694.23
35.2	3694.13	35.6	3693.94	35.9	3693.79	36.4	3693.5	36.6	3693.4
37.7	3692.94	37.7	3692.92	38.5	3692.51	38.7	3692.44	38.9	3692.35
39.4	3692.06	39.7	3691.93	40.1	3691.72	40.3	3691.6	40.7	3691.38
41.3	3691.09	41.7	3690.86	42.7	3690.38	43.7	3690.18	43.7	3690.16
43.8	3690.16	44.1	3690.16	44.6	3690.15	44.7	3690.15	44.9	3690.16
45.5	3690.19	45.8	3690.21	46.1	3690.21	46.4	3690.22	46.8	3690.22
47.3	3690.2	47.8	3690.18	48.8	3690.18	49	3690.18	49.8	3690.2
49.9	3690.2	50.4	3690.21	50.8	3690.22	50.9	3690.23	51.6	3690.33
51.8	3690.35	52.1	3690.33	52.5	3690.31	52.8	3690.28	53.3	3690.25
53.4	3690.24	53.9	3690.21	54.3	3690.14	55.1	3690.06	55.7	3690.04
55.9	3690.04	56	3690.04	56.8	3690.09	56.9	3690.09	57.8	3690.06
57.9	3690.06	58.1	3690.06	58.6	3690.06	58.9	3690.06	59.3	3690.12
59.5	3690.15	59.9	3690.2	60.4	3690.26	60.5	3690.27	60.9	3690.32
61.2	3690.34	62.1	3690.38	62.9	3690.47	63	3690.47	63.1	3690.5
63.9	3690.64	64	3690.66	64.1	3690.66	64.7	3690.66	65	3690.66
65.3	3690.68	65.6	3690.7	66	3690.73	66.5	3690.76	66.6	3690.77
67	3690.8	67.4	3690.77	67.8	3690.73	68	3690.7	68.2	3690.7
69	3690.61	69	3690.6	69.1	3690.6	69.5	3690.59	70	3690.59
70.1	3690.59	70.2	3690.59	70.9	3690.58	71.1	3690.58	71.7	3690.56
72.1	3690.56	72.6	3690.59	73.5	3690.63	73.8	3690.64	74.1	3690.65
75	3690.64	75.1	3690.64	75.2	3690.63	75.9	3690.62	76.1	3690.62
76.2	3690.62	77.1	3690.52	77.4	3690.52	77.8	3690.5	78.2	3690.5
78.6	3690.55	78.7	3690.57	79.2	3690.63	79.6	3690.68	79.8	3690.71
80.2	3690.76	80.5	3690.78	81	3690.8	81.2	3690.81	81.3	3690.82
82.2	3690.87	82.2	3690.88	83.1	3690.9	83.2	3690.9	83.4	3690.9
84.2	3690.89	84.6	3690.89	84.8	3690.89	85.2	3690.89	85.7	3690.9
86.3	3690.91	86.6	3690.91	87	3690.91	87.3	3690.91	88.3	3690.88
88.6	3690.88	89.2	3690.91	89.3	3690.91	89.4	3690.92	90.1	3690.97
90.3	3690.98	90.6	3690.99	90.9	3691	91.3	3691	91.8	3690.98
92.3	3690.96	92.7	3690.95	93	3690.96	93.3	3690.95	93.6	3690.95
94.2	3690.94	94.4	3690.94	94.9	3690.94	95.3	3690.94	95.4	3690.94
95.5	3690.95	96.4	3691.06	97.1	3691.14	97.4	3691.18	98.4	3691.28
98.8	3691.32	99.1	3691.35	99.4	3691.38	100.4	3691.47	100.6	3691.47
101.3	3691.5	101.4	3691.5	101.5	3691.5	102.3	3691.5	102.5	3691.5
102.7	3691.51	103.2	3691.54	103.5	3691.55	103.9	3691.56	104	3691.57
104.5	3691.58	104.9	3691.58	105.1	3691.58	105.5	3691.58	105.8	3691.59
106.3	3691.6	106.5	3691.61	107.5	3691.66	108.4	3691.65	108.5	3691.65
108.7	3691.64	109.3	3691.62	109.5	3691.61	109.9	3691.61	110.2	3691.62
110.6	3691.63	111	3691.63	111.1	3691.63	111.6	3691.63	111.9	3691.62
112.3	3691.6	112.6	3691.59	112.8	3691.59	113.5	3691.57	113.6	3691.57
113.7	3691.57	114.5	3691.68	114.6	3691.69	114.7	3691.7	115.6	3691.75
115.9	3691.79	116.6	3691.89	117.1	3691.89	117.2	3691.89	117.6	3691.89
118	3691.89	118.3	3691.87	118.7	3691.86	118.9	3691.84	119.5	3691.8
119.7	3691.78	119.8	3691.78	120.4	3691.78	120.6	3691.78	120.7	3691.78
121.5	3691.75	121.7	3691.75	121.9	3691.77	122.7	3691.84	123.2	3691.86
123.3	3691.86	123.7	3691.88	124.1	3691.92	124.4	3691.93	124.7	3691.97
125	3691.98	125.9	3692	126.8	3691.94	127.6	3691.84	127.8	3691.83
128	3691.8	128.5	3691.75	128.8	3691.71	129.2	3691.7	129.4	3691.69
129.8	3691.67	130.3	3691.66	130.4	3691.65	130.8	3691.64	131.1	3691.61
131.6	3691.56	131.8	3691.54	132	3691.55	132.8	3691.6	132.9	3691.6
133.1	3691.64	133.8	3691.72	133.9	3691.73	134	3691.74	134.6	3691.75
134.9	3691.77	135.2	3691.77	135.5	3691.78	135.9	3691.77	136.4	3691.76
136.4	3691.77	136.9	3691.76	137.2	3691.74	137.6	3691.73	137.9	3691.72
138.1	3691.7	138.8	3691.59	138.9	3691.57	139	3691.57	139.5	3691.55
139.9	3691.54	139.9	3691.53	140	3691.54	140.7	3691.54	140.9	3691.55
141.2	3691.57	142	3691.64	142.4	3691.7	142.5	3691.71	143	3691.76
143.4	3691.81	143.6	3691.83	144	3691.87	144.2	3691.89	144.8	3691.94
145	3691.95	145.1	3691.96	145.8	3692.04	146	3692.06	146.9	3692.08
147	3692.08	147.2	3692.06	148	3692	148.4	3691.94	148.6	3691.91
149	3691.86	149.5	3691.88	149.6	3691.89	150.1	3691.91	150.3	3691.92
150.9	3691.93	151.1	3691.93	151.2	3691.92	152.1	3691.88	152.2	3691.9
153.1	3692.04	153.3	3692.04	153.8	3692.01	154.1	3692	154.5	3692.01
155.1	3692.01	155.6	3692.08	155.7	3692.09	156.1	3692.15	156.5	3692.16
156.9	3692.16	157.1	3692.17	157.3	3692.17	158.1	3692.19	158.2	3692.19
158.6	3692.24	159.1	3692.3	159.2	3692.3	159.3	3692.31	160	3692.32
160.2	3692.33	160.5	3692.3	161.2	3692.22	161.7	3692.21	162.2	3692.2
162.6	3692.2	162.9	3692.2	163.2	3692.2	163.5	3692.21	164.1	3692.22
164.2	3692.23	164.3	3692.23	164.9	3692.26	165.2	3692.28	166.1	3692.27
166.3	3692.26	167.3	3692.18	167.7	3692.17	168.3	3692.16	168.7	3692.17
168.9	3692.21	169.3	3692.23	169.6	3692.3	170.1	3692.38	170.3	3692.42
170.4	3692.47	171.3	3692.8	171.3	3692.81	172.5	3693.16	173.1	3693.31
173.3	3693.41	173.7	3693.58	174.4	3693.84	174.9	3694.01	175.4	3694.13
175.7	3694.21	176.1	3694.33	176.4	3694.39	176.6	3694.45	177.3	3694.7
177.4	3694.71	177.4	3694.72	177.6	3694.78	178.3	3694.96	178.5	3695.02
179.2	3695.19	179.4	3695.24	179.8	3695.33	180	3695.4	180.4	3695.5
180.9	3695.63	181	3695.64	181.4	3695.77	181.8	3695.86	182.2	3695.94

182.5	3696.01	182.7	3696.06	183.4	3696.24	183.5	3696.27	184.4	3696.46
184.5	3696.47	184.6	3696.47	185.3	3696.52	185.5	3696.52	185.8	3696.6
186.5	3696.81	187	3696.89	187.5	3696.96	187.9	3697.03	188.2	3697.1
188.5	3697.17	188.8	3697.2	189.4	3697.29	189.5	3697.31	189.7	3697.33
190.4	3697.44	190.5	3697.47	190.6	3697.47	191.4	3697.53	191.6	3697.54
191.8	3697.58	192.3	3697.65	192.6	3697.71	193	3697.76	193.2	3697.78
193.6	3697.83	194	3697.85	195.6	3697.99	195.8	3698	196.6	3698.03
197.5	3698.16	197.6	3698.18	197.8	3698.21	198.4	3698.32	198.7	3698.36
199	3698.44	199.7	3698.59	200.1	3698.67	200.2	3698.68	200.7	3698.76
201	3698.8	201.4	3698.87	201.7	3698.91	201.9	3698.93	202.6	3699.02
202.7	3699.02	202.8	3699.03	203.1	3699.08	203.6	3699.16	203.7	3699.17
203.8	3699.19	204.5	3699.31	204.7	3699.34	205	3699.38	205.7	3699.49
206.2	3699.59	206.3	3699.59	206.8	3699.69	207.1	3699.74	207.5	3699.78
207.8	3699.82	208	3699.85	208.7	3699.94	209.5	3700.05	209.7	3700.09
209.8	3700.09	209.9	3700.1	210.6	3700.24	210.8	3700.27	211.1	3700.29
211.5	3700.34	211.8	3700.37	212.3	3700.43	212.4	3700.45	212.5	3700.46

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	42.7	.025	168.9	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
42.7	168.9	76.8	65.8	62.8	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	3698.42	Element			
Vel Head (ft)	5.20	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3693.22	Reach Len. (ft)	76.80	65.80	62.80
Crit W.S. (ft)	3694.67	Flow Area (sq ft)	7.91	244.37	2.17
E.G. Slope (ft/ft)	0.040013	Area (sq ft)	7.91	244.37	2.17
Q Total (cfs)	4590.00	Flow (cfs)	75.65	4503.98	10.37
Top Width (ft)	135.68	Top Width (ft)	5.66	126.20	3.82
Vel Total (ft/s)	18.04	Avg. Vel. (ft/s)	9.56	18.43	4.79
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	1.40	1.94	0.57
Conv. Total (cfs)	22946.2	Conv. (cfs)	378.2	22516.2	51.8
Length Wtd. (ft)	65.98	Wetted Per. (ft)	6.35	126.61	3.98
Min Ch El (ft)	3690.04	Shear (lb/sq ft)	3.11	4.82	1.36
Alpha	1.03	Stream Power (lb/ft s)	29.77	88.86	6.51
Frctn Loss (ft)	2.45	Cum Volume (acre-ft)	0.33	13.71	0.57
C & E Loss (ft)	0.04	Cum SA (acres)	0.27	6.26	0.39

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 2659

INPUT
Description:
Station Elevation Data num= 424

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3692.9	.9	3692.96	2.9	3692.92	3.9	3692.88	5.9	3693.19
6.9	3693.18	7.9	3693	8.9	3692.55	9.2	3692.36	9.6	3692.14
10.2	3691.77	10.8	3691.47	10.9	3691.42	11.9	3690.95	12.9	3690.29
13.9	3689.73	14.7	3689.32	15.9	3688.77	16.9	3688.2	18	3687.72
18.8	3687.3	18.9	3687.28	18.9	3687.27	19.9	3687	20.9	3686.94
21.8	3686.99	21.9	3687	22.9	3687.03	23	3687.04	23.9	3687.13
24	3687.15	24.7	3687.24	24.9	3687.26	25	3687.27	26.9	3687.45
27.9	3687.45	29.2	3687.48	29.6	3687.48	29.9	3687.49	30.2	3687.49
30.6	3687.5	30.9	3687.5	31.2	3687.52	31.5	3687.51	32.9	3687.57
33.3	3687.55	33.9	3687.52	34.3	3687.53	34.4	3687.54	34.9	3687.55
35.4	3687.53	35.4	3687.52	35.9	3687.5	36.9	3687.54	37.4	3687.49
37.4	3687.48	37.9	3687.43	38.3	3687.42	38.5	3687.42	38.9	3687.41
39.3	3687.42	39.9	3687.44	43.9	3687.75	44.7	3687.79	44.9	3687.8
45.1	3687.8	45.7	3687.82	45.9	3687.82	46.1	3687.83	46.7	3687.87
46.9	3687.89	47.1	3687.89	47.8	3687.91	47.9	3687.91	48	3687.91
48.8	3687.93	48.9	3687.93	49	3687.93	49.8	3687.94	49.9	3687.94
50	3687.94	50.9	3687.94	51.9	3687.94	52.3	3687.95	52.9	3687.97
55	3687.83	55.8	3687.76	56	3687.74	56.9	3687.68	57.1	3687.67
57.7	3687.62	57.9	3687.61	58.1	3687.62	58.7	3687.62	58.9	3687.62
59.1	3687.63	59.7	3687.68	59.9	3687.7	60.2	3687.69	60.6	3687.68
60.9	3687.67	61.2	3687.63	61.9	3687.53	62.2	3687.58	62.6	3687.59
62.9	3687.64	63.2	3687.75	63.6	3687.86	63.9	3687.98	64.3	3688.03
64.5	3688.07	64.9	3688.12	65.3	3688.14	65.5	3688.15	65.9	3688.17
66.3	3688.18	66.5	3688.18	66.9	3688.18	67.4	3688.19	67.9	3688.19
68.4	3688.24	68.9	3688.3	69.4	3688.34	69.9	3688.38	70.3	3688.35
70.5	3688.35	70.9	3688.33	71.3	3688.29	71.5	3688.28	71.9	3688.24
72.5	3688.22	72.9	3688.2	73.3	3688.19	73.6	3688.19	73.9	3688.19
74.2	3688.17	74.9	3688.13	75.6	3688.12	75.9	3688.12	76.2	3688.13
76.9	3688.17	77.1	3688.21	77.9	3688.32	78.1	3688.33	78.7	3688.36
79.1	3688.36	79.8	3688.34	79.9	3688.34	80.1	3688.33	80.8	3688.26
80.9	3688.25	81	3688.22	81.8	3688.05	81.9	3688.03	82	3688.03
82.9	3688.03	83	3688.04	83.9	3688.16	84.4	3688.22	84.9	3688.28
85.9	3688.16	86	3688.15	86.8	3688.04	86.9	3688.02	87	3688.03
87.8	3688.03	87.9	3688.05	88	3688.06	88.9	3688.21	89.1	3688.23
89.8	3688.32	90.1	3688.35	90.9	3688.46	91.7	3688.43	91.9	3688.42
92.2	3688.4	92.7	3688.37	92.9	3688.35	93.2	3688.34	93.6	3688.33

93.9	3688.32	94.2	3688.32	94.9	3688.34	95.3	3688.33	95.6	3688.3
96.3	3688.29	96.5	3688.29	96.9	3688.3	97.3	3688.3	97.5	3688.31
97.9	3688.3	98.4	3688.31	98.5	3688.31	98.9	3688.32	99.4	3688.37
99.9	3688.42	100.4	3688.48	100.9	3688.55	101.4	3688.6	101.5	3688.6
101.9	3688.65	102.4	3688.64	102.5	3688.64	102.9	3688.63	103.3	3688.62
103.5	3688.61	103.9	3688.6	104.3	3688.6	104.6	3688.6	104.9	3688.6
105.3	3688.59	105.9	3688.58	106.2	3688.57	106.6	3688.56	106.9	3688.54
107.2	3688.55	107.7	3688.58	107.9	3688.59	108.2	3688.59	108.7	3688.61
108.9	3688.62	109.2	3688.62	109.7	3688.64	109.9	3688.65	110.1	3688.67
110.8	3688.68	110.9	3688.7	111.1	3688.7	111.8	3688.72	111.9	3688.72
112.1	3688.72	112.8	3688.72	112.9	3688.72	113	3688.72	113.8	3688.69
113.9	3688.69	114	3688.69	114.9	3688.69	115	3688.69	115.9	3688.75
116	3688.75	116.5	3688.73	116.9	3688.72	117.9	3688.75	118	3688.75
118.9	3688.75	119	3688.76	119.8	3688.86	119.9	3688.87	120	3688.87
120.8	3688.87	120.9	3688.87	121.1	3688.9	121.8	3689.01	121.9	3689.05
122.1	3689.09	122.7	3689.23	122.9	3689.29	123.1	3689.35	123.7	3689.53
123.9	3689.6	124.2	3689.68	124.7	3689.86	124.9	3689.95	125.2	3690.04
125.9	3690.29	126.2	3690.37	126.6	3690.47	126.9	3690.56	127.3	3690.66
127.6	3690.75	127.9	3690.85	128.3	3690.95	128.6	3691.02	128.9	3691.13
129.3	3691.24	130.4	3691.56	130.5	3691.6	130.9	3691.74	131.5	3691.89
132.4	3692.19	132.9	3692.34	133.5	3692.52	133.9	3692.68	134.4	3692.84
134.5	3692.88	134.9	3693.04	135.4	3693.16	135.5	3693.21	135.9	3693.33
136.3	3693.42	136.9	3693.56	137.6	3693.72	137.9	3693.8	138.3	3693.9
138.6	3694.01	138.9	3694.11	139.13	694.177	139.2	3694.21	139.7	3694.36
139.9	3694.46	140.2	3694.55	140.7	3694.72	140.9	3694.8	141.2	3694.87
141.7	3695.01	141.9	3695.07	142.1	3695.11	142.8	3695.24	142.9	3695.28
143.1	3695.31	143.8	3695.5	144.1	3695.56	144.8	3695.66	144.9	3695.68
145.1	3695.68	145.9	3695.74	146	3695.74	146.9	3695.77	147	3695.78
147.9	3695.84	148	3695.85	148.7	3695.95	148.9	3696	149	3696
149.9	3696.06	149.9	3696.07	150	3696.08	150.9	3696.3	150.9	3696.32
151	3696.33	151.9	3696.44	152.1	3696.48	153	3696.72	153.1	3696.75
153.8	3696.9	154	3696.93	154.1	3696.95	154.8	3696.99	155	3697.02
155.2	3697.06	155.7	3697.17	156	3697.22	156.2	3697.26	156.7	3697.32
157	3697.36	157.2	3697.37	157.7	3697.4	158	3697.41	158.6	3697.55
159	3697.6	159.3	3697.65	159.6	3697.7	160	3697.75	160.3	3697.76
161	3697.79	161.3	3697.79	161.6	3697.78	162	3697.79	162.4	3697.84
162.5	3697.85	163	3697.9	163.5	3697.91	164	3697.92	164.4	3697.91
164.5	3697.91	165.4	3697.93	165.5	3697.93	166	3697.95	166.4	3698.01
167	3698.09	167.4	3698.12	167.5	3698.13	168	3698.16	168.3	3698.2
168.6	3698.23	169	3698.27	169.3	3698.31	169.6	3698.35	170	3698.4
170.3	3698.41	170.6	3698.41	171	3698.42	171.3	3698.45	171.7	3698.5
172	3698.54	172.2	3698.59	172.7	3698.7	173	3698.74	173.2	3698.76
173.7	3698.77	174	3698.79	174.2	3698.81	175	3698.88	175.1	3698.9
175.8	3699	176.1	3699.04	176.8	3699.06	177	3699.07	177.1	3699.08
178	3699.22	178.9	3699.19	179	3699.2	179.9	3699.28	180	3699.28
180.8	3699.31	181	3699.31	181.9	3699.31	182	3699.31	182.9	3699.28
183	3699.28	183.9	3699.28	184.8	3699.31	185	3699.31	185.1	3699.31
185.8	3699.29	186	3699.29	186.1	3699.29	186.8	3699.29	187	3699.3
187.2	3699.32	188	3699.42	188.2	3699.44	188.4	3699.45		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	18.9	.025	119.9	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
18.9	119.9	115.1	105.8	100.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3695.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.60	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3690.33	Reach Len. (ft)	115.10	105.80	100.50
Crit W.S. (ft)	3691.94	Flow Area (sq ft)	9.50	232.51	5.67
E.G. Slope (ft/ft)	0.034505	Area (sq ft)	9.50	232.51	5.67
Q Total (cfs)	4590.00	Flow (cfs)	91.11	4463.86	35.02
Top Width (ft)	113.19	Top Width (ft)	6.06	101.00	6.14
Vel Total (ft/s)	18.53	Avg. Vel. (ft/s)	9.59	19.20	6.18
Max Chl Dpth (ft)	3.39	Hydr. Depth (ft)	1.57	2.30	0.92
Conv. Total (cfs)	24710.0	Conv. (cfs)	490.5	24030.9	188.6
Length Wtd. (ft)	105.89	Wetted Per. (ft)	6.79	101.40	6.35
Min Ch El (ft)	3686.94	Shear (lb/sq ft)	3.01	4.94	1.92
Alpha	1.05	Stream Power (lb/ft s)	28.91	94.83	11.87
Frctn Loss (ft)	3.23	Cum Volume (acre-ft)	0.31	13.35	0.56
C & E Loss (ft)	0.05	Cum SA (acres)	0.26	6.09	0.38

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 2554

INPUT
Description:
Station Elevation Data num= 494

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	3689.43	1.9	3689.44	2.9	3689.5	3.9	3689.67	5.9	3689.75
7.9	3689.6	8.9	3689.56	9.9	3689.08	10.6	3688.74	10.9	3688.55
11.9	3687.96	12.8	3687.366	12.9	3687.3	14.9	3686.35	15.9	3685.83
17	3685.39	17.8	3684.96	18.2	3684.76	18.7	3684.43	20	3683.83
21	3683.39	22	3683.27	22.5	3683.28	23	3683.3	23.4	3683.34
23.6	3683.37	24	3683.41	24.3	3683.43	24.7	3683.44	25	3683.46
25.2	3683.46	27	3683.4	27.1	3683.38	27.9	3683.17	28	3683.16
28	3683.15	29	3683.03	30	3683	31	3683.07	31.2	3683.07
31.8	3683.07	32	3683.06	32.3	3683.06	32.7	3683.05	33	3683.05
33.3	3683.02	33.6	3683	34	3682.97	34.6	3682.97	35	3682.97
35.5	3682.98	36	3683	36.4	3683.04	36.6	3683.06	37	3683.11
37.4	3683.12	37.7	3683.11	38	3683.12	38.3	3683.13	38.8	3683.13
39	3683.13	39.2	3683.12	39.8	3683.12	40	3683.12	40.2	3683.12
40.9	3683.17	41	3683.18	41.1	3683.19	42	3683.25	42.3	3683.28
43	3683.34	43.1	3683.35	43.9	3683.4	44	3683.41	44.2	3683.41
44.8	3683.39	45	3683.38	45.3	3683.37	46	3683.33	46.3	3683.34
46.7	3683.36	47	3683.38	47.4	3683.39	47.6	3683.39	48.5	3683.44
48.6	3683.44	49	3683.47	49.5	3683.47	49.6	3683.47	50	3683.47
51.8	3683.43	52.1	3683.42	52.3	3683.41	52.8	3683.38	53.1	3683.36
53.2	3683.36	53.9	3683.34	54.2	3683.34	55	3683.37	55.1	3683.37
55.1	3683.38	55.7	3683.44	56	3683.47	56.1	3683.47	57.1	3683.54
57.2	3683.54	57.9	3683.56	60.1	3683.53	60.4	3683.55	60.7	3683.57
61.1	3683.6	61.5	3683.62	61.6	3683.63	62.1	3683.65	62.6	3683.65
63.1	3683.64	63.5	3683.64	63.7	3683.65	64.1	3683.66	64.4	3683.66
65.1	3683.65	65.4	3683.65	65.8	3683.67	66.1	3683.67	66.3	3683.68
66.9	3683.7	67.1	3683.7	67.2	3683.71	68	3683.76	68.1	3683.77
68.2	3683.76	69.1	3683.62	70	3683.6	70.1	3683.59	70.2	3683.59
71	3683.54	71.1	3683.54	71.3	3683.57	71.9	3683.69	72.1	3683.73
72.3	3683.74	72.8	3683.77	73.1	3683.78	73.4	3683.79	73.8	3683.79
74.7	3683.77	75.1	3683.77	75.6	3683.88	75.6	3683.89	76.1	3684
76.6	3683.97	76.7	3683.97	77.1	3683.93	77.5	3683.87	77.8	3683.81
78.1	3683.74	78.4	3683.7	78.8	3683.63	79.1	3683.59	79.9	3683.61
80.1	3683.62	80.3	3683.64	81	3683.68	81.1	3683.69	81.2	3683.69
82.1	3683.69	82.2	3683.7	82.6	3683.77	83.1	3683.84	83.2	3683.85
84	3683.99	84.1	3684	85	3684.05	85.1	3684.07	85.3	3684.09
85.9	3684.14	86.1	3684.16	86.4	3684.2	86.8	3684.25	87.1	3684.28
87.5	3684.29	87.8	3684.29	88.6	3684.31	89.2	3684.33	89.6	3684.33
89.7	3684.33	90.2	3684.33	90.6	3684.29	90.8	3684.27	91.2	3684.24
91.8	3684.21	92.2	3684.21	92.4	3684.18	92.9	3684.17	93.2	3684.15
93.4	3684.15	94.2	3684.15	95.1	3684.15	95.2	3684.15	95.2	3684.16
96.1	3684.24	96.2	3684.25	97.1	3684.51	97.2	3684.54	97.3	3684.57
98	3684.83	98.2	3684.88	99	3685.09	99.2	3685.15	99.4	3685.24
100.2	3685.49	101.2	3685.82	101.6	3685.98	101.8	3686.04	102.2	3686.2
102.7	3686.34	102.7	3686.35	103.2	3686.49	103.8	3686.69	104.2	3686.84
104.6	3686.96	104.8	3687.04	105.2	3687.15	105.5	3687.27	105.9	3687.46
106.2	3687.57	106.4	3687.65	107	3687.85	107.2	3687.92	107.4	3687.96
108.1	3688.15	108.2	3688.18	108.3	3688.2	109.2	3688.52	109.2	3688.53
109.2	3688.54	109.5	3688.65	110.2	3688.9	110.2	3688.91	110.3	3688.93
111.1	3689.17	111.2	3689.21	112	3689.5	112.2	3689.56	112.4	3689.65
113	3689.85	113.2	3689.95	113.5	3690.06	113.9	3690.19	114.2	3690.32
114.6	3690.45	114.8	3690.53	115.2	3690.66	115.7	3690.82	115.8	3690.86
116.2	3691.02	116.7	3691.17	117.2	3691.34	117.6	3691.49	117.9	3691.59
118.2	3691.73	118.6	3691.83	118.9	3691.93	119.2	3692.02	119.5	3692.11
120	3692.28	120.4	3692.42	121.1	3692.69	121.2	3692.74	121.4	3692.79
122.2	3693.09	122.2	3693.11	122.3	3693.13	123	3693.33	123.2	3693.41
123.3	3693.42	124.2	3693.79	124.3	3693.82	124.4	3693.86	125.3	3694.17
125.4	3694.24	126	3694.45	126.3	3694.53	126.5	3694.63	127	3694.79
127.3	3694.9	127.6	3694.99	127.9	3695.09	128.3	3695.18	128.7	3695.29
129.3	3695.44	129.8	3695.51	130.3	3695.58	130.7	3695.63	130.9	3695.65
131.3	3695.71	131.6	3695.74	131.9	3695.76	132.3	3695.78	132.43	3695.787
132.6	3695.8	133	3695.83	133.3	3695.84	133.5	3695.86	134.1	3695.9
134.3	3695.91	134.4	3695.93	135.2	3696.02	135.3	3696.03	139.1	3696.39
139.3	3696.42	139.5	3696.45	140	3696.51	140.3	3696.54	140.6	3696.56
141	3696.58	141.3	3696.59	141.7	3696.62	141.9	3696.63	142.3	3696.66
142.8	3696.69	143.3	3696.74	144.7	3696.76	144.9	3696.76	145.6	3696.77
146	3696.79	146.3	3696.79	146.6	3696.8	147.1	3696.83	147.3	3696.84
147.5	3696.85	148.2	3696.85	148.3	3696.85	148.4	3696.85	149.3	3696.87
149.4	3696.88	149.9	3696.89	150.3	3696.91	150.4	3696.91	151.2	3696.88
151.3	3696.88	151.4	3696.88	152.2	3696.91	152.3	3696.91	152.5	3696.91
153.1	3696.91	153.3	3696.91	153.6	3696.92	154.3	3696.94	155	3696.9
155.3	3696.89	156.3	3696.86	156.8	3696.88	156.9	3696.88	157.3	3696.89
157.8	3696.89	157.9	3696.89	158.3	3696.89	158.7	3696.9	159	3696.91
159.3	3696.92	159.6	3696.92	160.1	3696.93	160.4	3696.93	160.6	3696.92
161.4	3696.87	161.5	3696.86	162.3	3696.78	162.4	3696.78	163.3	3696.72
163.4	3696.72	164.3	3696.64	164.4	3696.63	165.2	3696.61	165.4	3696.61
165.5	3696.61	166.2	3696.62	166.4	3696.62	166.6	3696.62	167.1	3696.64
167.7	3696.64	168	3696.63	168.4	3696.62	168.8	3696.63	169	3696.63
169.4	3696.64	169.9	3696.66	170.4	3696.69	170.8	3696.73	170.9	3696.74
171.4	3696.78	171.8	3696.81	172	3696.83	172.4	3696.85	172.7	3696.88
173.1	3696.93	173.4	3696.96	173.6	3696.97	174.2	3696.99	174.4	3697
174.6	3697	175.3	3697.03	175.4	3697.03	176.4	3697.03	176.8	3697.07
177.4	3697.12	177.4	3697.13	178.3	3697.24	178.4	3697.25	178.5	3697.26
179.2	3697.28	179.4	3697.29	179.6	3697.31	180.2	3697.36	180.4	3697.38
180.7	3697.44	181.1	3697.48	181.4	3697.54	182	3697.52	182.4	3697.5
182.9	3697.51	183	3697.52	183.4	3697.52	183.9	3697.56	184	3697.57
184.4	3697.61	184.8	3697.65	185	3697.67	185.4	3697.71	185.8	3697.73
186.1	3697.76	186.4	3697.78	186.7	3697.8	187.2	3697.83	187.4	3697.85
187.6	3697.86	188.4	3697.91	188.6	3697.93	189.4	3698.03	189.5	3698.04
190.2	3698.13	190.4	3698.15	190.4	3698.16	190.5	3698.16	191.4	3698.35

191.4	3698.37	191.5	3698.38	192.3	3698.45	192.4	3698.46	193.2	3698.55
193.4	3698.56	193.7	3698.59	194.2	3698.67	194.4	3698.7	194.8	3698.71
195.1	3698.68	195.4	3698.69	195.9	3698.69	196	3698.69	196.5	3698.69
197	3698.71	197.5	3698.73	197.9	3698.77	198	3698.79	198.5	3698.82
198.8	3698.86	199.1	3698.89	199.5	3698.92	199.8	3698.95	200.5	3699.03
200.7	3699.07	201.3	3699.14	201.5	3699.17	201.6	3699.2	202.5	3699.43
202.6	3699.43	203.5	3699.5	203.7	3699.49	204.4	3699.47	204.5	3699.47
204.5	3699.48	205.4	3699.51	205.5	3699.52	205.6	3699.54	206.3	3699.67
206.7	3699.73	207.5	3699.83	207.8	3699.83	208.2	3699.83	208.5	3699.82
208.9	3699.84	209.1	3699.85	209.5	3699.87	210	3699.92		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	20	.025	95.2	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	95.2	120	110.5	98.7	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	3692.65	Element			
Vel Head (ft)	6.13	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3686.51	Reach Len. (ft)	120.00	110.50	98.70
Crit W.S. (ft)	3688.32	Flow Area (sq ft)	7.24	221.94	10.44
E.G. Slope (ft/ft)	0.027225	Area (sq ft)	7.24	221.94	10.44
Q Total (cfs)	4590.00	Flow (cfs)	55.35	4463.40	71.25
Top Width (ft)	88.72	Top Width (ft)	5.44	75.20	8.07
Vel Total (ft/s)	19.16	Avg. Vel. (ft/s)	7.65	20.11	6.82
Max Chl Dpth (ft)	3.54	Hydr. Depth (ft)	1.33	2.95	1.29
Conv. Total (cfs)	27818.1	Conv. (cfs)	335.5	27050.8	431.8
Length Wtd. (ft)	110.30	Wetted Per. (ft)	6.08	75.58	8.44
Min Ch El (ft)	3682.97	Shear (lb/sq ft)	2.02	4.99	2.10
Alpha	1.08	Stream Power (lb/ft s)	15.48	100.38	14.34
Frctn Loss (ft)	3.04	Cum Volume (acre-ft)	0.29	12.79	0.54
C & E Loss (ft)	0.06	Cum SA (acres)	0.24	5.87	0.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 2443

INPUT
Description:
Station Elevation Data num= 450

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3685.36	.6	3685.34	2.6	3685.44	4.7	3685.38	6.7	3685.41
7.7	3685.35	8.8	3685.4	9.8	3685.34	11.9	3685.31	15.9	3685.36
18	3685.28	19	3685.3	20	3685.24	21	3685.25	22.2	3685.32
23.1	3685.33	26.1	3685.22	27	3685.25	27.2	3685.25	27.3	3685.25
27.9	3685.23	30.4	3685.27	32.3	3685.24	32.5	3685.25	32.9	3685.29
34.6	3685.32	35.5	3685.38	36.3	3685.38	37.4	3685.52	38	3685.56
38.4	3685.58	39.4	3685.68	39.7	3685.69	40.3	3685.7	40.4	3685.71
40.5	3685.71	41.4	3685.78	41.5	3685.78	42.5	3685.77	43.5	3685.83
44.5	3685.87	45.6	3685.87	46.5	3685.82	46.6	3685.82	47.6	3685.88
48.1	3685.86	48.6	3685.84	48.73	3685.818	49	3685.75	49.8	3685.51
50.7	3685.16	51.9	3684.59	52.4	3684.38	54.5	3683.05	54.8	3682.91
54.9	3682.82	55.6	3682.43	55.7	3682.33	55.8	3682.31	55.8	3682.27
56.6	3681.88	56.8	3681.76	57.4	3681.37	58.8	3680.54	60.4	3679.99
60.8	3679.9	60.9	3679.88	61	3679.87	61.6	3679.81	61.9	3679.79
64.2	3679.8	64.9	3679.78	65	3679.78	66	3679.75	66.2	3679.77
67	3679.82	67.5	3679.84	67.6	3679.84	69.2	3679.97	71.4	3680.01
71.8	3680.02	72.1	3680.03	72.6	3680.02	72.7	3680.02	73.1	3680.01
73.5	3680.01	74.2	3680	74.3	3679.99	74.9	3679.95	76.6	3679.92
76.8	3679.91	79.1	3679.82	79.3	3679.82	81.1	3679.86	81.3	3679.85
81.7	3679.84	81.9	3679.83	82.3	3679.81	82.7	3679.74	84.4	3679.43
84.6	3679.41	85.3	3679.32	85.4	3679.31	86.1	3679.36	86.4	3679.4
86.9	3679.44	87	3679.45	87.5	3679.49	87.8	3679.52	88.5	3679.58
88.7	3679.59	89.5	3679.59	90.3	3679.66	92.1	3679.78	94.3	3679.87
94.6	3679.87	94.6	3679.88	94.7	3679.87	95.4	3679.81	96	3679.79
99.9	3679.81	100.5	3679.77	100.7	3679.76	101.2	3679.75	101.3	3679.75
101.8	3679.74	102.2	3679.76	102.5	3679.78	102.8	3679.8	103.8	3679.87
104	3679.87	104.7	3679.85	104.8	3679.84	105	3679.83	105.5	3679.81
105.9	3679.79	106.3	3679.77	106.4	3679.78	106.9	3679.75	107.2	3679.7
107.6	3679.64	107.9	3679.6	108.1	3679.59	108.9	3679.63	113	3679.71
113.7	3679.68	114	3679.66	114.1	3679.66	114.8	3679.66	115.4	3679.66
115.7	3679.65	116.1	3679.64	116.5	3679.62	116.7	3679.61	117.1	3679.59
117.3	3679.57	118	3679.54	118.2	3679.52	118.6	3679.5	119.1	3679.47
119.9	3679.4	120.2	3679.38	120.6	3679.27	120.7	3679.24	121.2	3679.12
121.6	3679.09	121.9	3679.04	122.2	3679	122.4	3678.97	123.2	3678.91
123.3	3678.91	124.2	3679.03	124.5	3679.06	124.9	3679.1	125.3	3679.16
125.8	3679.31	126.3	3679.46	127.1	3679.68	127.3	3679.75	128.2	3680.09
128.3	3680.13	129.2	3680.42	129.7	3680.61	130	3680.75	130.4	3680.9

130.9	3681.04	131	3681.07	131.4	3681.21	131.7	3681.33	132.2	3681.58
132.4	3681.66	132.5	3681.7	133.1	3681.89	133.4	3681.99	133.4	3682.01
133.5	3682.05	134.2	3682.3	134.5	3682.39	135.1	3682.5	135.5	3682.58
135.9	3682.71	136.1	3682.78	136.5	3682.9	136.8	3682.98	137.5	3683.24
138.4	3683.51	138.7	3683.6	140.6	3684.23	141	3684.38	141.3	3684.5
141.6	3684.61	141.8	3684.7	142.6	3685.01	142.6	3685.03	142.7	3685.03
142.8	3685.07	143.7	3685.32	144.4	3685.56	144.7	3685.7	145.2	3685.83
145.7	3685.94	146	3686.04	146.5	3686.2	146.7	3686.28	146.9	3686.32
147.6	3686.55	147.7	3686.59	147.8	3686.6	147.8	3686.61	148.6	3686.89
148.8	3686.97	149.4	3687.23	149.8	3687.39	150.3	3687.55	150.4	3687.58
150.8	3687.72	151.1	3687.79	151.7	3687.94	151.8	3687.98	152	3688.01
152.5	3688.15	152.8	3688.25	152.9	3688.27	154.9	3688.91	155.3	3689.02
155.9	3689.18	156.2	3689.27	157	3689.59	157	3689.6	157.9	3689.84
158	3689.87	158.1	3689.95	158.7	3690.21	159	3690.32	159.4	3690.49
159.5	3690.52	160	3690.7	160.4	3690.81	161	3691.01	162.1	3691.43
162.1	3691.44	162.2	3691.48	163.3	3692.04	164.1	3692.4	164.6	3692.55
165.1	3692.69	165.5	3692.79	166.1	3692.98	166.3	3693.03	167	3693.21
167.2	3693.26	167.2	3693.28	168	3693.59	168.5	3693.79	168.8	3693.91
169.2	3694.05	169.7	3694.22	169.93	3694.304	170.2	3694.43	170.5	3694.53
171.1	3694.73	171.3	3694.79	171.4	3694.82	171.9	3694.96	172.2	3695.05
172.3	3695.07	172.4	3695.09	173.1	3695.22	173.7	3695.29	174.3	3695.33
175.3	3695.3	175.6	3695.29	176.3	3695.28	176.7	3695.28	177.4	3695.31
177.6	3695.31	178.1	3695.31	178.4	3695.32	178.9	3695.33	179	3695.33
179.4	3695.34	179.8	3695.36	180.5	3695.38	180.6	3695.38	181.5	3695.37
182.3	3695.35	182.5	3695.36	182.8	3695.36	183.2	3695.35	183.5	3695.35
184	3695.36	184.1	3695.36	184.5	3695.37	185.7	3695.57	186.4	3695.71
186.6	3695.75	186.6	3695.76	186.6	3695.78	187.6	3696.17	187.9	3696.33
188.6	3696.66	189.1	3696.74	189.2	3696.76	189.7	3696.83	189.9	3696.84
190.5	3696.9	190.8	3696.9	191.2	3696.87	191.6	3696.85	191.8	3696.85
192.5	3696.83	192.7	3696.83	193.1	3696.82	193.3	3696.83	193.7	3696.81
194.2	3696.84	194.4	3696.85	194.8	3696.88	195	3696.88	195.7	3696.88
195.8	3696.88	196.1	3696.88	196.7	3696.9	196.8	3696.9	197.5	3696.9
197.8	3696.91	198.3	3696.92	198.4	3696.92	198.9	3696.94	200.9	3697.03
201.7	3697.12	201.9	3697.14	202.9	3697.26	203.4	3697.37	204	3697.5
204.3	3697.57	205	3697.7	205.1	3697.73	206	3697.87	206.1	3697.88
206.8	3697.96	207	3697.98	210.1	3698.07	210.2	3698.07	210.6	3698.08
211	3698.1	211.9	3698.2	212.1	3698.22	212.5	3698.23	212.7	3698.23
213.2	3698.25	213.6	3698.28	213.8	3698.3	214.4	3698.33	215.1	3698.34
215.2	3698.34	215.3	3698.34	215.5	3698.34	216.1	3698.35	216.2	3698.35
216.4	3698.37	216.9	3698.4	217.8	3698.49	218.3	3698.54	218.6	3698.58
219	3698.63	219.3	3698.67	220.3	3698.69	221.2	3698.72	221.3	3698.73
221.6	3698.73	222	3698.74	222.4	3698.75	222.8	3698.77	222.9	3698.77
223.4	3698.78	224.2	3698.83	224.5	3698.85	225.2	3698.87	225.5	3698.89
226.2	3698.96	226.4	3698.98	226.8	3698.99	227.1	3698.99	228.1	3699.08
228.8	3699.13	229.4	3699.15	229.5	3699.16	230.4	3699.21	230.5	3699.22
231.3	3699.26	232	3699.33	232.1	3699.35	233	3699.42	233.3	3699.42
233.6	3699.44	233.8	3699.46	234.6	3699.55	234.6	3699.56	234.8	3699.57
235.5	3699.58	235.6	3699.59	235.9	3699.61	236.3	3699.62	236.7	3699.65
237.2	3699.69	237.2	3699.7	237.7	3699.74	238	3699.77	238.5	3699.77
238.7	3699.78	238.9	3699.79	239.7	3699.84	239.7	3699.85	240.8	3699.94
241.4	3700.07	241.8	3700.12	242.3	3700.26	242.3	3700.29	242.8	3700.43
243.6	3700.65	243.8	3700.7	243.9	3700.7	244.5	3700.75	244.8	3700.76
244.9	3700.74	245.6	3700.57	245.9	3700.52	246.2	3700.49	246.3	3700.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	60.4	.025	124.9	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
60.4	124.9	119.9	118.8	117.4	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3689.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.70	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3682.85	Reach Len. (ft)	119.90	118.80	117.40
Crit W.S. (ft)	3684.82	Flow Area (sq ft)	8.66	203.26	21.60
E.G. Slope (ft/ft)	0.027860	Area (sq ft)	8.66	203.26	21.60
Q Total (cfs)	4590.00	Flow (cfs)	73.84	4325.57	190.59
Top Width (ft)	81.48	Top Width (ft)	5.54	64.50	11.44
Vel Total (ft/s)	19.66	Avg. Vel. (ft/s)	8.53	21.28	8.82
Max Chl Dpth (ft)	3.94	Hydr. Depth (ft)	1.56	3.15	1.89
Conv. Total (cfs)	27499.6	Conv. (cfs)	442.4	25915.3	1141.8
Length Wtd. (ft)	118.76	Wetted Per. (ft)	6.29	64.70	12.09
Min Ch El (ft)	3678.91	Shear (lb/sq ft)	2.39	5.46	3.11
Alpha	1.12	Stream Power (lb/ft s)	20.41	116.28	27.43
Frctn Loss (ft)	3.37	Cum Volume (acre-ft)	0.27	12.25	0.50
C & E Loss (ft)	0.03	Cum SA (acres)	0.23	5.69	0.34

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1

REACH: Reach 1 RS: 2324

INPUT
Description:
Station Elevation Data num= 444

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3681.42	3.6	3681.48	5.6	3681.44	7.7	3681.47	8.7	3681.53
9.6	3681.5	11.8	3681.54	13.8	3681.63	16.9	3681.66	21	3681.8
21.9	3681.78	24.1	3681.83	27.2	3681.78	28.2	3681.88	29.7	3681.86
31.3	3681.93	31.6	3681.91	32.2	3681.85	34.4	3681.86	35.2	3681.92
36	3682	36.4	3682.04	37.9	3682.09	38.5	3682.12	44.6	3682.53
47.7	3682.64	48	3682.65	48.5	3682.63	48.7	3682.63	48.8	3682.64
49.7	3682.78	50.5	3682.73	52.83	3682.656	53	3682.65	53.9	3682.66
54.9	3682.72	55.9	3682.7	56.9	3682.59	57.2	3682.52	58	3682.28
58	3682.26	58.3	3682.18	58.9	3682.03	59	3681.99	60	3681.57
61	3680.97	61.8	3680.5	62.1	3680.39	62.8	3679.94	63	3679.77
65.8	3678	66.4	3677.72	67.2	3677.38	68	3676.94	68.2	3676.85
68.9	3676.62	69.2	3676.47	69.7	3676.37	69.8	3676.35	70.3	3676.26
70.5	3676.23	71.3	3676.18	72.2	3676.16	73	3676.14	74.4	3676.21
74.7	3676.2	75.2	3676.19	75.4	3676.19	75.5	3676.19	76.1	3676.19
76.4	3676.19	76.5	3676.19	77.2	3676.17	77.4	3676.16	77.8	3676.11
78	3676.09	78.5	3676.05	78.9	3676.04	79.2	3676.04	79.5	3676.03
83.6	3676.05	83.9	3676.07	84.5	3676.09	84.6	3676.09	84.7	3676.09
85.1	3676.09	85.5	3676.1	85.7	3676.1	85.8	3676.12	86.4	3676.16
86.7	3676.18	87.2	3676.27	87.2	3676.28	87.7	3676.38	88	3676.39
89.8	3676.35	91.8	3676.19	92.8	3676.17	93.1	3676.21	93.8	3676.34
93.9	3676.34	94	3676.36	94.7	3676.45	94.9	3676.47	95.2	3676.47
95.6	3676.47	95.9	3676.47	96.9	3676.41	97.8	3676.27	98	3676.25
98.1	3676.24	98.4	3676.24	98.9	3676.23	103.2	3676.41	103.9	3676.41
104.1	3676.41	104.5	3676.4	104.7	3676.38	105.2	3676.38	106.4	3676.39
107.3	3676.34	109.3	3676.29	109.7	3676.24	109.8	3676.24	110.3	3676.2
110.6	3676.19	111.2	3676.19	111.3	3676.18	111.4	3676.18	111.8	3676.17
112.2	3676.15	112.3	3676.15	112.5	3676.14	113.1	3676.12	113.4	3676.1
113.8	3676.03	113.9	3676.02	114.4	3675.95	114.7	3675.92	115.2	3675.88
115.4	3675.86	115.6	3675.84	116.3	3675.74	116.4	3675.72	116.4	3675.71
116.5	3675.71	117.2	3675.54	117.5	3675.51	117.8	3675.48	118.1	3675.47
118.5	3675.44	119.5	3675.44	121.6	3675.54	121.8	3675.54	122.6	3675.54
123.9	3675.53	124.5	3675.55	124.7	3675.56	124.8	3675.57	125.6	3675.68
125.7	3675.69	125.8	3675.68	126.4	3675.65	126.7	3675.65	127.2	3675.62
127.7	3675.59	128.1	3675.6	128.5	3675.63	128.8	3675.64	128.9	3675.64
129.8	3675.56	130.8	3675.52	131.2	3675.53	131.4	3675.53	131.8	3675.55
132.3	3675.58	132.5	3675.6	132.9	3675.63	133.1	3675.67	133.8	3675.85
133.9	3675.87	133.9	3675.88	134.1	3675.94	134.8	3676.15	134.9	3676.19
135.2	3676.28	135.6	3676.43	135.9	3676.56	136.4	3676.74	136.5	3676.77
137	3676.95	137.3	3677.04	138	3677.27	138.1	3677.3	138.9	3677.52
139	3677.54	139.2	3677.59	139.8	3677.76	140.5	3677.97	140.6	3678
141.1	3678.13	141.8	3678.33	142.1	3678.4	143	3678.71	143.1	3678.75
143.9	3678.99	144.1	3679.06	144.5	3679.18	144.8	3679.28	145.6	3679.57
146.2	3679.8	146.4	3679.88	151.2	3681.45	151.3	3681.51	152.5	3682.01
153.8	3682.55	153.9	3682.62	154.4	3682.84	154.8	3682.95	155.2	3683.06
155.4	3683.15	155.6	3683.21	156.4	3683.47	156.4	3683.5	156.5	3683.5
156.5	3683.51	157.3	3683.63	157.5	3683.66	157.8	3683.67	158.1	3683.67
158.5	3683.67	159	3683.65	159.2	3683.65	159.5	3683.63	159.8	3683.62
160.5	3683.59	160.6	3683.58	161.5	3683.6	161.6	3683.6	161.8	3683.57
162.3	3683.51	162.6	3683.46	163.2	3683.46	163.6	3683.47	164	3683.44
164.5	3683.41	164.7	3683.39	164.8	3683.39	165.3	3683.35	165.7	3683.32
165.8	3683.34	166.5	3683.41	166.7	3683.45	167.2	3683.5	167.3	3683.51
167.8	3683.57	168.1	3683.65	168.5	3683.72	168.8	3683.79	169	3683.81
169.8	3683.93	169.8	3683.94	170.6	3684.08	170.8	3684.12	171.2	3684.17
171.5	3684.21	171.9	3684.29	172.5	3684.47	172.9	3684.57	173.1	3684.62
173.8	3684.82	173.9	3684.84	174	3684.86	174.2	3684.95	174.8	3685.21
174.9	3685.26	175.2	3685.35	175.6	3685.55	176	3685.68	176.5	3685.87
177.3	3686.19	177.8	3686.41	178	3686.49	178.1	3686.53	178.7	3686.69
179	3686.77	179.1	3686.82	179.8	3687.01	180.6	3687.31	181.1	3687.49
181.5	3687.66	182.1	3687.93	182.3	3688	183.1	3688.31	184.5	3688.87
184.8	3688.97	185.2	3689.12	185.6	3689.26	186.2	3689.44	187.23	3689.731
187.3	3689.76	187.6	3689.86	188.1	3690.07	189	3690.31	189.3	3690.41
189.8	3690.62	190.3	3690.83	190.6	3690.97	191.4	3691.28	191.5	3691.32
192.3	3691.62	192.4	3691.65	192.5	3691.69	193.1	3692	193.4	3692.1
193.8	3692.22	194	3692.26	194.4	3692.4	194.8	3692.54	195.1	3692.67
195.5	3692.79	195.7	3692.85	196.5	3693.12	196.5	3693.13	197.3	3693.39
197.8	3693.53	198.2	3693.63	198.5	3693.73	199	3693.83	199.1	3693.85
199.6	3693.94	199.8	3693.98	200.6	3694.09	200.7	3694.09	201	3694.07
201.5	3694.04	201.6	3694.03	201.8	3694.02	202.3	3693.98	202.6	3693.96
203.7	3693.94	204	3693.93	204.5	3693.93	204.7	3693.93	204.8	3693.94
205.7	3693.97	206.5	3693.95	207.1	3693.91	207.3	3693.9	207.8	3693.88
208.8	3693.91	209	3693.94	209.8	3694.03	209.9	3694.04	210.7	3694.1
210.8	3694.12	211.5	3694.18	211.9	3694.23	212.9	3694.32	213.2	3694.36
213.8	3694.42	213.9	3694.44	214	3694.44	214.3	3694.43	214.8	3694.42
215	3694.42	215.1	3694.43	216	3694.51	216.5	3694.52	217	3694.53
217.3	3694.55	217.8	3694.56	218	3694.57	218.2	3694.58	218.8	3694.59
219	3694.6	219.1	3694.6	220.1	3694.64	220.5	3694.68	220.7	3694.71
221.1	3694.75	221.5	3694.79	221.8	3694.81	222.3	3694.86	223.1	3694.96
223.2	3694.97	224	3694.95	224.5	3694.99	225.7	3695.1	225.8	3695.1
226.2	3695.12	227.1	3695.25	227.3	3695.27	227.7	3695.25	228.2	3695.23
228.3	3695.24	228.5	3695.25	229	3695.32	229.3	3695.35	229.8	3695.4
229.9	3695.41	230.3	3695.46	230.7	3695.47	231.1	3695.47	231.4	3695.47
231.5	3695.46	232.2	3695.49	232.4	3695.5	232.5	3695.5	233.2	3695.49
233.4	3695.49	233.8	3695.48	234	3695.48	234.5	3695.47	237.5	3695.66

237.8	3695.69	238.2	3695.74	238.6	3695.77	239	3695.78	239.1	3695.78		
239.6	3695.78	240.5	3695.75	240.6	3695.74	241.1	3695.75	241.5	3695.76		
241.6	3695.76	242.4	3695.8	242.7	3695.81	243.1	3695.84	243.2	3695.84		
243.7	3695.86	244	3695.88	244.5	3695.9	244.7	3695.91	244.9	3695.9		
245.5	3695.91	245.7	3695.91	245.8	3695.91	246.5	3695.97	246.8	3695.98		
247.1	3695.99	247.4	3696	247.8	3696.02	247.9	3696.03				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	69.2	.025	132.3	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
69.2	132.3	154.2	154.8	156.2	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3686.16	Element	Left OB	Channel	Right OB	
Vel Head (ft)	6.95	Wt. n-Val.	0.036	0.025	0.041	
W.S. Elev (ft)	3679.20	Reach Len. (ft)	154.20	154.80	156.20	
Crit W.S. (ft)	3681.24	Flow Area (sq ft)	7.90	198.93	23.00	
E.G. Slope (ft/ft)	0.028949	Area (sq ft)	7.90	198.93	23.00	
Q Total (cfs)	4590.00	Flow (cfs)	66.74	4316.01	207.25	
Top Width (ft)	80.68	Top Width (ft)	5.31	63.10	12.27	
Vel Total (ft/s)	19.97	Avg. Vel. (ft/s)	8.45	21.70	9.01	
Max Chl Dpth (ft)	3.76	Hydr. Depth (ft)	1.49	3.15	1.87	
Conv. Total (cfs)	26977.4	Conv. (cfs)	392.2	25367.0	1218.1	
Length Wtd. (ft)	154.84	Wetted Per. (ft)	5.99	63.31	12.83	
Min Ch El (ft)	3675.44	Shear (lb/sq ft)	2.38	5.68	3.24	
Alpha	1.12	Stream Power (lb/ft s)	20.14	123.21	29.20	
Frctn Loss (ft)	4.72	Cum Volume (acre-ft)	0.25	11.71	0.44	
C & E Loss (ft)	0.06	Cum SA (acres)	0.21	5.52	0.31	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 2170

INPUT
Description:
Station Elevation Data num= 452

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3679.5	.9	3679.5	6	3679.69	8	3679.67	9	3679.77
10.1	3679.78	13.1	3679.98	14.2	3680	16.2	3680.16	18.3	3680.21
20.3	3680.21	21.3	3680.17	24.3	3680.24	26.5	3680.26	27.6	3680.23
28.6	3680.25	29.3	3680.31	35.7	3680.46	37.8	3680.47	39.1	3680.55
44.9	3680.76	45.7	3680.84	45.9	3680.86	46.1	3680.88	46.9	3681.06
47	3681.06	47.1	3681.07	48	3681.09	50	3681.34	50.93	681.377
54.1	3681.51	54.4	3681.48	55	3681.38	55.2	3681.35	55.3	3681.33
55.8	3681.21	56.2	3681.11	56.3	3681.07	57	3680.85	57.6	3680.59
57.8	3680.53	58.2	3680.34	59.3	3679.81	60.3	3679.18	60.4	3679.16
61.1	3678.85	61.3	3678.77	62	3678.36	62.3	3678.14	63.4	3677.61
63.6	3677.44	64.2	3677.08	64.4	3676.99	66.2	3676.05	67.5	3675.3
67.8	3675.06	69.5	3674.09	70.3	3673.65	71.6	3673.06	72	3672.78
72.6	3672.45	72.9	3672.39	73.5	3672.33	73.6	3672.31	77	3672.16
78.7	3672.13	78.7	3672.12	78.8	3672.12	79.6	3672.07	80.8	3672.06
81.4	3672.13	81.8	3672.17	82.1	3672.2	82.7	3672.35	82.8	3672.36
82.9	3672.38	83.2	3672.47	83.7	3672.61	83.9	3672.64	84.9	3672.66
85.4	3672.61	85.9	3672.56	86.3	3672.49	86.7	3672.4	87.1	3672.31
87.9	3672.04	89.6	3671.95	92.1	3671.96	93.3	3671.84	93.8	3671.82
94.1	3671.79	95.5	3671.6	95.9	3671.6	96.2	3671.59	96.3	3671.58
96.9	3671.55	97.1	3671.53	97.2	3671.53	98	3671.5	98.2	3671.5
98.6	3671.48	98.8	3671.46	99.2	3671.44	103	3671.63	103.8	3671.72
106.3	3671.88	106.4	3671.88	106.5	3671.87	107.2	3671.81	108	3671.74
108.5	3671.7	108.9	3671.69	109.5	3671.68	111.8	3671.4	112.2	3671.3
112.6	3671.24	113	3671.23	113.1	3671.22	113.6	3671.21	113.9	3671.21
114.6	3671.24	115.2	3671.23	115.6	3671.22	115.7	3671.22	116.7	3671.22
117.1	3671.23	117.2	3671.23	118.7	3671.18	120.6	3671.2	120.8	3671.21
121.8	3671.28	122.3	3671.39	122.3	3671.42	122.8	3671.53	123.1	3671.56
123.7	3671.63	123.8	3671.64	123.9	3671.65	124.4	3671.69	124.9	3671.73
125	3671.73	125.6	3671.75	125.9	3671.75	126.3	3671.81	126.4	3671.83
126.9	3671.89	127.3	3671.91	127.6	3671.94	131	3672.09	131.5	3672.08
131.6	3672.08	132.3	3672.08	132.9	3672.06	133.1	3672.06	133.5	3672.03
134	3672.02	134.1	3672.01	134.2	3672.02	134.8	3672.03	135.1	3672.03
135.6	3672.02	136.1	3672	136.5	3672	136.9	3672.01	137.1	3672.01
137.3	3672	138.1	3672	138.2	3672	139	3671.93	139.2	3671.91
139.5	3671.91	139.8	3671.9	140.2	3671.9	140.7	3671.9	140.8	3671.9
141.2	3671.9	141.5	3671.88	142.2	3671.82	142.3	3671.81	142.7	3671.8
143.2	3671.78	143.3	3671.77	143.5	3671.75	144	3671.66	144.9	3671.54
145.7	3671.47	146.1	3671.45	146.4	3671.44	146.5	3671.47	147.3	3671.68
147.4	3671.71	147.4	3671.72	148.2	3671.84	148.4	3671.87	148.8	3671.98
149	3672.07	149.4	3672.21	150.1	3672.46	150.5	3672.62	150.7	3672.72
151.5	3673.02	151.6	3673.03	151.8	3673.07	152.4	3673.16	152.5	3673.18
153.5	3673.54	154	3673.72	154.1	3673.73	154.6	3673.91	154.9	3674.01
155.4	3674.15	155.6	3674.22	156.6	3674.54	156.7	3674.56	157.4	3674.8

158	3674.99	158.7	3675.22	159.1	3675.35	159.3	3675.42	159.7	3675.53
160.6	3675.87	160.7	3675.89	160.8	3675.91	161	3675.98	161.6	3676.19
161.7	3676.24	162	3676.31	162.4	3676.44	162.8	3676.54	164.8	3677.25
165	3677.28	165.8	3677.53	165.8	3677.54	165.9	3677.58	166.6	3677.84
167.2	3678.05	167.5	3678.12	167.9	3678.25	168.3	3678.39	168.6	3678.48
169.9	3679	169.9	3679.02	170	3679.04	170.8	3679.31	171	3679.36
171.6	3679.54	172	3679.63	173.3	3680.06	173.9	3680.25	174	3680.32
174.2	3680.35	174.7	3680.52	175	3680.61	175.1	3680.63	175.2	3680.66
175.8	3680.81	176.1	3680.89	176.5	3681.03	176.7	3681.1	177.1	3681.26
177.5	3681.39	177.8	3681.47	178.1	3681.57	179.1	3681.98	179.2	3682
180	3682.41	180.2	3682.49	180.9	3682.73	181.2	3682.87	181.8	3683.06
182.2	3683.22	183.3	3683.55	184.2	3683.89	184.4	3683.97	185	3684.19
185.3	3684.3	185.9	3684.48	186.3	3684.6	187.1	3684.86	187.4	3684.96
187.6	3685.04	188.4	3685.41	188.4	3685.42	189.2	3685.7	189.4	3685.76
189.7	3685.85	190.1	3685.96	190.4	3686.1	190.9	3686.27	191	3686.3
191.5	3686.46	191.7	3686.57	192.5	3686.84	192.6	3686.87	193	3687.03
193.4	3687.19	193.5	3687.23	194.13	3687.448	194.3	3687.52	194.5	3687.63
195.6	3688.06	195.9	3688.2	196.3	3688.35	196.6	3688.47	196.8	3688.53
197.6	3688.84	197.6	3688.85	198.4	3689.11	198.6	3689.18	198.9	3689.3
199.3	3689.43	199.7	3689.57	200.1	3689.75	200.7	3689.97	201.6	3690.29
201.7	3690.33	201.8	3690.35	202.1	3690.45	202.7	3690.61	202.9	3690.63
203.5	3690.71	203.8	3690.74	204.2	3690.78	204.3	3690.79	204.8	3690.83
205.1	3690.82	205.8	3690.79	206	3690.78	206.9	3690.71	207.6	3690.65
208.2	3690.57	208.9	3690.45	209.5	3690.37	209.9	3690.32	210.2	3690.28
210.8	3690.21	211	3690.19	211.8	3690.17	212	3690.17	212.2	3690.19
212.7	3690.25	213.5	3690.32	214	3690.36	214.3	3690.41	214.8	3690.49
215	3690.53	215.2	3690.55	215.9	3690.63	216	3690.66	216.1	3690.66
216.1	3690.67	217.1	3690.81	217.4	3690.87	217.7	3690.91	218.1	3690.97
218.5	3691.11	218.8	3691.19	219.1	3691.32	219.4	3691.38	220.2	3691.56
220.4	3691.57	221	3691.59	221.2	3691.59	221.4	3691.59	221.9	3691.59
222.7	3691.63	223.2	3691.66	223.6	3691.71	224.3	3691.82	224.4	3691.85
225.2	3692.02	225.3	3692.02	225.4	3692.02	226.1	3691.95	226.3	3691.93
226.7	3691.92	226.9	3691.91	227.3	3691.89	227.7	3691.91	228	3691.94
228.4	3691.97	228.6	3691.97	229.4	3691.97	229.6	3692	230.4	3692.12
230.6	3692.16	231.1	3692.22	231.9	3692.29	232	3692.29	232.5	3692.32
232.8	3692.36	233.5	3692.43	233.6	3692.43	234.2	3692.4	234.5	3692.38
234.6	3692.37	235.3	3692.35	235.5	3692.33	235.9	3692.35	236.1	3692.35
236.6	3692.38	237	3692.39	237.2	3692.41	237.6	3692.42	237.8	3692.44
238.6	3692.47	238.7	3692.48	239.5	3692.58	239.6	3692.61	239.9	3692.66
240.7	3692.83	241.1	3692.9	241.2	3692.91	242.7	3693.21	243.6	3693.31
243.7	3693.32	243.8	3693.32	244.5	3693.3	244.8	3693.31	245.2	3693.26
245.3	3693.26	245.8	3693.19	246.2	3693.16	246.5	3693.13	247.8	3693
247.9	3693	248.7	3693.04	248.9	3693.05	249.1	3693.07	249.5	3693.11
250.3	3693.16	250.5	3693.17	250.9	3693.2	251.2	3693.24	251.8	3693.34
252	3693.37	252.5	3693.39	252.9	3693.4	253.1	3693.4	254	3693.39
254.4	3693.43	254.5	3693.44	255	3693.48	255.4	3693.54	255.7	3693.58
256	3693.62	257.9	3693.75	258.1	3693.77	258.4	3693.8	258.7	3693.83
259.1	3693.89	259.8	3693.82						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	72.6	.025	147.4	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
72.6	147.4	36.7	34	30.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3681.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.75	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3674.62	Reach Len. (ft)	36.70	34.00	30.50
Crit W.S. (ft)	3676.55	Flow Area (sq ft)	4.37	210.13	14.21
E.G. Slope (ft/ft)	0.032155	Area (sq ft)	4.37	210.13	14.21
Q Total (cfs)	4590.00	Flow (cfs)	31.38	4442.60	116.02
Top Width (ft)	88.30	Top Width (ft)	4.03	74.80	9.48
Vel Total (ft/s)	20.07	Avg. Vel. (ft/s)	7.17	21.14	8.16
Max Chl Dpth (ft)	3.44	Hydr. Depth (ft)	1.09	2.81	1.50
Conv. Total (cfs)	25597.0	Conv. (cfs)	175.0	24775.0	647.0
Length Wtd. (ft)	33.93	Wetted Per. (ft)	4.58	75.21	9.95
Min Ch El (ft)	3671.18	Shear (lb/sq ft)	1.92	5.61	2.87
Alpha	1.08	Stream Power (lb/ft s)	13.74	118.57	23.42
Frctn Loss (ft)	1.01	Cum Volume (acre-ft)	0.22	10.98	0.38
C & E Loss (ft)	0.13	Cum SA (acres)	0.19	5.28	0.27

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 2136

INPUT
Description:
Station Elevation Data num= 446

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3680.76	.5	3680.83	1.7	3680.88	2.8	3680.87	3.8	3680.91

4.8	3680.91	7.9	3681	10	3681.14	12.1	3681.16	12.8	3681.27
14.1	3681.32	15.2	3681.47	16.1	3681.55	17.2	3681.52	19.4	3681.67
19.9	3681.67	20.2	3681.68	20.3	3681.68	21.3	3681.75	22.7	3681.76
23.4	3681.82	24.4	3681.78	25.5	3681.82	27.5	3681.72	28.6	3681.71
29.6	3681.562	31.7	3681.25	32.7	3681.14	33.7	3680.89	34.2	3680.7
35.8	3679.93	36.7	3679.68	36.8	3679.62	37.1	3679.48	37.5	3679.34
37.9	3679.17	38.3	3678.99	38.5	3678.89	38.9	3678.74	39.9	3678.31
40	3678.3	40.8	3677.93	41	3677.84	42	3677.45	42.4	3677.28
42.7	3677.12	43	3676.97	43.2	3676.88	44	3676.48	44.9	3676.17
46.5	3675.46	46.9	3675.32	47.2	3675.21	47.3	3675.13	48.2	3674.76
49	3674.28	49.2	3674.13	49.7	3673.91	49.8	3673.83	51.3	3673.11
51.4	3673.03	52	3672.71	52.3	3672.59	52.3	3672.56	52.4	3672.51
53.4	3672.11	53.8	3671.88	54.4	3671.6	54.7	3671.53	55.2	3671.45
55.5	3671.4	56.4	3671.29	56.6	3671.29	57.5	3671.3	58.5	3671.34
58.8	3671.34	59.4	3671.33	59.6	3671.33	59.7	3671.34	60	3671.39
60.5	3671.43	60.6	3671.43	60.8	3671.42	61.3	3671.38	61.6	3671.38
62.2	3671.34	63.5	3671.29	63.7	3671.28	63.8	3671.28	64.1	3671.27
64.6	3671.25	64.7	3671.24	65.4	3671.21	65.7	3671.18	66.2	3671.15
66.8	3671.11	67	3671.11	67.7	3671.1	67.8	3671.1	67.9	3671.09
70.5	3671.01	70.9	3670.99	72	3670.87	72.1	3670.86	72.8	3670.79
73	3670.78	73.3	3670.77	73.6	3670.76	74.4	3670.75	76.1	3670.81
76.9	3670.78	77.1	3670.77	79.2	3670.84	79.4	3670.85	80.1	3670.88
80.2	3670.88	80.2	3670.87	81	3670.83	81.8	3670.75	82.3	3670.7
82.7	3670.69	83	3670.67	83.3	3670.66	83.5	3670.65	84.2	3670.66
84.3	3670.66	84.3	3670.65	84.4	3670.65	85.1	3670.59	85.4	3670.59
87.2	3670.69	87.4	3670.71	87.6	3670.73	88.2	3670.85	88.4	3670.9
88.5	3670.9	90.5	3670.91	90.9	3670.89	91.3	3670.85	91.6	3670.83
91.7	3670.83	92.2	3670.81	92.5	3670.79	92.7	3670.78	93.3	3670.75
93.6	3670.73	94.1	3670.67	94.7	3670.59	95.5	3670.52	95.7	3670.5
95.8	3670.5	96.6	3670.5	96.7	3670.5	96.9	3670.49	97.4	3670.46
97.8	3670.45	98.3	3670.42	98.8	3670.39	99.1	3670.39	99.8	3670.43
99.9	3670.46	100.2	3670.56	100.7	3670.72	100.8	3670.76	101.1	3670.83
101.5	3671.01	101.9	3671.12	102.9	3671.14	103.2	3671.14	103.8	3671.13
103.9	3671.13	104	3671.12	104.2	3671.11	105	3671.07	105.2	3671.07
105.7	3671.07	106	3671.08	106.5	3671.09	106.6	3671.09	107.3	3671.11
109.1	3671.1	109.4	3671.11	109.8	3671.12	110.1	3671.14	110.6	3671.1
110.8	3671.07	113.2	3670.84	113.6	3670.85	113.9	3670.86	114.3	3670.87
114.7	3670.86	115	3670.86	115.3	3670.85	116.3	3670.81	117.4	3670.8
118.8	3670.91	119.1	3670.93	119.4	3670.96	119.6	3670.96	120.3	3671
120.4	3671	120.5	3671	121.3	3670.98	121.5	3670.94	121.9	3670.88
122.1	3670.85	122.5	3670.77	122.9	3670.72	123.3	3670.69	123.6	3670.66
123.7	3670.68	124.3	3670.75	124.5	3670.78	124.6	3670.79	125.4	3670.84
125.6	3670.85	126.1	3670.9	126.2	3670.91	126.7	3670.95	127	3670.98
127.7	3671.13	127.8	3671.15	128.4	3671.3	128.7	3671.38	128.7	3671.41
128.9	3671.48	129.5	3671.77	129.8	3671.91	130.2	3672.06	130.3	3672.07
130.8	3672.23	131.1	3672.31	131.6	3672.42	131.8	3672.46	131.9	3672.49
132.4	3672.56	132.8	3672.61	132.9	3672.64	133	3672.66	133.6	3672.69
133.9	3672.76	134.4	3672.95	134.9	3673.16	135.2	3673.26	135.8	3673.54
136.4	3673.83	136.9	3673.97	137	3674.01	137.7	3674.23	138	3674.33
138.6	3674.55	139.1	3674.75	139.3	3674.88	140	3675.19	140.1	3675.25
140.2	3675.28	140.4	3675.37	141	3675.53	141.1	3675.57	141.4	3675.63
141.8	3675.71	142.1	3675.8	142.6	3675.86	142.7	3675.9	143.2	3675.98
143.4	3676.02	144.2	3676.25	144.3	3676.26	144.4	3676.32	145.1	3676.53
145.2	3676.58	145.5	3676.7	146.3	3677.03	146.7	3677.19	146.9	3677.27
147.3	3677.43	147.5	3677.51	148.3	3677.84	148.3	3677.86	148.4	3677.86
149.4	3678.27	149.7	3678.39	150.4	3678.65	150.8	3678.77	151.4	3678.97
151.7	3678.93	152.5	3679.09	153.3	3678.99	153.5	3679.04	153.9	3679.23
154.1	3679.37	154.5	3679.59	154.9	3679.91	155.3	3680.07	155.6	3680.29
155.8	3680.37	156.5	3680.66	156.6	3680.69	156.6	3680.71	157.6	3681.05
158	3681.18	158.7	3681.39	159	3681.11	159.4	3680.87	159.9	3680.58
160.5	3680.27	160.7	3680.2	160.7	3680.18	161.8	3680.24	162.2	3680.35
162.3	3680.4	162.8	3680.48	163.2	3680.32	163.6	3680.1	164	3679.92
164.5	3679.7	164.9	3679.57	165	3679.66	165.6	3680.17	165.9	3680.4
166.4	3680.78	167.3	3681.76	168	3682.49	168.1	3682.71	168.5	3683.43
168.9	3684	169	3684.11	169.1	3684.27	169.7	3685.02	170	3685.25
170.5	3685.58	171.1	3685.88	171.4	3686	171.9	3686.18	172.1	3686.24
172.2	3686.25	172.5	3686.359	173	3686.54	173.3	3686.66	173.8	3686.79
174.2	3686.89	175.2	3687.43	175.5	3687.55	176.1	3687.78	176.3	3687.85
177.1	3688.16	177.3	3688.2	180.4	3689.29	181.4	3689.56	182	3689.69
182.4	3689.75	183.4	3689.64	184.5	3689.5	184.6	3689.49	185.5	3689.42
185.8	3689.42	186.2	3689.43	186.5	3689.42	187.2	3689.52	187.8	3689.6
188.6	3689.72	189.4	3689.83	189.6	3689.87	190	3689.89	190.7	3689.92
191.1	3689.94	191.4	3689.96	191.7	3689.98	191.9	3690	192.7	3690.09
192.8	3690.1	193.5	3690.19	193.8	3690.22	194.2	3690.29	194.4	3690.33
195.2	3690.51	195.6	3690.61	195.8	3690.69	196	3690.73	196.7	3690.89
196.8	3690.93	196.9	3690.95	197.7	3691.05	197.9	3691.09	198.3	3691.15
198.9	3691.24	200	3691.25	200.7	3691.14	200.9	3691.1	201	3691.09
201.1	3691.08	201.8	3690.97	202.5	3690.9	202.6	3690.89	203.4	3690.76
203.9	3690.72	204.7	3690.69	205	3690.69	205.1	3690.69	205.3	3690.7
205.9	3690.71	206.2	3690.72	206.7	3690.77	207.2	3690.81	207.5	3690.85
208.1	3690.94	208.2	3690.96	208.3	3690.97	208.7	3691.01	209.2	3691.07
209.3	3691.09	209.4	3691.12	210	3691.22	210.3	3691.27	210.8	3691.32
212.2	3691.48	212.4	3691.5	212.7	3691.51	213.3	3691.53	213.4	3691.54
213.6	3691.55	214.1	3691.59	214.4	3691.62	214.9	3691.65	215.5	3691.68
215.7	3691.69	216.4	3691.74	216.5	3691.75	216.8	3691.77	217.5	3691.81
217.8	3691.84	219.2	3691.95	219.6	3691.98	219.8	3691.99	220.6	3692.03
220.7	3692.03	221.6	3692.04	222	3692.07	222.3	3692.1	222.7	3692.12
223.3	3692.22	223.7	3692.28	223.9	3692.31	224.7	3692.46	224.7	3692.47
225.9	3692.49								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	54.4	.025	127	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
54.4	127	49.7	50.5	52.6	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3680.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.33	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3673.91	Reach Len. (ft)	49.70	50.50	52.60
Crit W.S. (ft)	3675.73	Flow Area (sq ft)	5.55	216.64	14.87
E.G. Slope (ft/ft)	0.027790	Area (sq ft)	5.55	216.64	14.87
Q Total (cfs)	4590.00	Flow (cfs)	39.60	4436.13	114.27
Top Width (ft)	86.98	Top Width (ft)	4.70	72.60	9.68
Vel Total (ft/s)	19.36	Avg. Vel. (ft/s)	7.13	20.48	7.69
Max Chl Dpth (ft)	3.52	Hydr. Depth (ft)	1.18	2.98	1.54
Conv. Total (cfs)	27534.1	Conv. (cfs)	237.5	26611.0	685.5
Length Wtd. (ft)	50.55	Wetted Per. (ft)	5.27	72.92	10.21
Min Ch El (ft)	3670.39	Shear (lb/sq ft)	1.83	5.15	2.53
Alpha	1.09	Stream Power (lb/ft s)	13.05	105.54	19.42
Frctn Loss (ft)	1.28	Cum Volume (acre-ft)	0.22	10.81	0.37
C & E Loss (ft)	0.17	Cum SA (acres)	0.19	5.22	0.26

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 2085

INPUT
Description:
Station Elevation Data num= 452

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3681.24	2.5	3681.36	5.4	3681.42	10.6	3681.41	11.6	3681.53
12.4	3681.54	14.1	3681.61	20.7	3682.01	21.9	3682.11	22.73	682.197
23.1	3682.24	24	3682.25	24.8	3682.15	25	3682.13	26.4	3682.12
26.7	3682.14	27	3682.15	28.1	3682	29.1	3681.73	29.4	3681.55
29.7	3681.37	30.1	3681.17	31.2	3680.9	32.3	3680.36	33.2	3679.82
34.7	3679.03	35.5	3678.56	36.3	3678.2	36.3	3678.19	36.3	3678.18
36.4	3678.15	37.7	3677.61	38	3677.45	38.4	3677.25	39.4	3676.66
39.6	3676.55	40.4	3676.21	40.4	3676.19	40.5	3676.17	42.5	3674.98
43.1	3674.63	43.5	3674.42	43.8	3674.32	44.5	3673.99	44.6	3673.97
45.4	3673.57	45.6	3673.51	46.6	3672.98	47.1	3672.74	47.3	3672.65
47.7	3672.44	47.9	3672.33	48.6	3672.02	48.7	3671.99	48.7	3671.97
48.9	3671.88	49.5	3671.42	50.4	3670.95	50.7	3670.71	51.2	3670.45
51.4	3670.37	51.8	3670.16	52	3670.1	52.7	3669.95	52.8	3669.94
52.8	3669.93	53	3669.93	53.7	3669.87	54.1	3669.85	54.5	3669.83
55.9	3669.82	56.1	3669.81	56.8	3669.75	56.9	3669.75	57	3669.74
57.2	3669.72	57.8	3669.66	58	3669.64	58.2	3669.63	58.6	3669.63
59	3669.61	59.4	3669.65	59.6	3669.67	60	3669.71	61	3669.83
61	3669.84	61.1	3669.84	61.3	3669.84	61.9	3669.85	62.1	3669.86
62.3	3669.88	62.7	3669.9	63.1	3669.93	63.6	3669.94	65.1	3669.88
65.2	3669.88	66	3669.88	66.2	3669.88	66.4	3669.89	66.9	3669.91
67.2	3669.92	67.7	3669.94	67.8	3669.95	68.3	3669.98	68.5	3669.98
69.2	3669.94	69.3	3669.94	69.6	3669.94	71.4	3669.91	71.8	3669.79
71.9	3669.77	72.4	3669.67	73.3	3669.63	73.4	3669.63	73.5	3669.63
74.3	3669.66	74.7	3669.69	75.1	3669.74	75.5	3669.78	76	3669.79
76.8	3669.8	77.4	3669.74	77.5	3669.74	77.9	3669.7	78.4	3669.67
78.6	3669.67	78.8	3669.67	79.3	3669.67	79.6	3669.68	80.1	3669.69
80.2	3669.69	80.6	3669.69	80.9	3669.66	81.5	3669.61	81.7	3669.59
81.7	3669.58	82	3669.54	82.7	3669.44	82.9	3669.42	83.7	3669.35
84.3	3669.33	84.7	3669.32	85	3669.36	85.6	3669.43	85.9	3669.46
86.2	3669.52	86.7	3669.64	86.8	3669.66	87	3669.67	87.5	3669.69
87.8	3669.71	88.3	3669.76	88.4	3669.76	88.9	3669.8	89.9	3669.91
90	3669.91	90.3	3669.92	90.8	3669.94	90.9	3669.95	91.1	3669.95
92	3669.95	92.5	3669.93	93	3669.91	93.3	3669.91	93.9	3669.93
94	3669.93	94.5	3669.94	95.1	3669.94	97.4	3670.11	98	3670.17
98.1	3670.18	98.2	3670.18	98.6	3670.17	99.1	3670.15	99.2	3670.15
99.4	3670.15	99.9	3670.13	100.2	3670.12	100.7	3670.12	101.2	3670.11
101.5	3670.08	102.1	3670.04	102.3	3670.03	102.4	3670.03	102.8	3670
103.2	3669.98	103.3	3669.97	103.5	3669.97	104	3669.95	104.3	3669.95
104.8	3669.95	105.4	3669.94	105.7	3669.93	106.2	3669.93	106.4	3669.93
106.5	3669.93	106.9	3669.91	107.3	3669.89	107.4	3669.89	108.4	3669.92
109	3669.9	109.5	3669.88	110.3	3669.84	110.5	3669.83	110.6	3669.82
111.1	3669.79	111.5	3669.74	111.7	3669.74	112.3	3669.71	112.6	3669.71
113.6	3669.73	113.9	3669.76	114.4	3669.82	114.7	3669.84	115.2	3669.86
115.6	3669.87	115.7	3669.88	115.8	3669.87	116.4	3669.84	116.7	3669.83
117.2	3669.83	118	3669.83	118.7	3669.84	119.4	3669.83	119.7	3669.82
119.8	3669.82	119.9	3669.83	120.8	3669.9	121.3	3669.97	121.8	3670.04
122.2	3670.07	122.7	3670.12	122.9	3670.14	123	3670.16	123.5	3670.26
123.9	3670.36	124	3670.4	124.6	3670.59	124.9	3670.68	125.4	3670.83
125.5	3670.85	126	3670.98	126.8	3671.12	127	3671.16	127.1	3671.21

127.6	3671.39	127.9	3671.5	128	3671.52	128.1 3671.56	128.8 3671.76
129.1	3671.82	129.5	3671.93	129.6	3671.95	130.1 3672.09	130.4 3672.26
130.9	3672.51	131.8	3673.02	132.1	3673.19	132.1 3673.22	132.3 3673.27
132.9	3673.55	133.2	3673.66	133.7	3673.92	134.2 3674.13	135 3674.4
135.2	3674.48	135.4	3674.52	135.9	3674.73	136.3 3674.85	137 3675.19
137.3	3675.29	137.9	3675.5	138.3	3675.71	138.7 3675.85	139.4 3676.08
139.5	3676.14	140.5	3676.49	141.2	3676.69	141.4 3676.76	141.9 3676.95
142	3677	142.4	3677.22	142.8	3677.34	143.2 3677.5	143.5 3677.59
143.6	3677.63	144.2	3677.82	144.5	3677.89	144.5 3677.91	145.3 3678.25
145.5	3678.35	146	3678.49	146.1	3678.54	146.6 3678.69	146.9 3678.83
147.3	3679	147.6	3679.1	147.8	3679.17	148.4 3679.36	148.6 3679.43
148.6	3679.44	149.4	3679.72	149.7	3679.82	150.2 3680.01	150.7 3680.16
151.1	3680.3	151.5	3680.44	151.7	3680.54	151.9 3680.59	152.5 3680.78
152.7	3680.83	153.5	3681.11	153.8	3681.22	154.2 3681.4	154.4 3681.47
154.8	3681.65	155.2	3681.77	155.6	3681.87	156 3682	156.7 3682.2
156.8	3682.24	156.9	3682.25	157.7	3682.52	157.9 3682.61	158.3 3682.79
158.5	3682.87	158.9	3683.07	159.3	3683.23	159.7 3683.39	160 3683.52
160.8	3683.71	161	3683.74	161.1	3683.75	161.8 3683.87	162.6 3684.12
163.1	3684.26	163.4	3684.38	163.8	3684.5	165.1 3684.91	165.2 3684.93
166.1	3685.33	166.5	3685.52	166.7	3685.63	167.2 3685.81	167.6 3685.97
167.9	3686.15	168.2	3686.29	168.7	3686.41	169.2 3686.53	169.3 3686.54
170.3	3686.86	171.3	3687.09	171.7	3687.21	172.3 3687.38	172.5 3687.44
173.4	3687.69	173.4	3687.7	174.4	3687.99	174.8 3688.1	175 3688.18
175.8	3688.44	176.1	3688.55	176.5	3688.66	176.6 3688.71	177.4 3688.92
177.5	3688.94	177.5	3688.95	178.9	3689.41	179.1 3689.49	179.9 3689.71
180.3	3689.79	180.6	3689.88	181.6	3690.11	181.6 3690.12	181.6 3690.13
182.4	3690.25	182.6	3690.27	183	3690.31	183.2 3690.35	183.7 3690.39
184.1	3690.4	184.4	3690.4	184.7	3690.41	185.7 3690.53	186.5 3690.59
187.1	3690.64	187.4	3690.66	187.8	3690.7	188.2 3690.76	188.5 3690.78
188.8	3690.81	189	3690.83	190.7	3690.98	190.9 3691	191.2 3691.01
191.5	3691.02	191.9	3691.03	192.3	3691.04	192.6 3691.05	192.9 3691.05
193.1	3691.06	194	3691.09	194	3691.1	195 3691.14	195.3 3691.15
195.6	3691.15	196	3691.16	196.5	3691.18	196.7 3691.19	197.3 3691.21
198.1	3691.22	199.1	3691.31	199.8	3691.33	200.2 3691.36	200.6 3691.38
200.8	3691.38	201.2	3691.4	201.4	3691.41	202.2 3691.47	202.3 3691.47
203.6	3691.61	203.9	3691.67	204.3	3691.75	204.9 3691.78	205.3 3691.8
206.4	3691.88	207.2	3691.92	207.4	3691.92	207.7 3691.92	208 3691.91
208.4	3691.91	208.8	3691.89	209.4	3691.87	209.7 3691.87	210.4 3691.87
210.5	3691.88	210.6	3691.88	211.5	3691.92	211.8 3691.93	212.1 3691.96
212.5	3691.97	213	3692	213.2	3692.01	213.5 3692.03	213.8 3692.04
214.5	3692.06	214.6	3692.06	214.7	3692.08	215.4 3692.16	215.6 3692.17
215.9	3692.17	216.3	3692.16				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	51.8	.025	121.8	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
51.8	121.8	44.3	62.6	88.4	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3678.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.76	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3673.03	Reach Len. (ft)	44.30	62.60	88.40
Crit W.S. (ft)	3674.77	Flow Area (sq ft)	7.43	224.17	18.00
E.G. Slope (ft/ft)	0.023169	Area (sq ft)	7.43	224.17	18.00
Q Total (cfs)	4590.00	Flow (cfs)	53.38	4396.21	140.40
Top Width (ft)	85.33	Top Width (ft)	5.30	70.00	10.02
Vel Total (ft/s)	18.39	Avg. Vel. (ft/s)	7.19	19.61	7.80
Max Chl Dpth (ft)	3.71	Hydr. Depth (ft)	1.40	3.20	1.80
Conv. Total (cfs)	30155.2	Conv. (cfs)	350.7	28882.1	922.4
Length Wtd. (ft)	63.33	Wetted Per. (ft)	6.07	70.24	10.55
Min Ch El (ft)	3669.32	Shear (lb/sq ft)	1.77	4.62	2.47
Alpha	1.10	Stream Power (lb/ft s)	12.73	90.53	19.26
Frctn Loss (ft)	1.35	Cum Volume (acre-ft)	0.21	10.56	0.35
C & E Loss (ft)	0.10	Cum SA (acres)	0.18	5.14	0.25

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 2023

INPUT
Description:
Station Elevation Data num= 489

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3679.63	2.1	3679.81	4.1	3679.84	5.1	3679.83	6.1	3679.86
7.1	3679.77	8.1	3679.8	9.1	3679.75	11.1	3679.73	13.1	3679.68
16.1	3679.71	16.8	3679.75	18.4	3679.87	21.1	3680.12	22.1	3680.16
22.4	3680.17	22.9	3680.22	24.1	3680.29	24.9	3680.38	26	3680.48
26.1	3680.49	27.1	3680.62	28	3680.67	28.3	3680.68	29.1	3680.68

30.1 3680.81	31.1 3680.87	31.2 3680.88	32.1 3680.9	32.2 3680.91
33.1 3681.02	33.1 3681.03	33.2 3681.03	34.1 3681.03	35.1 3681.16
36 3681.18	36.1 3681.19	37.1 3681.25	38.1 3681.28	38.2 3681.28
39.1 3681.37	40.1 3681.4	40.1 3681.41	40.2 3681.41	41 3681.47
41.1 3681.47	42 3681.5	42.1 3681.51	43 3681.56	43.1 3681.56
43.2 3681.57	43.93681.588	44 3681.59	44.1 3681.6	44.3 3681.59
45.1 3681.53	45.3 3681.47	46 3681.26	46.1 3681.2	46.3 3681.11
47 3680.71	47.1 3680.62	47.3 3680.53	47.9 3680.32	48.1 3680.23
48.3 3680.14	49.1 3679.73	49.4 3679.59	49.9 3679.23	50.1 3679.08
50.9 3678.69	51.1 3678.55	51.4 3678.41	51.9 3678.12	52.1 3677.99
52.4 3677.83	52.9 3677.59	53.1 3677.44	53.4 3677.29	53.8 3677.08
54.1 3676.93	54.4 3676.8	54.8 3676.65	55.1 3676.52	55.5 3676.35
55.8 3676.14	56.1 3675.97	56.5 3675.81	56.8 3675.67	57.1 3675.5
57.8 3675.22	58.1 3675.06	58.5 3674.87	58.8 3674.71	59.1 3674.52
59.5 3674.32	59.7 3674.19	60.1 3673.99	60.5 3673.8	60.7 3673.71
61.1 3673.51	63.1 3672.75	63.6 3672.48	63.7 3672.44	64.1 3672.17
64.6 3671.9	64.7 3671.87	65.1 3671.61	67.1 3670.59	67.6 3670.29
67.7 3670.26	68.1 3669.95	68.6 3669.69	68.7 3669.65	69.1 3669.39
69.6 3669.13	69.7 3669.07	70.1 3668.81	70.6 3668.6	71.1 3668.33
71.5 3668.23	71.7 3668.18	72.1 3668.09	72.5 3668.04	72.7 3668.01
73.1 3667.96	73.5 3667.84	73.8 3667.76	74.1 3667.63	74.5 3667.53
74.8 3667.45	75.1 3667.34	75.5 3667.37	75.8 3667.38	76.1 3667.4
76.5 3667.55	76.8 3667.71	77.1 3667.86	77.5 3668.01	77.8 3668.2
78.1 3668.34	78.8 3668.45	79.1 3668.49	79.4 3668.53	79.9 3668.58
80.1 3668.62	80.4 3668.63	80.9 3668.67	81.1 3668.69	81.4 3668.67
81.9 3668.61	82.1 3668.59	82.4 3668.59	82.9 3668.61	83.1 3668.61
83.4 3668.61	83.9 3668.61	84.1 3668.61	84.3 3668.6	84.9 3668.58
85.1 3668.57	85.3 3668.57	86 3668.55	86.3 3668.55	87 3668.53
87.1 3668.52	88 3668.48	88.1 3668.47	88.3 3668.48	89 3668.55
89.1 3668.56	89.3 3668.55	90 3668.45	90.1 3668.44	90.2 3668.41
91 3668.21	91.1 3668.18	91.2 3668.16	92.1 3667.98	92.1 3667.96
92.2 3667.95	93.1 3667.85	93.2 3667.84	94.1 3667.87	94.2 3667.87
95.1 3667.84	95.2 3667.85	96.1 3667.94	96.7 3668.06	97.1 3668.16
98.1 3668.22	98.2 3668.22	99.1 3668.28	99.2 3668.29	100.1 3668.43
100.1 3668.44	100.2 3668.44	101.1 3668.47	101.1 3668.48	101.2 3668.49
102.1 3668.62	102.1 3668.63	102.2 3668.63	103 3668.63	104 3668.63
104.1 3668.62	104.3 3668.62	105.1 3668.62	105.3 3668.61	106 3668.55
106.1 3668.54	106.3 3668.53	107 3668.48	107.1 3668.47	107.3 3668.47
108 3668.45	108.1 3668.44	108.9 3668.41	109.1 3668.4	109.9 3668.35
110.1 3668.34	110.4 3668.34	110.9 3668.3	111.1 3668.3	111.4 3668.3
111.9 3668.31	112.1 3668.31	112.4 3668.32	112.9 3668.35	113.1 3668.36
113.4 3668.37	113.9 3668.37	114.4 3668.4	114.8 3668.42	115.1 3668.45
115.4 3668.5	115.8 3668.57	116.1 3668.62	116.8 3668.78	117.1 3668.85
117.8 3668.88	118.1 3668.89	118.5 3668.89	118.8 3668.9	119.1 3668.91
119.5 3668.9	119.8 3668.9	120.1 3668.89	120.5 3668.88	120.7 3668.88
121.1 3668.86	121.6 3668.84	122.1 3668.81	123.1 3668.79	123.6 3668.72
123.7 3668.71	124.1 3668.64	124.6 3668.62	124.7 3668.62	125.1 3668.59
125.6 3668.55	125.7 3668.54	126.1 3668.5	126.6 3668.46	127.1 3668.42
127.6 3668.39	127.7 3668.39	128.1 3668.36	128.6 3668.23	128.7 3668.21
129.1 3668.08	129.6 3667.97	129.7 3667.94	130.1 3667.83	131.1 3667.89
131.6 3667.93	131.7 3667.94	132.1 3667.97	132.6 3668.04	133.1 3668.14
133.5 3668.19	133.8 3668.22	134.1 3668.27	134.5 3668.31	134.8 3668.35
135.1 3668.39	135.5 3668.48	135.8 3668.55	136.1 3668.63	136.5 3668.7
136.8 3668.76	137.1 3668.82	137.8 3668.96	138.1 3669.02	138.5 3669.11
138.8 3669.21	139.1 3669.3	139.4 3669.39	139.9 3669.52	140.1 3669.6
140.9 3669.85	141.1 3669.95	141.4 3670.04	142.1 3670.3	142.9 3670.52
143.1 3670.59	143.4 3670.65	143.9 3670.78	144.1 3670.84	144.4 3670.92
144.9 3671.12	145.1 3671.19	145.3 3671.27	146.1 3671.53	147 3671.89
147.1 3671.96	147.3 3672.02	148 3672.3	148.1 3672.36	148.3 3672.41
149 3672.66	149.1 3672.71	149.3 3672.75	150 3673.03	150.1 3673.07
150.3 3673.12	151 3673.43	151.1 3673.47	151.2 3673.51	152.1 3673.73
152.1 3673.76	153.1 3674.19	153.1 3674.22	153.2 3674.25	154.1 3674.55
154.1 3674.57	155.2 3674.95	156.1 3675.28	156.2 3675.29	157.1 3675.69
157.4 3675.78	158.1 3676.09	159.1 3676.43	159.1 3676.44	160.1 3676.72
160.2 3676.74	161.1 3677.19	161.1 3677.22	161.2 3677.24	162.1 3677.57
162.1 3677.6	162.2 3677.62	163.1 3677.88	163.1 3677.9	163.2 3677.93
164 3678.1	164.1 3678.12	164.3 3678.17	165 3678.43	165.3 3678.52
166 3678.74	167.1 3679.14	167.3 3679.2	168 3679.45	168.1 3679.52
169 3679.81	169.1 3679.88	169.3 3679.96	170.1 3680.34	170.4 3680.41
170.9 3680.61	171.1 3680.69	171.4 3680.76	171.9 3680.95	172.4 3681.11
172.9 3681.28	173.1 3681.37	173.4 3681.43	173.9 3681.53	174.1 3681.59
174.4 3681.7	174.9 3681.86	175.1 3681.97	175.4 3682.08	176.1 3682.36
176.5 3682.46	176.8 3682.57	177.1 3682.68	177.5 3682.79	177.8 3682.89
178.8 3683.19	179.1 3683.3	179.5 3683.44	179.8 3683.54	180.1 3683.67
180.5 3683.78	180.8 3683.85	181.1 3683.97	181.7 3684.14	182.1 3684.26
182.6 3684.48	1833684.728	183.1 3684.79	183.6 3684.91	183.7 3684.96
184.1 3685.08	184.6 3685.23	184.7 3685.26	185.1 3685.41	185.6 3685.52
185.7 3685.54	186.1 3685.66	186.6 3685.86	186.7 3685.87	187.1 3686.08
187.6 3686.23	187.7 3686.23	188.2 3686.39	188.6 3686.54	188.7 3686.55
189.2 3686.7	189.6 3686.84	189.7 3686.85	190.2 3686.99	190.6 3687.08
190.7 3687.11	191.2 3687.2	191.6 3687.25	191.7 3687.27	192.2 3687.32
192.6 3687.32	193.2 3687.32	193.6 3687.29	194.2 3687.24	195.5 3687.21
195.8 3687.22	196.2 3687.22	196.5 3687.23	196.8 3687.25	197.2 3687.27
197.5 3687.27	197.8 3687.25	198.2 3687.25	198.8 3687.3	199.2 3687.31
199.5 3687.33	199.9 3687.34	200.2 3687.36	200.4 3687.36	200.9 3687.36
201.2 3687.36	201.4 3687.37	201.9 3687.38	202.2 3687.39	202.4 3687.41
202.9 3687.45	203.4 3687.47	204.2 3687.43	204.4 3687.44	204.9 3687.44
205.2 3687.44	205.4 3687.46	206.2 3687.53	206.3 3687.53	207 3687.55
207.2 3687.56	207.3 3687.56	208 3687.54	208.2 3687.54	209.3 3687.67

210	3687.76	210.2	3687.77	211	3687.92	211.2	3687.95	211.3	3687.96		
212.1	3688.08	212.2	3688.09	213.1	3687.9	214.1	3687.86	214.2	3687.86		
214.2	3687.85	215.1	3687.79	215.2	3687.79	215.2	3687.78	216.1	3687.75		
216.2	3687.75	217.1	3687.84	217.2	3687.84	217.7	3687.84				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	72.1	.025	133.1	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
72.1	133.1	62.3	94.8	128	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3677.34	Element	Left OB	Channel	Right OB	
Vel Head (ft)	5.42	Wt. n-Val.	0.036	0.025	0.041	
W.S. Elev (ft)	3671.92	Reach Len. (ft)	62.30	94.80	128.00	
Crit W.S. (ft)	3673.54	Flow Area (sq ft)	15.46	217.32	30.53	
E.G. Slope (ft/ft)	0.019764	Area (sq ft)	15.46	217.32	30.53	
Q Total (cfs)	4590.00	Flow (cfs)	133.48	4203.50	253.02	
Top Width (ft)	82.49	Top Width (ft)	7.54	61.00	13.95	
Vel Total (ft/s)	17.43	Avg. Vel. (ft/s)	8.64	19.34	8.29	
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	2.05	3.56	2.19	
Conv. Total (cfs)	32649.1	Conv. (cfs)	949.4	29899.9	1799.7	
Length Wtd. (ft)	95.54	Wetted Per. (ft)	8.51	61.71	14.51	
Min Ch El (ft)	3667.34	Shear (lb/sq ft)	2.24	4.35	2.60	
Alpha	1.15	Stream Power (lb/ft s)	19.35	84.06	21.52	
Frctn Loss (ft)	1.88	Cum Volume (acre-ft)	0.20	10.24	0.30	
C & E Loss (ft)	0.02	Cum SA (acres)	0.18	5.04	0.23	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 1928

INPUT
Description:
Station Elevation Data num= 496

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3677.2	1	3677.36	1.6	3677.43	4.1	3677.36	4.8	3677.37
5.7	3677.42	5.9	3677.41	7	3677.49	9.1	3677.5	10.4	3677.63
11.2	3677.77	12.3	3677.78	14.2	3677.74	15.5	3677.76	16.6	3677.69
16.6	3677.7	17.4	3677.78	17.6	3677.8	18.7	3677.8	19.5	3677.85
19.7	3677.87	19.8	3677.87	19.9	3677.88	20.8	3677.94	21.2	3677.96
21.6	3677.96	21.9	3677.97	24	3678.08	25.1	3678.19	25.3	3678.2
25.9	3678.22	26.2	3678.23	28.2	3678.4	28.3	3678.4	28.4	3678.41
29	3678.43	29.3	3678.46	29.8	3678.51	30.1	3678.53	30.4	3678.56
30.6	3678.57	31	3678.56	31.4	3678.56	31.5	3678.57	32.1	3678.63
32.5	3678.65	34.5	3678.72	35.2	3678.75	35.2	3678.76	36.8	3678.81
37.9	3678.8	38.4	3678.8	38.5	3678.79	38.9	3678.77	39.1	3678.77
39.6	3678.75	39.9	3678.75	40	3678.75	40.7	3678.71	41.1	3678.69
41.5	3678.59	41.83	3678.515	41.9	3678.49	42.1	3678.44	42.2	3678.41
42.5	3678.32	43.2	3678.03	43.6	3677.84	44.6	3677.4	45.3	3677.01
45.3	3677	45.4	3677	45.4	3676.98	46.1	3676.61	46.4	3676.47
46.9	3676.24	47.5	3675.97	47.7	3675.86	48.3	3675.57	48.5	3675.46
48.5	3675.42	48.7	3675.33	49.2	3675.05	49.6	3674.86	50	3674.65
50.4	3674.5	50.7	3674.38	50.8	3674.32	51.1	3674.15	51.6	3673.91
51.7	3673.83	52.1	3673.67	52.4	3673.57	52.8	3673.36	53.1	3673.2
53.8	3672.83	53.9	3672.79	53.9	3672.77	54	3672.72	54.7	3672.32
54.9	3672.19	55.5	3671.96	56	3671.71	56.3	3671.61	56.9	3671.32
57	3671.26	57.1	3671.24	57.2	3671.19	57.8	3670.91	58.1	3670.74
58.6	3670.56	58.9	3670.44	59.2	3670.3	59.4	3670.24	59.8	3670.03
60.1	3669.83	60.3	3669.76	60.6	3669.61	60.9	3669.46	61.3	3669.24
61.7	3669.05	62.3	3668.71	62.4	3668.64	64	3667.64	64.5	3667.29
64.8	3667.12	65.5	3666.65	65.6	3666.61	65.6	3666.6	66.4	3666.51
66.7	3666.44	67.1	3666.36	67.4	3666.32	67.7	3666.26	67.9	3666.23
68.4	3666.16	68.7	3666.11	68.8	3666.08	69.1	3666.05	69.5	3665.99
69.9	3665.94	70.3	3665.84	70.8	3665.73	70.9	3665.68	71	3665.68
71.3	3665.66	71.8	3665.61	72	3665.6	72.5	3665.61	72.6	3665.61
73.1	3665.61	73.4	3665.63	74.1	3665.72	74.2	3665.72	74.9	3665.77
75.2	3665.8	75.7	3665.91	75.9	3665.94	76.3	3666.02	76.5	3666.07
77	3666.18	77.3	3666.25	77.5	3666.27	78	3666.32	78.4	3666.36
78.8	3666.38	79.2	3666.42	79.5	3666.44	79.6	3666.45	79.9	3666.47
80.4	3666.52	80.5	3666.53	80.9	3666.54	81.1	3666.55	81.6	3666.56
81.9	3666.53	82.6	3666.47	82.7	3666.47	82.8	3666.47	83.5	3666.46
84.3	3666.41	85.6	3666.43	85.8	3666.43	86	3666.44	86.6	3666.47
86.9	3666.49	87.4	3666.52	87.7	3666.53	88	3666.55	88.1	3666.54
88.5	3666.53	88.9	3666.53	89.1	3666.53	89.7	3666.56	90.5	3666.59
91.1	3666.62	91.2	3666.62	91.3	3666.62	91.4	3666.61	92	3666.56
92.3	3666.55	92.8	3666.54	93.3	3666.51	93.6	3666.5	94.3	3666.45
94.4	3666.44	94.5	3666.44	95.1	3666.45	95.5	3666.45	95.9	3666.48
96.2	3666.48	96.5	3666.5	97.1	3666.53	97.5	3666.56	97.6	3666.56
97.9	3666.58	98.3	3666.61	98.7	3666.64	99	3666.66	99.6	3666.68
99.7	3666.69	99.8	3666.69	100	3666.7	100.6	3666.71	100.8	3666.71

101.3	3666.68	101.4	3666.68	101.9	3666.66	102.2	3666.64	102.9	3666.62
103	3666.63	103.7	3666.66	104	3666.68	104.5	3666.68	105.1	3666.69
105.3	3666.69	105.8	3666.71	106	3666.71	106.1	3666.71	106.4	3666.71
106.8	3666.7	107.2	3666.7	107.6	3666.71	108.1	3666.72	108.3	3666.72
108.4	3666.72	109.2	3666.78	109.3	3666.78	109.8	3666.77	109.9	3666.76
110.4	3666.75	111.5	3666.59	112.3	3666.55	112.5	3666.5	113.2	3666.38
113.6	3666.28	113.8	3666.23	114.4	3666.14	114.6	3666.1	114.7	3666.09
114.9	3666.06	115.4	3665.97	115.7	3665.92	116.6	3665.93	116.8	3665.94
116.9	3665.93	117.2	3665.91	117.7	3665.89	117.9	3665.88	118.3	3665.89
118.5	3665.89	118.9	3665.89	119.3	3665.92	119.9	3665.97	120	3665.97
120.1	3665.98	121.1	3666.05	121.6	3666.02	122.1	3666	123	3665.95
123.2	3665.94	123.2	3665.93	123.9	3665.91	124.3	3665.91	124.7	3665.93
125	3665.93	125.3	3665.94	125.5	3665.95	125.9	3665.98	126.3	3666.03
126.4	3666.05	126.7	3666.1	127	3666.16	127.5	3666.2	127.8	3666.2
128.4	3666.22	128.5	3666.22	128.6	3666.22	128.7	3666.22	129.6	3666.22
130.1	3666.25	130.2	3666.25	130.7	3666.28	130.9	3666.42	131.6	3666.86
131.7	3666.92	131.7	3666.94	131.8	3666.99	132.5	3667.39	132.8	3667.57
133.3	3667.73	133.5	3667.8	133.9	3667.92	134	3667.96	134.5	3668.06
134.8	3668.13	134.9	3668.17	135.6	3668.3	136	3668.39	136.4	3668.48
136.9	3668.6	137.1	3668.64	137.2	3668.67	137.4	3668.72	137.9	3668.87
138.1	3668.91	138.6	3669.07	139.2	3669.29	139.5	3669.37	140.2	3669.53
140.3	3669.53	140.3	3669.54	141	3669.73	141.3	3669.8	141.8	3670.02
142	3670.12	142.4	3670.35	142.6	3670.42	143.1	3670.49	143.4	3670.53
143.7	3670.62	144.2	3670.79	144.5	3670.92	144.9	3671.09	145.4	3671.27
145.6	3671.36	145.7	3671.4	146	3671.52	146.5	3671.74	146.7	3671.82
147.1	3671.99	147.3	3672.07	147.7	3672.27	148	3672.42	148.8	3672.79
148.8	3672.81	148.9	3672.83	149.6	3673.12	149.9	3673.23	150.4	3673.41
150.9	3673.62	151.2	3673.69	151.7	3673.91	151.9	3673.99	152	3674.01
152.2	3674.08	152.7	3674.32	153.1	3674.45	153.5	3674.55	153.9	3674.66
154.1	3674.73	154.3	3674.77	154.6	3674.89	155.1	3675.06	155.2	3675.11
155.6	3675.24	155.8	3675.34	156.3	3675.48	156.6	3675.6	157.3	3675.83
157.3	3675.86	157.4	3675.88	157.5	3675.92	158.2	3676.13	158.4	3676.2
158.9	3676.33	159	3676.34	159.5	3676.49	159.7	3676.57	160.4	3676.79
160.5	3676.85	160.7	3676.87	161.3	3677.05	161.6	3677.12	162.1	3677.27
162.3	3677.37	162.7	3677.47	162.8	3677.51	163.6	3677.75	163.7	3677.79
164	3677.85	164.4	3677.93	164.8	3678.03	165.2	3678.11	165.9	3678.24
165.9	3678.25	166.1	3678.26	166.7	3678.28	166.9	3678.29	167.4	3678.3
167.5	3678.31	169	3678.25	169.1	3678.25	169.8	3678.17	170.1	3678.15
170.6	3678.13	170.8	3678.1	171.2	3678.07	171.4	3678.05	171.9	3677.99
172.2	3677.94	172.3	3677.92	172.9	3677.88	173.3	3677.86	173.7	3677.83
174.2	3677.78	174.4	3677.76	174.5	3677.76	174.7	3677.75	175.3	3677.72
175.5	3677.7	176.5	3677.6	176.8	3677.57	177.6	3677.47	178.4	3677.37
178.7	3677.34	179.2	3677.3	179.3	3677.28	179.7	3677.24	179.9	3677.23
180.5	3677.27	180.7	3677.28	180.8	3677.28	181	3677.25	181.5	3677.12
181.9	3677.08	182.3	3676.9	182.7	3676.59	183.1	3676.38	183.4	3676.23
183.8	3675.97	184.4	3675.59	184.6	3675.42	185.1	3675.11	185.4	3675.02
186.1	3674.98	186.1	3674.97	186.2	3674.97	186.9	3675	187.2	3675.04
187.7	3675.12	188.3	3675.18	188.5	3675.2	189.1	3675.19	189.3	3675.19
189.3	3675.18	189.5	3675.15	190.1	3675.06	191.6	3674.56	192	3674.53
192.4	3674.52	192.5	3674.53	192.9	3674.56	193.2	3674.59	193.9	3674.66
194.6	3674.74	194.7	3674.77	194.9	3674.81	195.5	3675.05	195.7	3675.13
196.3	3675.2	196.8	3675.25	197.1	3675.24	197.7	3675.19	197.8	3675.19
197.9	3675.19	198	3675.18	199.7	3675.09	200	3675.07	200.6	3675.12
201.1	3675.2	201.4	3675.29	201.7	3675.42	202.1	3675.54	202.5	3675.65
202.8	3675.76								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	65.5	.025	129.6	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
65.5	129.6	96.9	103.9	113.1	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3675.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.58	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3669.87	Reach Len. (ft)	96.90	103.90	113.10
Crit W.S. (ft)	3671.57	Flow Area (sq ft)	8.24	227.66	20.15
E.G. Slope (ft/ft)	0.019598	Area (sq ft)	8.24	227.66	20.15
Q Total (cfs)	4590.00	Flow (cfs)	56.61	4394.58	138.81
Top Width (ft)	81.41	Top Width (ft)	5.46	64.10	11.86
Vel Total (ft/s)	17.93	Avg. Vel. (ft/s)	6.87	19.30	6.89
Max Chl Dpth (ft)	4.27	Hydr. Depth (ft)	1.51	3.55	1.70
Conv. Total (cfs)	32787.1	Conv. (cfs)	404.4	31391.2	991.5
Length Wtd. (ft)	104.06	Wetted Per. (ft)	6.35	64.43	12.56
Min Ch El (ft)	3665.60	Shear (lb/sq ft)	1.59	4.32	1.96
Alpha	1.12	Stream Power (lb/ft s)	10.91	83.45	13.52
Frctn Loss (ft)	1.84	Cum Volume (acre-ft)	0.18	9.76	0.22
C & E Loss (ft)	0.13	Cum SA (acres)	0.17	4.91	0.19

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1

REACH: Reach 1 RS: 1824

INPUT
Description:
Station Elevation Data num= 440

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3673.45	.7	3673.47	1.8	3673.56	3.2	3673.63	3.9	3673.61
4.7	3673.65	5.8	3673.66	6.9	3673.71	7.6	3673.72	8.6	3673.77
9.9	3673.77	13.6	3673.9	15.3	3673.93	16.4	3674.01	16.5	3674.01
16.8	3674.01	17.5	3674.01	18	3674.04	18.4	3674.07	18.7	3674.09
21.2	3674.14	21.7	3674.19	22	3674.21	22.5	3674.21	23	3674.22
23.2	3674.22	24.3	3674.27	27.7	3674.31	28.4	3674.31	28.8	3674.33
29.2	3674.33	29.9	3674.34	31	3674.33	31.4	3674.35	32.1	3674.37
32.2	3674.38	32.9	3674.4	33.3	3674.42	33.6	3674.44	34.3	3674.41
34.4	3674.4	34.6	3674.39	35.1	3674.36	35.9	3674.35	36.5	3674.32
36.6	3674.31	36.7	3674.31	36.9	3674.31	37.3	3674.31	37.8	3674.31
38.1	3674.28	38.6	3674.21	38.8	3674.19	38.9	3674.18	39.6	3674.17
40	3674.11	40.3	3674.05	40.8	3673.92	41	3673.87	41.2	3673.84
41.43	3673.753	41.5	3673.71	41.8	3673.61	42.3	3673.45	42.5	3673.34
43	3673.1	43.3	3672.96	43.4	3672.9	43.8	3672.68	44	3672.59
44.5	3672.33	44.8	3672.22	45.2	3672.01	45.7	3671.76	46.2	3671.49
46.2	3671.44	47	3670.99	47.4	3670.75	47.7	3670.56	48.5	3670.14
48.5	3670.13	49	3669.79	49.2	3669.68	50	3669.25	50.2	3669.13
50.7	3668.78	50.8	3668.73	51.3	3668.41	51.4	3668.33	51.8	3668.22
52.2	3668.06	52.4	3667.95	52.9	3667.65	53.1	3667.56	53.5	3667.32
53.9	3667.07	54.4	3666.79	55.4	3666.27	55.8	3666.08	55.9	3666
56.1	3665.84	56.6	3665.49	57.4	3665.1	57.7	3664.89	58	3664.72
58.1	3664.68	58.3	3664.62	58.9	3664.44	59.2	3664.39	59.6	3664.38
60	3664.38	60.3	3664.37	60.4	3664.38	60.5	3664.39	61.1	3664.43
61.4	3664.46	61.8	3664.48	62.4	3664.45	62.5	3664.44	62.7	3664.42
63.3	3664.29	63.7	3664.24	64.1	3664.22	64.7	3664.19	64.8	3664.19
65.6	3664.23	65.9	3664.26	66.3	3664.3	67	3664.34	67.1	3664.34
67.8	3664.31	68.2	3664.28	68.5	3664.25	69.2	3664.22	69.3	3664.22
70	3664.21	70.4	3664.22	70.8	3664.24	71.4	3664.3	71.5	3664.31
71.6	3664.31	72.2	3664.3	72.6	3664.31	73	3664.31	73.6	3664.31
73.7	3664.31	73.8	3664.31	73.9	3664.32	74.5	3664.33	74.9	3664.35
75.9	3664.38	76	3664.38	76.7	3664.44	77.1	3664.48	77.4	3664.5
78.3	3664.53	78.6	3664.52	78.9	3664.52	79.4	3664.49	79.7	3664.48
80.2	3664.49	80.4	3664.49	80.5	3664.49	80.9	3664.47	81.6	3664.46
81.9	3664.45	82.4	3664.44	82.6	3664.42	82.8	3664.41	83.4	3664.32
83.9	3664.25	84.1	3664.24	84.5	3664.22	84.9	3664.21	85	3664.21
85.5	3664.2	85.6	3664.2	86.1	3664.2	86.3	3664.2	86.7	3664.22
87.1	3664.24	87.3	3664.26	87.8	3664.3	88.4	3664.34	88.6	3664.35
88.9	3664.36	89.3	3664.38	89.5	3664.39	90.1	3664.45	90.2	3664.47
90.6	3664.54	90.8	3664.55	91.1	3664.56	91.5	3664.57	91.8	3664.57
92.3	3664.6	92.5	3664.61	92.9	3664.62	93	3664.63	93.3	3664.62
94	3664.62	94.5	3664.62	94.8	3664.61	95.1	3664.6	95.3	3664.6
95.5	3664.59	96	3664.58	96.3	3664.57	96.7	3664.56	97.1	3664.56
97.4	3664.56	97.5	3664.57	97.7	3664.58	98.2	3664.61	98.5	3664.61
99	3664.6	99.4	3664.6	99.6	3664.59	99.7	3664.59	99.9	3664.59
100.8	3664.55	101.2	3664.54	101.7	3664.54	101.9	3664.53	102	3664.53
102.7	3664.5	103	3664.49	103.4	3664.5	104	3664.53	104.1	3664.53
104.2	3664.53	104.2	3664.54	104.9	3664.56	105.3	3664.55	105.7	3664.52
106.4	3664.5	107.5	3664.42	107.9	3664.43	108.6	3664.47	108.7	3664.47
109.4	3664.48	109.8	3664.47	110.1	3664.46	110.8	3664.44	110.9	3664.44
111	3664.45	111.6	3664.48	112	3664.5	112.3	3664.5	113	3664.47
113.1	3664.46	113.3	3664.43	113.8	3664.36	114.3	3664.3	114.6	3664.27
115.2	3664.25	115.3	3664.25	115.6	3664.28	116	3664.33	116.5	3664.4
116.8	3664.43	117.3	3664.46	117.5	3664.47	117.6	3664.47	117.9	3664.49
118.3	3664.51	118.8	3664.53	119	3664.57	119.5	3664.7	119.8	3664.77
119.9	3664.81	121	3665.18	121.2	3665.28	122	3665.58	122.1	3665.64
122.6	3665.84	122.7	3665.92	123.3	3666.17	123.5	3666.26	123.9	3666.41
124.2	3666.52	124.4	3666.58	125	3666.85	125.5	3667.1	125.7	3667.19
126.1	3667.37	126.4	3667.52	126.6	3667.59	127.2	3667.8	127.8	3668.03
128.3	3668.3	128.7	3668.49	128.9	3668.58	129.4	3668.85	130	3669.14
130.2	3669.22	130.5	3669.39	130.9	3669.67	131.1	3669.82	131.6	3670.14
132.3	3670.51	132.4	3670.6	132.6	3670.73	132.83	3670.806	133.1	3670.92
133.4	3671.03	133.9	3671.28	134.1	3671.44	134.5	3671.64	134.6	3671.68
134.8	3671.72	135.4	3671.83	135.6	3671.9	136.1	3672	136.5	3672.07
136.7	3672.13	136.8	3672.14	137	3672.16	137.6	3672.21	137.9	3672.24
139	3672.39	139.1	3672.4	139.2	3672.41	139.8	3672.45	140.1	3672.46
140.6	3672.5	141.1	3672.52	141.2	3672.53	141.3	3672.54	141.4	3672.55
142	3672.64	142.4	3672.66	142.8	3672.69	143.4	3672.77	143.5	3672.78
144.3	3672.85	144.6	3672.88	145	3672.87	145.7	3672.91	145.8	3672.91
146.5	3672.94	146.9	3672.95	147.9	3673.03	148	3673.03	148.7	3672.96
149.1	3672.92	150.2	3672.93	151.4	3672.9	151.7	3672.88	152.3	3672.87
152.5	3672.87	152.7	3672.87	153.2	3672.88	153.6	3672.89	154.5	3672.92
154.7	3672.93	155	3672.94	155.9	3672.97	156.1	3672.96	156.7	3672.92
156.9	3672.91	157	3672.91	157.3	3672.91	157.6	3672.92	158.1	3672.89
158.4	3672.88	158.9	3672.89	159.1	3672.9	159.2	3672.9	159.6	3672.91
159.9	3672.92	160.4	3672.93	160.6	3672.92	161.3	3672.91	161.5	3672.91
161.9	3672.93	162.6	3672.97	162.8	3672.97	163.7	3672.94	164.3	3672.99
164.3	3673	164.9	3673.04	165.1	3673.07	165.4	3673.13	165.8	3673.19
166	3673.21	166.5	3673.27	167.1	3673.34	167.3	3673.35	167.6	3673.39
168.2	3673.42	168.8	3673.43	168.9	3673.44	169.4	3673.47	169.5	3673.48
169.8	3673.51	170.3	3673.55	170.5	3673.56	171	3673.59	171.2	3673.62
171.6	3673.67	171.7	3673.69	172	3673.75	172.5	3673.85	172.7	3673.9
173.5	3674.01	173.9	3674.05	174	3674.07	174.2	3674.07	175	3674.11
175.5	3674.13	175.8	3674.14	176.1	3674.16	176.2	3674.16	176.4	3674.17

176.9	3674.19	177.2	3674.18	177.7	3674.23	178.1	3674.31	178.4	3674.34
178.4	3674.35	178.6	3674.37	179.5	3674.48	179.9	3674.54	180.5	3674.58
180.6	3674.6	180.7	3674.6	181.4	3674.66	182.1	3674.74	182.8	3674.81
182.9	3674.81	182.9	3674.82	183.6	3674.95	184	3675	185.1	3675.12
185.1	3675.13	185.8	3675.27	186.2	3675.3	186.6	3675.29	187	3675.28

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.036	58.9	.025	118.3	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
58.9	118.3	129.5	122.9	113.8	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3673.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.14	Wt. n-Val.	0.036	0.025	0.041
W.S. Elev (ft)	3668.33	Reach Len. (ft)	129.50	122.90	113.80
Crit W.S. (ft)	3669.87	Flow Area (sq ft)	14.64	232.20	21.29
E.G. Slope (ft/ft)	0.016021	Area (sq ft)	14.64	232.20	21.29
Q Total (cfs)	4590.00	Flow (cfs)	110.03	4328.04	151.93
Top Width (ft)	76.96	Top Width (ft)	7.50	59.40	10.06
Vel Total (ft/s)	17.12	Avg. Vel. (ft/s)	7.51	18.64	7.13
Max Chl Dpth (ft)	4.14	Hydr. Depth (ft)	1.95	3.91	2.12
Conv. Total (cfs)	36263.9	Conv. (cfs)	869.3	34194.2	1200.4
Length Wtd. (ft)	122.82	Wetted Per. (ft)	8.49	59.54	10.82
Min Ch El (ft)	3664.19	Shear (lb/sq ft)	1.72	3.90	1.97
Alpha	1.13	Stream Power (lb/ft s)	12.96	72.71	14.05
Frctn Loss (ft)	4.16	Cum Volume (acre-ft)	0.16	9.21	0.17
C & E Loss (ft)	0.52	Cum SA (acres)	0.15	4.76	0.16

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 1701

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3666.97	20	3656.97	140	3656.97	160	3666.97

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	77.6	100.2	119.4	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3668.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	10.34	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3658.44	Reach Len. (ft)	77.60	100.20	119.40
Crit W.S. (ft)	3660.49	Flow Area (sq ft)	2.15	175.75	2.15
E.G. Slope (ft/ft)	0.114104	Area (sq ft)	2.15	175.75	2.15
Q Total (cfs)	4590.00	Flow (cfs)	19.61	4550.77	19.61
Top Width (ft)	125.86	Top Width (ft)	2.93	120.00	2.93
Vel Total (ft/s)	25.49	Avg. Vel. (ft/s)	9.14	25.89	9.14
Max Chl Dpth (ft)	1.46	Hydr. Depth (ft)	0.73	1.46	0.73
Conv. Total (cfs)	13588.2	Conv. (cfs)	58.1	13472.1	58.1
Length Wtd. (ft)	100.18	Wetted Per. (ft)	3.27	120.00	3.27
Min Ch El (ft)	3656.97	Shear (lb/sq ft)	4.67	10.43	4.67
Alpha	1.02	Stream Power (lb/ft s)	42.66	270.15	42.66
Frctn Loss (ft)	6.96	Cum Volume (acre-ft)	0.13	8.63	0.14
C & E Loss (ft)	1.29	Cum SA (acres)	0.14	4.50	0.14

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 1601

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3662.58	20	3652.58	140	3652.58	160	3662.58

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	65.8	90.7	111.2	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	3660.52	Element			
Vel Head (ft)	6.03	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3654.49	Reach Len. (ft)	65.80	90.70	111.20
Crit W.S. (ft)	3656.10	Flow Area (sq ft)	3.65	229.37	3.65
E.G. Slope (ft/ft)	0.046732	Area (sq ft)	3.65	229.37	3.65
Q Total (cfs)	4590.00	Flow (cfs)	25.53	4538.94	25.53
Top Width (ft)	127.65	Top Width (ft)	3.82	120.00	3.82
Vel Total (ft/s)	19.39	Avg. Vel. (ft/s)	6.99	19.79	6.99
Max Chl Dpth (ft)	1.91	Hydr. Depth (ft)	0.96	1.91	0.96
Conv. Total (cfs)	21232.7	Conv. (cfs)	118.1	20996.5	118.1
Length Wtd. (ft)	90.68	Wetted Per. (ft)	4.27	120.00	4.27
Min Ch El (ft)	3652.58	Shear (lb/sq ft)	2.49	5.58	2.49
Alpha	1.03	Stream Power (lb/ft s)	17.43	110.35	17.43
Frctn Loss (ft)	4.24	Cum Volume (acre-ft)	0.13	8.17	0.13
C & E Loss (ft)	0.00	Cum SA (acres)	0.13	4.23	0.14

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 1510

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3658.33	20	3648.33	140	3648.33	160	3658.33

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	99.2	102.6	106.6	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	3656.28	Element			
Vel Head (ft)	6.04	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3650.24	Reach Len. (ft)	99.20	102.60	106.60
Crit W.S. (ft)	3651.85	Flow Area (sq ft)	3.65	229.13	3.65
E.G. Slope (ft/ft)	0.046893	Area (sq ft)	3.65	229.13	3.65
Q Total (cfs)	4590.00	Flow (cfs)	25.51	4538.99	25.51
Top Width (ft)	127.64	Top Width (ft)	3.82	120.00	3.82
Vel Total (ft/s)	19.41	Avg. Vel. (ft/s)	7.00	19.81	7.00
Max Chl Dpth (ft)	1.91	Hydr. Depth (ft)	0.95	1.91	0.95
Conv. Total (cfs)	21196.3	Conv. (cfs)	117.8	20960.8	117.8
Length Wtd. (ft)	102.60	Wetted Per. (ft)	4.27	120.00	4.27
Min Ch El (ft)	3648.33	Shear (lb/sq ft)	2.50	5.59	2.50
Alpha	1.03	Stream Power (lb/ft s)	17.49	110.73	17.49
Frctn Loss (ft)	5.39	Cum Volume (acre-ft)	0.12	7.69	0.12
C & E Loss (ft)	0.09	Cum SA (acres)	0.13	3.98	0.13

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 1407

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3652.05	20	3642.05	140	3642.05	160	3652.05

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	107.5	105.6	99.7	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3650.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.96	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3643.83	Reach Len. (ft)	107.50	105.60	99.70
Crit W.S. (ft)	3645.57	Flow Area (sq ft)	3.17	213.63	3.17
E.G. Slope (ft/ft)	0.059312	Area (sq ft)	3.17	213.63	3.17
Q Total (cfs)	4590.00	Flow (cfs)	23.80	4542.40	23.80
Top Width (ft)	127.12	Top Width (ft)	3.56	120.00	3.56
Vel Total (ft/s)	20.87	Avg. Vel. (ft/s)	7.51	21.26	7.51
Max Chl Dpth (ft)	1.78	Hydr. Depth (ft)	0.89	1.78	0.89
Conv. Total (cfs)	18847.0	Conv. (cfs)	97.7	18651.5	97.7
Length Wtd. (ft)	105.58	Wetted Per. (ft)	3.98	120.00	3.98
Min Ch El (ft)	3642.05	Shear (lb/sq ft)	2.95	6.59	2.95
Alpha	1.03	Stream Power (lb/ft s)	22.14	140.17	22.14
Frctn Loss (ft)	7.33	Cum Volume (acre-ft)	0.12	7.17	0.11
C & E Loss (ft)	0.15	Cum SA (acres)	0.12	3.70	0.12

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 1302

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3643.21	20	3633.21	140	3633.21	160	3643.21

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	106.1	78.6	59	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3643.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.49	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3634.82	Reach Len. (ft)	106.10	78.60	59.00
Crit W.S. (ft)	3636.73	Flow Area (sq ft)	2.61	193.74	2.61
E.G. Slope (ft/ft)	0.082314	Area (sq ft)	2.61	193.74	2.61
Q Total (cfs)	4590.00	Flow (cfs)	21.60	4546.79	21.60
Top Width (ft)	126.46	Top Width (ft)	3.23	120.00	3.23
Vel Total (ft/s)	23.07	Avg. Vel. (ft/s)	8.29	23.47	8.29
Max Chl Dpth (ft)	1.61	Hydr. Depth (ft)	0.81	1.61	0.81
Conv. Total (cfs)	15998.3	Conv. (cfs)	75.3	15847.8	75.3
Length Wtd. (ft)	78.64	Wetted Per. (ft)	3.61	120.00	3.61
Min Ch El (ft)	3633.21	Shear (lb/sq ft)	3.71	8.30	3.71
Alpha	1.03	Stream Power (lb/ft s)	30.75	194.71	30.75
Frctn Loss (ft)	5.08	Cum Volume (acre-ft)	0.11	6.67	0.11
C & E Loss (ft)	0.62	Cum SA (acres)	0.11	3.41	0.11

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 1223

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3639.34	20	3629.34	140	3629.34	160	3639.34

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           20     140             79.8    93.3   107.8             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           3637.62    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               6.43    Wt. n-Val.                0.041      0.025      0.041
  W.S. Elev (ft)           3631.19    Reach Len. (ft)           79.80      93.30     107.80
  Crit W.S. (ft)           3632.86    Flow Area (sq ft)          3.43     222.19       3.43
  E.G. Slope (ft/ft)      0.051993    Area (sq ft)               3.43     222.19       3.43
  Q Total (cfs)            4590.00    Flow (cfs)                24.74    4540.52      24.74
  Top Width (ft)            127.41    Top Width (ft)             3.70     120.00       3.70
  Vel Total (ft/s)           20.04    Avg. Vel. (ft/s)           7.22      20.44       7.22
  Max Chl Dpth (ft)           1.85    Hydr. Depth (ft)           0.93       1.85       0.93
  Conv. Total (cfs)        20129.9    Conv. (cfs)              108.5    19912.9      108.5
  Length Wtd. (ft)            93.31    Wetted Per. (ft)           4.14     120.00       4.14
  Min Ch El (ft)           3629.34    Shear (lb/sq ft)           2.69       6.01       2.69
  Alpha                       1.03    Stream Power (lb/ft s)    19.40     122.82      19.40
  Frctn Loss (ft)             4.34    Cum Volume (acre-ft)       0.10       6.30       0.10
  C & E Loss (ft)             0.24    Cum SA (acres)             0.10       3.19       0.10


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: River 1
REACH: Reach 1            RS: 1130

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 3635.44      20 3625.44     140 3625.44     160 3635.44

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0   .0414      20    .025     140   .0414

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           20     140             60    81.6    98.5             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           3633.05    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               5.63    Wt. n-Val.                0.041      0.025      0.041
  W.S. Elev (ft)           3627.42    Reach Len. (ft)           60.00      81.60      98.50
  Crit W.S. (ft)           3628.96    Flow Area (sq ft)          3.91     237.16       3.91
  E.G. Slope (ft/ft)      0.041775    Area (sq ft)               3.91     237.16       3.91
  Q Total (cfs)            4590.00    Flow (cfs)                26.39    4537.22      26.39
  Top Width (ft)            127.91    Top Width (ft)             3.95     120.00       3.95
  Vel Total (ft/s)           18.74    Avg. Vel. (ft/s)           6.76      19.13       6.76
  Max Chl Dpth (ft)           1.98    Hydr. Depth (ft)           0.99       1.98       0.99
  Conv. Total (cfs)        22457.1    Conv. (cfs)              129.1    22198.9      129.1
  Length Wtd. (ft)            81.57    Wetted Per. (ft)           4.42     120.00       4.42
  Min Ch El (ft)           3625.44    Shear (lb/sq ft)           2.31       5.15       2.31
  Alpha                       1.03    Stream Power (lb/ft s)    15.57      98.61      15.57
  Frctn Loss (ft)             3.77    Cum Volume (acre-ft)       0.09       5.81       0.09
  C & E Loss (ft)             0.08    Cum SA (acres)             0.10       2.93       0.09


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: River 1
REACH: Reach 1            RS: 1048

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 3630.97      20 3620.97     140 3620.97     160 3630.97

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0   .0414      20    .025     140   .0414

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           20     140             62.6    64.3    67.2             .1       .3
```

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3629.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.38	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3622.83	Reach Len. (ft)	62.60	64.30	67.20
Crit W.S. (ft)	3624.49	Flow Area (sq ft)	3.45	222.98	3.45
E.G. Slope (ft/ft)	0.051377	Area (sq ft)	3.45	222.98	3.45
Q Total (cfs)	4590.00	Flow (cfs)	24.83	4540.35	24.83
Top Width (ft)	127.43	Top Width (ft)	3.72	120.00	3.72
Vel Total (ft/s)	19.97	Avg. Vel. (ft/s)	7.19	20.36	7.19
Max Chl Dpth (ft)	1.86	Hydr. Depth (ft)	0.93	1.86	0.93
Conv. Total (cfs)	20250.2	Conv. (cfs)	109.5	20031.2	109.5
Length Wtd. (ft)	64.31	Wetted Per. (ft)	4.15	120.00	4.15
Min Ch El (ft)	3620.97	Shear (lb/sq ft)	2.67	5.96	2.67
Alpha	1.03	Stream Power (lb/ft s)	19.17	121.36	19.17
Frctn Loss (ft)	2.56	Cum Volume (acre-ft)	0.09	5.38	0.09
C & E Loss (ft)	0.48	Cum SA (acres)	0.09	2.71	0.09

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 984

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3629.25	20	3619.25	140	3619.25	160	3629.25

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	42.4	49	55.2	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3626.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.77	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3621.39	Reach Len. (ft)	42.40	49.00	55.20
Crit W.S. (ft)	3622.77	Flow Area (sq ft)	4.59	257.20	4.59
E.G. Slope (ft/ft)	0.031816	Area (sq ft)	4.59	257.20	4.59
Q Total (cfs)	4590.00	Flow (cfs)	28.59	4532.82	28.59
Top Width (ft)	128.57	Top Width (ft)	4.29	120.00	4.29
Vel Total (ft/s)	17.23	Avg. Vel. (ft/s)	6.22	17.62	6.22
Max Chl Dpth (ft)	2.14	Hydr. Depth (ft)	1.07	2.14	1.07
Conv. Total (cfs)	25732.9	Conv. (cfs)	160.3	25412.4	160.3
Length Wtd. (ft)	49.00	Wetted Per. (ft)	4.79	120.00	4.79
Min Ch El (ft)	3619.25	Shear (lb/sq ft)	1.90	4.26	1.90
Alpha	1.03	Stream Power (lb/ft s)	11.85	75.03	11.85
Frctn Loss (ft)	1.58	Cum Volume (acre-ft)	0.08	5.02	0.08
C & E Loss (ft)	0.01	Cum SA (acres)	0.08	2.53	0.08

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 935

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3627.59	20	3617.59	140	3617.59	160	3627.59

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	71.2	76.7	67.1	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3624.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.86	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3619.71	Reach Len. (ft)	71.20	76.70	67.10
Crit W.S. (ft)	3621.11	Flow Area (sq ft)	4.51	254.91	4.51
E.G. Slope (ft/ft)	0.032784	Area (sq ft)	4.51	254.91	4.51
Q Total (cfs)	4590.00	Flow (cfs)	28.34	4533.32	28.34
Top Width (ft)	128.50	Top Width (ft)	4.25	120.00	4.25
Vel Total (ft/s)	17.39	Avg. Vel. (ft/s)	6.28	17.78	6.28
Max Chl Dpth (ft)	2.12	Hydr. Depth (ft)	1.06	2.12	1.06
Conv. Total (cfs)	25350.2	Conv. (cfs)	156.5	25037.2	156.5
Length Wtd. (ft)	76.61	Wetted Per. (ft)	4.75	120.00	4.75
Min Ch El (ft)	3617.59	Shear (lb/sq ft)	1.94	4.35	1.94
Alpha	1.03	Stream Power (lb/ft s)	12.21	77.32	12.21
Frctn Loss (ft)	3.24	Cum Volume (acre-ft)	0.08	4.73	0.07
C & E Loss (ft)	0.19	Cum SA (acres)	0.08	2.40	0.07

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 858

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3622.56	20	3612.56	140	3612.56	160	3622.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	111.8	93.6	70.3	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3621.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.78	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3614.36	Reach Len. (ft)	111.80	93.60	70.30
Crit W.S. (ft)	3616.08	Flow Area (sq ft)	3.25	216.47	3.25
E.G. Slope (ft/ft)	0.056740	Area (sq ft)	3.25	216.47	3.25
Q Total (cfs)	4590.00	Flow (cfs)	24.11	4541.78	24.11
Top Width (ft)	127.22	Top Width (ft)	3.61	120.00	3.61
Vel Total (ft/s)	20.58	Avg. Vel. (ft/s)	7.41	20.98	7.41
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)	0.90	1.80	0.90
Conv. Total (cfs)	19269.3	Conv. (cfs)	101.2	19066.9	101.2
Length Wtd. (ft)	93.57	Wetted Per. (ft)	4.03	120.00	4.03
Min Ch El (ft)	3612.56	Shear (lb/sq ft)	2.86	6.39	2.86
Alpha	1.03	Stream Power (lb/ft s)	21.17	134.07	21.17
Frctn Loss (ft)	6.06	Cum Volume (acre-ft)	0.07	4.32	0.07
C & E Loss (ft)	0.12	Cum SA (acres)	0.07	2.18	0.07

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 765

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3615.3	20	3605.3	140	3605.3	160	3615.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	86.5	74	48.3	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3614.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.00	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3606.96	Reach Len. (ft)	86.50	74.00	48.30
Crit W.S. (ft)	3608.82	Flow Area (sq ft)	2.76	199.51	2.76
E.G. Slope (ft/ft)	0.074600	Area (sq ft)	2.76	199.51	2.76

Q Total (cfs)	4590.00	Flow (cfs)	22.24	4545.52	22.24
Top Width (ft)	126.65	Top Width (ft)	3.33	120.00	3.33
Vel Total (ft/s)	22.39	Avg. Vel. (ft/s)	8.05	22.78	8.05
Max Chl Dpth (ft)	1.66	Hydr. Depth (ft)	0.83	1.66	0.83
Conv. Total (cfs)	16805.2	Conv. (cfs)	81.4	16642.4	81.4
Length Wtd. (ft)	73.93	Wetted Per. (ft)	3.72	120.00	3.72
Min Ch El (ft)	3605.30	Shear (lb/sq ft)	3.46	7.74	3.46
Alpha	1.03	Stream Power (lb/ft s)	27.86	176.41	27.86
Frctn Loss (ft)	3.29	Cum Volume (acre-ft)	0.07	3.87	0.06
C & E Loss (ft)	1.03	Cum SA (acres)	0.06	1.93	0.06

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 691

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3613.88	20	3603.88	140	3603.88	160	3613.88

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	57.7	74.9	89.4	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3610.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.57	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3606.07	Reach Len. (ft)	57.70	74.90	89.40
Crit W.S. (ft)	3607.40	Flow Area (sq ft)	4.80	262.82	4.80
E.G. Slope (ft/ft)	0.029586	Area (sq ft)	4.80	262.82	4.80
Q Total (cfs)	4590.00	Flow (cfs)	29.21	4531.58	29.21
Top Width (ft)	128.76	Top Width (ft)	4.38	120.00	4.38
Vel Total (ft/s)	16.85	Avg. Vel. (ft/s)	6.09	17.24	6.09
Max Chl Dpth (ft)	2.19	Hydr. Depth (ft)	1.10	2.19	1.10
Conv. Total (cfs)	26685.0	Conv. (cfs)	169.8	26345.4	169.8
Length Wtd. (ft)	74.88	Wetted Per. (ft)	4.90	120.00	4.90
Min Ch El (ft)	3603.88	Shear (lb/sq ft)	1.81	4.05	1.81
Alpha	1.04	Stream Power (lb/ft s)	11.02	69.75	11.02
Frctn Loss (ft)	2.79	Cum Volume (acre-ft)	0.06	3.48	0.06
C & E Loss (ft)	0.16	Cum SA (acres)	0.06	1.72	0.06

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 616

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3609.64	20	3599.64	140	3599.64	160	3609.64

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	77	79.2	81.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3607.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.16	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3601.53	Reach Len. (ft)	77.00	79.20	81.50
Crit W.S. (ft)	3603.16	Flow Area (sq ft)	3.58	226.96	3.58
E.G. Slope (ft/ft)	0.048413	Area (sq ft)	3.58	226.96	3.58
Q Total (cfs)	4590.00	Flow (cfs)	25.27	4539.47	25.27

Top Width (ft)	127.57	Top Width (ft)	3.78	120.00	3.78
Vel Total (ft/s)	19.61	Avg. Vel. (ft/s)	7.06	20.00	7.06
Max Chl Dpth (ft)	1.89	Hydr. Depth (ft)	0.95	1.89	0.95
Conv. Total (cfs)	20860.9	Conv. (cfs)	114.8	20631.3	114.8
Length Wtd. (ft)	79.20	Wetted Per. (ft)	4.23	120.00	4.23
Min Ch El (ft)	3599.64	Shear (lb/sq ft)	2.56	5.72	2.56
Alpha	1.03	Stream Power (lb/ft s)	18.06	114.33	18.06
Frctn Loss (ft)	3.42	Cum Volume (acre-ft)	0.05	3.06	0.05
C & E Loss (ft)	0.23	Cum SA (acres)	0.05	1.52	0.05

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 537

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3606.63	20	3596.63	140	3596.63	160	3606.63

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	71.9	76.2	81.9	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3604.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.38	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3598.65	Reach Len. (ft)	71.90	76.20	81.90
Crit W.S. (ft)	3600.15	Flow Area (sq ft)	4.08	242.43	4.08
E.G. Slope (ft/ft)	0.038802	Area (sq ft)	4.08	242.43	4.08
Q Total (cfs)	4590.00	Flow (cfs)	26.97	4536.06	26.97
Top Width (ft)	128.08	Top Width (ft)	4.04	120.00	4.04
Vel Total (ft/s)	18.32	Avg. Vel. (ft/s)	6.61	18.71	6.61
Max Chl Dpth (ft)	2.02	Hydr. Depth (ft)	1.01	2.02	1.01
Conv. Total (cfs)	23301.5	Conv. (cfs)	136.9	23027.7	136.9
Length Wtd. (ft)	76.21	Wetted Per. (ft)	4.52	120.00	4.52
Min Ch El (ft)	3596.63	Shear (lb/sq ft)	2.19	4.89	2.19
Alpha	1.03	Stream Power (lb/ft s)	14.46	91.57	14.46
Frctn Loss (ft)	2.86	Cum Volume (acre-ft)	0.05	2.63	0.04
C & E Loss (ft)	0.06	Cum SA (acres)	0.04	1.30	0.04

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 460

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3603.88	20	3593.88	140	3593.88	160	3603.88

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	73.1	77.1	81.2	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3601.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.17	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3595.94	Reach Len. (ft)	73.10	77.10	81.20
Crit W.S. (ft)	3597.40	Flow Area (sq ft)	4.25	247.29	4.25
E.G. Slope (ft/ft)	0.036299	Area (sq ft)	4.25	247.29	4.25
Q Total (cfs)	4590.00	Flow (cfs)	27.50	4534.99	27.50
Top Width (ft)	128.24	Top Width (ft)	4.12	120.00	4.12
Vel Total (ft/s)	17.94	Avg. Vel. (ft/s)	6.48	18.34	6.48
Max Chl Dpth (ft)	2.06	Hydr. Depth (ft)	1.03	2.06	1.03

Conv. Total (cfs)	24091.4	Conv. (cfs)	144.4	23802.7	144.4
Length Wtd. (ft)	77.10	Wetted Per. (ft)	4.61	120.00	4.61
Min Ch El (ft)	3593.88	Shear (lb/sq ft)	2.09	4.67	2.09
Alpha	1.03	Stream Power (lb/ft s)	13.53	85.64	13.53
Frctn Loss (ft)	2.91	Cum Volume (acre-ft)	0.04	2.20	0.04
C & E Loss (ft)	0.02	Cum SA (acres)	0.04	1.09	0.04

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 383

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3600.74	20	3590.74	140	3590.74	160	3600.74

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	85.6	84.3	83.7	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	3598.17	Element			
Vel Head (ft)	5.42	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3592.75	Reach Len. (ft)	85.60	84.30	83.70
Crit W.S. (ft)	3594.26	Flow Area (sq ft)	4.05	241.64	4.05
E.G. Slope (ft/ft)	0.039230	Area (sq ft)	4.05	241.64	4.05
Q Total (cfs)	4590.00	Flow (cfs)	26.88	4536.24	26.88
Top Width (ft)	128.05	Top Width (ft)	4.03	120.00	4.03
Vel Total (ft/s)	18.38	Avg. Vel. (ft/s)	6.63	18.77	6.63
Max Chl Dpth (ft)	2.01	Hydr. Depth (ft)	1.01	2.01	1.01
Conv. Total (cfs)	23174.0	Conv. (cfs)	135.7	22902.6	135.7
Length Wtd. (ft)	84.30	Wetted Per. (ft)	4.50	120.00	4.50
Min Ch El (ft)	3590.74	Shear (lb/sq ft)	2.21	4.93	2.21
Alpha	1.03	Stream Power (lb/ft s)	14.62	92.58	14.62
Frctn Loss (ft)	3.29	Cum Volume (acre-ft)	0.03	1.77	0.03
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	0.88	0.03

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 299

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3597.47	20	3587.47	140	3587.47	160	3597.47

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	69.4	65.2	55.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	3594.88	Element			
Vel Head (ft)	5.38	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3589.49	Reach Len. (ft)	69.40	65.20	55.50
Crit W.S. (ft)	3590.99	Flow Area (sq ft)	4.08	242.43	4.08
E.G. Slope (ft/ft)	0.038802	Area (sq ft)	4.08	242.43	4.08
Q Total (cfs)	4590.00	Flow (cfs)	26.97	4536.06	26.97
Top Width (ft)	128.08	Top Width (ft)	4.04	120.00	4.04
Vel Total (ft/s)	18.32	Avg. Vel. (ft/s)	6.61	18.71	6.61
Max Chl Dpth (ft)	2.02	Hydr. Depth (ft)	1.01	2.02	1.01
Conv. Total (cfs)	23301.5	Conv. (cfs)	136.9	23027.7	136.9
Length Wtd. (ft)	65.17	Wetted Per. (ft)	4.52	120.00	4.52
Min Ch El (ft)	3587.47	Shear (lb/sq ft)	2.19	4.89	2.19
Alpha	1.03	Stream Power (lb/ft s)	14.46	91.57	14.46
Frctn Loss (ft)	2.83	Cum Volume (acre-ft)	0.02	1.30	0.02
C & E Loss (ft)	0.08	Cum SA (acres)	0.02	0.64	0.02

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 234

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3593.89	20	3583.89	140	3583.89	160	3593.89

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	77.2	67.8	59.3	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3591.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.19	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3585.78	Reach Len. (ft)	77.20	67.80	59.30
Crit W.S. (ft)	3587.41	Flow Area (sq ft)	3.56	226.44	3.56
E.G. Slope (ft/ft)	0.048792	Area (sq ft)	3.56	226.44	3.56
Q Total (cfs)	4590.00	Flow (cfs)	25.21	4539.58	25.21
Top Width (ft)	127.55	Top Width (ft)	3.77	120.00	3.77
Vel Total (ft/s)	19.65	Avg. Vel. (ft/s)	7.08	20.05	7.08
Max Chl Dpth (ft)	1.89	Hydr. Depth (ft)	0.94	1.89	0.94
Conv. Total (cfs)	20779.7	Conv. (cfs)	114.1	20551.4	114.1
Length Wtd. (ft)	67.81	Wetted Per. (ft)	4.22	120.00	4.22
Min Ch El (ft)	3583.89	Shear (lb/sq ft)	2.57	5.75	2.57
Alpha	1.03	Stream Power (lb/ft s)	18.20	115.23	18.20
Frctn Loss (ft)	2.89	Cum Volume (acre-ft)	0.02	0.95	0.02
C & E Loss (ft)	0.27	Cum SA (acres)	0.02	0.46	0.01

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 166

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3591.48	20	3581.48	140	3581.48	160	3591.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	140	102.6	100.4	97.4	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3588.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.28	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3583.52	Reach Len. (ft)	102.60	100.40	97.40
Crit W.S. (ft)	3585.00	Flow Area (sq ft)	4.16	244.72	4.16
E.G. Slope (ft/ft)	0.037599	Area (sq ft)	4.16	244.72	4.16
Q Total (cfs)	4590.00	Flow (cfs)	27.22	4535.56	27.22
Top Width (ft)	128.16	Top Width (ft)	4.08	120.00	4.08
Vel Total (ft/s)	18.14	Avg. Vel. (ft/s)	6.55	18.53	6.55
Max Chl Dpth (ft)	2.04	Hydr. Depth (ft)	1.02	2.04	1.02
Conv. Total (cfs)	23671.3	Conv. (cfs)	140.4	23390.6	140.4
Length Wtd. (ft)	100.40	Wetted Per. (ft)	4.56	120.00	4.56
Min Ch El (ft)	3581.48	Shear (lb/sq ft)	2.14	4.79	2.14
Alpha	1.03	Stream Power (lb/ft s)	14.01	88.72	14.01
Frctn Loss (ft)	3.36	Cum Volume (acre-ft)	0.01	0.58	0.01
C & E Loss (ft)	0.20	Cum SA (acres)	0.01	0.28	0.01

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: River 1
REACH: Reach 1 RS: 66

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3588.44	20	3578.44	140	3578.44	160	3588.44

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.0414	20	.025	140	.0414

Bank Sta: Left Right Coeff Contr. Expan.
20 140 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	3585.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.61	Wt. n-Val.	0.041	0.025	0.041
W.S. Elev (ft)	3580.62	Reach Len. (ft)			
Crit W.S. (ft)	3581.96	Flow Area (sq ft)	4.76	261.68	4.76
E.G. Slope (ft/ft)	0.030022	Area (sq ft)	4.76	261.68	4.76
Q Total (cfs)	4590.00	Flow (cfs)	29.08	4531.83	29.08
Top Width (ft)	128.72	Top Width (ft)	4.36	120.00	4.36
Vel Total (ft/s)	16.93	Avg. Vel. (ft/s)	6.12	17.32	6.12
Max Chl Dpth (ft)	2.18	Hydr. Depth (ft)	1.09	2.18	1.09
Conv. Total (cfs)	26490.5	Conv. (cfs)	167.8	26154.8	167.8
Length Wtd. (ft)		Wetted Per. (ft)	4.88	120.00	4.88
Min Ch El (ft)	3578.44	Shear (lb/sq ft)	1.83	4.09	1.83
Alpha	1.04	Stream Power (lb/ft s)	11.18	70.78	11.18
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

SUMMARY OF MANNING'S N VALUES

River:River 1

Reach	River Sta.	n1	n2	n3
Reach 1	2725	.036	.025	.0414
Reach 1	2659	.036	.025	.0414
Reach 1	2554	.036	.025	.0414
Reach 1	2443	.036	.025	.0414
Reach 1	2324	.036	.025	.0414
Reach 1	2170	.036	.025	.0414
Reach 1	2136	.036	.025	.0414
Reach 1	2085	.036	.025	.0414
Reach 1	2023	.036	.025	.0414
Reach 1	1928	.036	.025	.0414
Reach 1	1824	.036	.025	.0414
Reach 1	1701	.0414	.025	.0414
Reach 1	1601	.0414	.025	.0414
Reach 1	1510	.0414	.025	.0414
Reach 1	1407	.0414	.025	.0414
Reach 1	1302	.0414	.025	.0414
Reach 1	1223	.0414	.025	.0414
Reach 1	1130	.0414	.025	.0414
Reach 1	1048	.0414	.025	.0414
Reach 1	984	.0414	.025	.0414
Reach 1	935	.0414	.025	.0414
Reach 1	858	.0414	.025	.0414
Reach 1	765	.0414	.025	.0414
Reach 1	691	.0414	.025	.0414
Reach 1	616	.0414	.025	.0414
Reach 1	537	.0414	.025	.0414
Reach 1	460	.0414	.025	.0414
Reach 1	383	.0414	.025	.0414
Reach 1	299	.0414	.025	.0414
Reach 1	234	.0414	.025	.0414
Reach 1	166	.0414	.025	.0414
Reach 1	66	.0414	.025	.0414

SUMMARY OF REACH LENGTHS

River: River 1

Reach	River Sta.	Left	Channel	Right
Reach 1	2725	76.8	65.8	62.8
Reach 1	2659	115.1	105.8	100.5
Reach 1	2554	120	110.5	98.7
Reach 1	2443	119.9	118.8	117.4
Reach 1	2324	154.2	154.8	156.2
Reach 1	2170	36.7	34	30.5
Reach 1	2136	49.7	50.5	52.6
Reach 1	2085	44.3	62.6	88.4
Reach 1	2023	62.3	94.8	128
Reach 1	1928	96.9	103.9	113.1
Reach 1	1824	129.5	122.9	113.8
Reach 1	1701	77.6	100.2	119.4
Reach 1	1601	65.8	90.7	111.2
Reach 1	1510	99.2	102.6	106.6
Reach 1	1407	107.5	105.6	99.7
Reach 1	1302	106.1	78.6	59
Reach 1	1223	79.8	93.3	107.8
Reach 1	1130	60	81.6	98.5
Reach 1	1048	62.6	64.3	67.2
Reach 1	984	42.4	49	55.2
Reach 1	935	71.2	76.7	67.1
Reach 1	858	111.8	93.6	70.3
Reach 1	765	86.5	74	48.3
Reach 1	691	57.7	74.9	89.4
Reach 1	616	77	79.2	81.5
Reach 1	537	71.9	76.2	81.9
Reach 1	460	73.1	77.1	81.2
Reach 1	383	85.6	84.3	83.7
Reach 1	299	69.4	65.2	55.5
Reach 1	234	77.2	67.8	59.3
Reach 1	166	102.6	100.4	97.4
Reach 1	66			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: River 1

Reach	River Sta.	Contr.	Expan.
Reach 1	2725	.1	.3
Reach 1	2659	.1	.3
Reach 1	2554	.1	.3
Reach 1	2443	.1	.3
Reach 1	2324	.1	.3
Reach 1	2170	.1	.3
Reach 1	2136	.1	.3
Reach 1	2085	.1	.3
Reach 1	2023	.1	.3
Reach 1	1928	.1	.3
Reach 1	1824	.1	.3
Reach 1	1701	.1	.3
Reach 1	1601	.1	.3
Reach 1	1510	.1	.3
Reach 1	1407	.1	.3
Reach 1	1302	.1	.3
Reach 1	1223	.1	.3
Reach 1	1130	.1	.3
Reach 1	1048	.1	.3
Reach 1	984	.1	.3
Reach 1	935	.1	.3
Reach 1	858	.1	.3
Reach 1	765	.1	.3
Reach 1	691	.1	.3
Reach 1	616	.1	.3
Reach 1	537	.1	.3
Reach 1	460	.1	.3
Reach 1	383	.1	.3
Reach 1	299	.1	.3
Reach 1	234	.1	.3
Reach 1	166	.1	.3
Reach 1	66	.1	.3

MEETING NOTES **Project No. 62029-100**
By: Steve Jones

SUBJECT:	Summerlin West Wash Planning and Design Kickoff Meeting with CLV Flood Control	
PLACE:	CLV, 7th Floor, Opal Conference Room	
TIME:	4:00 pm	
DATE:	August 20, 2019	
ATTENDING:	Peter Jackson, CLV Matthew Meyer, CLV Steve Jones, GCW Vicki Marjerrison, GCW	Oh Sang Kwon, CLV Albert Sung, CLV Mark Sorensen, CLV

The following items were presented and discussed, in addition to the included agenda outline:

Agenda Item 1 – The scope was discussed and understood by all parties present. Note the following also was discussed regarding the scope:

- Although GCW is more focused on the Summerlin Village 29 wash at the present time; it was discussed that they would like this discussion to extrapolate into other future villages that are bisected by washes that Howard Hughes wants to maintain as conveyance corridors.
- The wash is a replacement wash predicated by the Corps permit for Summerlin for others being filled in by the village; therefore, the Corps is going to expect the wash to be wider at the bottom and natural to mimic a regulatory waterway.
- The design 100-year flow rate will include the upstream Street K diversion flow that Howard Hughes is proposing.
- The subject wash is on a 2018 MPU CCRFCD alignment.

Agenda Item 2 – The following items were discussed:

- Since currently, the flows are not contained in the wash, it is expected that effort will be made to contain the 100-year floodplain in the wash during design.
- In cases where washes are on a CCRFCD alignment, eligible for CCRFCD maintenance funds, the washes are not required to be concrete because CCRFCD allows maintenance funds to be used for natural washes. Note that if it is City funded facility (i.e. publicly maintained and not on a CCRFCD alignment), concrete lined channel would be required per their ordinances. However, bank protection would likely be needed to make sure erosion does not adversely affect adjacent homes or development. The bank protection could include the following, but not limited to, cut-off walls at the toe of bank, shallower bank slopes, and erosion resistant material such as caliche (preferred) or riprap on the slopes. In order to meet maintenance standards, an access road will have to be provided at the top of both banks, and the access road can act as the offset for development.
    - ***Follow-up: 8/21/2019 phone conversation between Steve Jones and Peter Jackson, concluded that future consultation with CCRFCD may be necessary to determine if a CCRFCD Master Plan Change is required to***

change the description on the regional alignment to show the alignment through an existing natural wash.

- At roadway crossings, the discussion of bridges vs. culverts lead the City to heavily recommend the use of culverts instead of bridges if the developer was interested in turning the crossing over to the public. Design considerations for culvert crossings at the roadways include, but not limited to: bulking the flow volume to account for sediment from a natural bottom wash, sacrificial concrete, wingwalls, and 2-ft freeboard above the bulked flow volume HGL (CCRFCD alignment criteria).
- If a recreational trail is planned in this corridor, it is recommended that the maintenance access be utilized as dual-use; therefore, it is above the 100-year floodplain.
- The existing diversion berm (APM5-0047) is likely to experience higher flow than it was designed due to the ultimate condition planning by Summerlin West. More detailed consultation is required in the future to demonstrate its adequacy for an increase in flow. It is recommended that future development be elevated above the top of berm. Additionally, prior to future development adjacent to the berm, if the facility requires re-design it may be subject to levee criteria. City will be requiring a phasing plan in the Village 29 Master Drainage Study for downstream development based on when the berm is re-evaluated or re-designed.

Agenda Item 3 – The following items were discussed:

- Access roads at the top of both wash banks above the 100-year floodplain required.
- Access roads could be dual-use, and beautification improvements such as landscaping could be privately maintained along the trail if the client chooses.
- Ensure additional space for ramps at each roadway crossing facility.
- If the wash is on a CCRFCD alignment, the City's preference is that they be provided the wash as public right-of-way with license and maintenance agreements for the landscaping in the open area in order to reduce concerns over rights to enter for maintenance. It was noted by GCW that future discussion may be needed between developer and City regarding the acceptability of turning these areas over for right-of-way due to planning and how they intend to use open space in their development plan.
- City will be requiring an access point of connection between the DB5 right-of-way and the COS washes.

Agenda Item 4 – The following items were discussed:

- The minimum height for maintenance clearance at the roadway crossings is 7-ft. If an arch facility is chose, the minimum height is 5-ft at the stem wall and 7-ft at the centerline of the crossing.

ACTION ITEMS:

- ***GCW to plan/design for a wash that has a natural bottom for USACE requirements, with bank protection, maintenance access at the top of both banks and culvert roadway crossings. Other considerations summarized in these notes will also be accounted for in plan/design work.***

- ***GCW, CLV and CCRFCD to consult regarding if a Master Plan Change is required to change the MPU facility's description to a natural wash in order to be eligible for CCRFCD maintenance funds and be in conformance with the USACE requirements of a natural wash.***

- ***GCW, CLV and Howard Hughes to consult regarding the public drainage easement vs. right-of-way advantages and disadvantages.***

- ***GCW and Howard Hughes to address potential increased flow impacts to existing diversion berm (APM5-0047), including potential re-design and a phasing plan prior to allowing future development in Village 29.***

cc: Attendees

MEETING NOTES **Project No. 62029-100**
By: Steve Jones

SUBJECT:	Summerlin Village 29 and COS-3/4 Design	
PLACE:	WebEX Conference Call Hosted by City of Las Vegas (Oh Sang Kwon)	
TIME:	2:00 pm	
DATE:	December 21, 2020	
ATTENDING:	Oh Sang Kwon, CLV Peter Jackson, CLV Matthew Meyer, CLV Mark Sorensen, CLV	Vincent Esposito, HHC April Chapman, HHC Steve Jones, GCW Vicki Marjerrison, GCW

The following items were presented and discussed:

1. GCW presented the current land plan for the Summerlin Village 29 area, discussing they have started engineering on the village in order to accommodate Howard Hughes Company's (HHC) schedule for anticipated 2023 sales in the village. GCW is anticipating to submit to the City, a Master Drainage Study for the village in the first full week of January. Additionally, three early packages have been identified by GCW and HHC as necessary critical paths to continue with engineering and development within the village: 1) COS-3/4 channel improvements, 2) Mass Grading, and 3) Summerlin Detention Basin #5 Expansion. These packages will be prepared concurrently with the Master Drainage Study as they are needed for both engineering design and sales schedule for the remainder of the village. Below is a brief summary of the goals for both projects that will be presented in future Technical Drainage Studies.
    - **COS-3/4 Channel:** In order to develop Village 29 and have a shadow of protection from offsite flows, the future alignment of Park Drift needs to divert flows to the COS-3/4 wash per the currently approved Summerlin West MPU by VTN. With the additional flow in the COS-3/4 channel, it needs to be improved to accommodate an increased flow from the Park Drift diversion.
    - **Mass Grading:** HHC needs to mass grade the village's parcels as an early critical path. Therefore, flow is likely to exceed the interim facilities downstream such as the Far Hills RCB inlet at Sky Vista without the diversion in Park Drift present. The mass grading package will include the grading of a temporary ditch/berm in Park Drift alignment to mimic ultimate condition patterns that diverts flows to the COS-3/4 channel.
    - **Summerlin Detention Basin #5 Expansion:** Although the detention basin was designed for an ultimate condition which accounts for Village 29 developed and the Park Drift diversion, the design of the inflow drop structure into the basin from COS-3/4 needs to be evaluated and updated accordingly for the interim flow in COS-3/4 that will include the Park Drift diversion. This interim condition evaluation will be presented in a pending TDS Update for this project that addresses the plan revisions from Dam Safety coordination.

2. GCW discussed the technical design components for the COS-3/4 channel project, as a follow-up to the August 20, 2019 planning meeting regarding Summerlin West drainage. GCW described that the scope of these channel improvements includes widening of the existing wash to a width that allows for riprap lining the banks of the channel and leaving the bottom of the channel natural. The channel will extend from the drop structure at the Summerlin Detention Basin #5 easement boundary as the downstream boundary to just short of the future Park Drift road at the upstream end. Additionally, a culvert crossing at the future Grand Park Boulevard roadway will be constructed with this project. Note that the channel will not include the future culvert crossing at Park Drift due to unknown circumstances still being planned for Park Drift that may affect the culvert design. It was also discussed that the design will be provided in a manner that will allow future public maintenance by the City. The following items were discussed and agreed to by CLV, HHC and GCW to be included in the design of the channel.

- The concept of a natural bottom channel and riprap banks was communicated by HHC to be similar to the Village 24 Crossbridge wash with large boulders as the riprap bank protection. The City communicated that it would maintain the channel similar to their other channels in the city, likely once a year. As a result, routine maintenance items such as trash cleanup may be an aesthetic factor for HHC selection.
- Access needs to be restricted with a means to keep public out of the channel for safety. This is a typical requirement for publicly maintained channels of this nature, and will definitely be required by CCRFCD to accept the channel as an MPU facility. This requirement is usually satisfied by a 6-ft high chain link fence around the entire channel, with gates for critical access points such as ramps and public rescue points per the CCRFCD Manual. GCW and HHC discussed that chain link fence is likely not going to be aesthetic to the community and further study of viable means to meet this requirement will be pursued.
- Access roads at the top of both banks will be provided that will also include a trail. Access is not required to the bottom of the channel, except for at culvert locations such as at Grand Park “Boulevard roadway and any local culvert discharges into the channel from adjacent parcels.
- Per HCDDM 707.1, a low flow channel or pipe will be required through the channel alignment.
- At the Grand Park Boulevard culvert crossing, a concrete ramp will be provided to the downstream end of the culvert crossing, and a concrete pad will be provided at the upstream end of the culverts. The culverts will be designed large enough for a vehicle to drive through for turnaround purposes.
- Access along the banks of the wash needs to be provided in a manner that allows through access at all ends from public right-of-way. The City mentioned that it is likely that Maintenance will access the channel from Grand Park Boulevard, but will likely use the access provided by Detention Basin #5 as exit path along the north channel bank if a gate is provided by the basin.
- City directed GCW to study Chapter 20.10 – Uniform Regulations for the Control of Drainage for all other requirements for the channel improvements. See website link below.
  https://library.municode.com/nv/las_vegas/codes/code_of_ordinances?nodeId=TIT20FLCO_CH20.10UNRECODR

3. GCW and the City discussed that the intent is to have HHC turn the channel over to the City for public maintenance. The following requirements were communicated as needed prior to the City accepting the channel. Until these requirements are met, the channel will need to be privately maintained by HHC with a maintenance bond posted.
- An MPU Amendment must be prepared, approved by CCRFCD and adopted by City Council showing the channel in the CCRFCD Las Vegas Valley MPU.
- The channel needs to be in its permanent ultimate condition state when turned over for public maintenance.

4. GCW communicated that prior to continuing with the CCRFCD MPU Amendment to add the COS-3/4 channel, it will process an Update to the currently approved Summerlin West MPU that includes all regional facilities for Summerlin West based on current planning including the Village 29 COS-3/4 channel, the Village 31 WOTUS #5 channel and others. It is the preference to include all of Summerlin West in the MPU Amendment so that the process is only done once if HHC is comfortable that the regional alignments in the upcoming GCW Update to the Summerlin West MPU won't change in the future.

cc: Attendees

APPENDIX C

Referenced Materials and Supporting Documents

Addendum #1 to Update #2 to the FLOOD CONTROL MASTER PLAN UPDATE

SUMMERLIN WEST PLANNING AREA

Las Vegas, Nevada

W.O. # 7809

Prepared for:
The Howard Hughes Company, LLC

Submitted to:
Public Works Department
City of Las Vegas

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: February 27, 2020
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: **Summerlin West Planning Area Master Plan - Update #2**		**COPIES TO:** VTN Nevada
Cross Streets:	West of I-215 between Lake Mead Boulevard and Charleston Boulevard		The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS4926M.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017 & more		CCRFCD
Zoning Action:	N/A		CCPW
FEMA Flood Zone	YES	NO **X**	
Proposed Storm Drain	YES **X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	10/9/2017 & 10/25/2017	11/8/2017	Not Approved	$400.00	490518: $400
2nd Submittal	12/6/2017	12/20/2017 & 1/10/2018	Not Approved	$400.00	492005: $400
3rd Submittal	2/27/2018	3/24/2018	Not Approved	$400.00	493739: $400
4th Submittal & Supplement	4/23/2018 & 5/22/2018	5/22/2018	See Comments Below	$400.00	495223: $400
CCPW & CCRFCD	7/30/2018	7/30/2018	Concurrence Recv'd	N/C	N/C
5th Submittal	1/3/2019 (Paid on 1/7/2019)	1/30/2019	Not Approved	$100.00	502286: $100
6th Submittal	2/19/2019	3/13/2019	Conditional Approval	$400.00	503267: $400
CCPW & CCRFCD	4/15/2019	4/17/2019	Concurrence Recv'd	N/C	N/C
7th Submittal	10/28/2019	12/2/2019	Not Approved	$100.00	3625174: $100
8th Submittal – Mass Grading	11/19/2019 & 11/27/2019	11/25/2019	Conditionally Approved	$100.00	3645141: $100
9th Submittal & Supplement	12/17/2019 & 1/21/2020	1/21/2019	Conditional Approval	$400.00	3679639: $400
Revised Memo	1/23/2020	1/23/2020	Conditional Approval	N/C	N/C
CCRFCD	2/24/2020	2/27/2020	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	**$2,700.00**	**----**

REMARKS:

9th Submittal: Addendum & Supplement to Update #2

8th Submittal: Update for Mass Grading ONLY within V21 and V25

7th Submittal: Update #2 to refine the overall drainage basins model

5th & 6th Submittals: Update #1 & Addendum #1 to address Land Use Changes in the Summerlin West Planning Area

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

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

Note that the Clark County Regional Flood Control District (District) has begun efforts to update the *Hydrologic Criteria and Drainage Design Manual* (HCDDM) and is requesting participation from the engineering community. The District is collecting comments and suggestions on errors, clarifications, or changes needed to the current Manual and/or content and usability enhancements to be incorporated into the updated Manual. Additional information on procedures and deadline to provide feedback and comments are available online at (http://www.ccrfcd.org/hcddmupdate.html).

1. The subject Update #2 to the Summerlin West Planning Area is premised on the *DB5 Modifications* (ie, Enhancement) for regulating the downstream outflows. A technical drainage study for *DB5 Modifications* must be submitted for review and approval prior to any upstream Villages development with the exception of Villages 21 and 22.

The following comments are repeated until they are complete:

1. Flood Control supports the Mass Grading concept with the understanding that these are interim improvements and are the responsibility of the Master Developer. Mass Grading shall not place any fill material in the proposed embankment area of the detention basin. State Dam Safety Permit approval is required prior to any other detention basin work.
2. The Mass Grading Plans shall be revised to show no grading work within the area of the future detention basin embankment & spillway areas. This exclusion area needs to be clearly delineated on the plans and added as a Note on each Sheet of the Grading Plans.
3. Howard Hughes Company (Summerlin) is solely responsible for the maintenance and erosion control of the interim facilities based upon the Mass Grading.

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.

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

END OF REMARKS
WSP/AYS/PBJ

T/R/S: T21S/R69E/22
AREA K-22

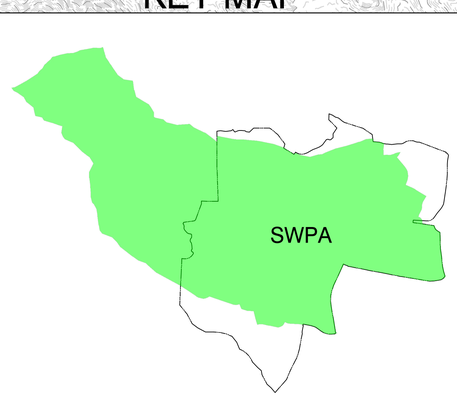
HEC-1 SUMMARY TABLE
DB5/ALTA TRIBUTARY
ULTIMATE CONDITION

Basin / Concentration Point	Area (Acre)			Q_{100} (cfs)			SDN	Basin / Concentration Point	Area (Acre)			Q_{100} (cfs)			SDN
	Update	Previous	Difference	Update	Previous	Difference			Update	Previous	Difference	Update	Previous	Difference	
3-1	1422.67	1422.67	0.00	2117	2117	0	SDN3	CP3-L	-	-	-	1828	2221	-393	SDN3
3-2	145.16	144.58	0.58	428	429	-1	SDN3	RCSWAA-1	3033.6	4636.55	-1602.95	1827	2220	-393	SDN3
CP3.1	-	-	-	2172	2172	0	SDN3	SWAA-2	448	449	-1	948	948	0	SDN3
3-3	111.13	111.16	-0.03	392	392	0	SDN3	CSWAA-2	5158.4	5085.55	72.85	2230	2884	-654	SDN4
CP3.2	-	-	-	2222	-	-	SDN3	SWAA-3	371.2	372.2	-1	668	668	0	SDN3
3-4	222.38	221.26	1.12	761	757	4	SDN3	CSWAA-3	5529.6	5457.75	71.85	2710	3121	-411	SDN4
3-5	187.91	187.91	0.00	625	625	0	SDN3	3-G2	103.69	82.23	21.46	359	432	-73	SDN3
CP3.3	-	-	-	1358	-	-	SDN3	3-L2	98.49	59.53	38.96	317	186	131	SDN3
3-6	56.74	56.74	0.00	201	203	-2	SDN3	CP3.8	-	-	-	677	602	6.02	SDN3
3-7	83.21	109.69	-26.48	290	423	-133	SDN3	3-A1	359.79	-	-	688	-	-	SDN3
3-J	221.68	157.02	64.66	555	414	141	SDN3	3-A2	117.88	-	-	379	-	-	SDN3
CP3.J	-	-	-	2128	-	-	SDN3	CP3.A	-	-	-	975	-	-	SDN3
WOUS-4	81.26	-	-	193	-	-	SDN3	3-B	167.27	446.26	-278.99	490	332	158	SDN3
CP3.4A	-	-	-	3464	-	-	SDN3	3-C	140.11	184.83	-44.72	414	389	25	SDN3
3-D	116.88	213.04	-96.16	342	614	-272	SDN3	CPDBA-B	768	864.3	-96.3	1721	1785	-64	SDN3
CP3.4B	-	-	-	3680	-	-	SDN3	GPDB	768	864.3	-96.3	91	184	-93	SDN3
WOUS-5	114.29	-	-	341	-	-	SDN3	3-G1	108.64	110.4	-1.76	353	407	-54	SDN3
CP3.5A	-	-	-	3855	-	-	SDN3	CP3-G1	-	-	-	408	529	-121	SDN3
3-E	84.60	362.34	-277.74	264	855	-591	SDN3	3-Q2	81.18	95.5	-14.32	245	204	41	SDN3
3-F	225.79	138.17	87.62	583	476	107	SDN3	CP3-Q2	-	-	-	631	713	-82	SDN3
CP3.5B	-	-	-	4599	-	-	SDN3	3-H1	76.22	80.61	-4.39	253	257	-4	SDN3
WOUS-4B	13.48	-	-	35	-	-	SDN3	CP3-H1	-	-	-	857	958	-101	SDN3
CP3.5C	-	-	-	4565	-	-	SDN3	3-I1	193.02	187.75	5.27	565	538	27	SDN3
3-8	448.61	408.73	39.88	1145	1113	32	SDN3	CP3.9	-	-	-	1953	1950	3	SDN3
3-K1	298.04	-	-	980	-	-	SDN3	3-H2	64.21	64.21	0	198	197	1	SDN3
3-K2	245.96	-	-	678	-	-	SDN3	3-I2	74.15	74.15	0	211	211	0	SDN3
WOUS-3	24.20	-	-	61	-	-	SDN3	CP3.10A	-	-	-	399	398	1	SDN3
CP3.6A	-	-	-	2562	-	-	SDN3	CP3.10	-	-	-	2265	2301	-36	SDN3
3-N1	127.88	-	-	324	-	-	SDN3	3-O	46.97	55.79	-8.82	153	187	-34	SDN3
CP3.6B	-	-	-	2762	-	-	SDN3	3-P1	119.49	85.52	33.97	397	419	-22	SDN3
3-M	157.57	149.46	8.11	436	485	-49	SDN3	CP3-P	-	-	-	548	596	-48	SDN3
3-N2	116.34	-	-	343	-	-	SDN3	3-Q	83.47	65.66	17.81	244	202	42	SDN3
CP3.7	-	-	-	756	-	-	SDN3	CP3-Q	-	-	-	763	779	-16	SDN3
3-DB5	45.50	-	-	100	-	-	SDN3	3-H3	92.46	89.8	2.66	254	252	2	SDN3
CPDB5	-	-	-	7649	7787	-138	SDN3	CP3.11	-	-	-	3123	3191	-68	SDN3
DB5MOD	4582.40	4510.94	71.46	1778	2148	-370	SDN3	ANGLPKIN	14547.2	14451.2	96	8685	8949	-264	SDN5
3-L	126.43	152.22	-25.79	392	486	-94	SDN3	ANGLPKDB	14547.2	14451.2	96	407	877	-470	SDN5

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- LOT BOUNDARY
- 3-A ONSITE BASIN ID
- 3-3 OFFSITE BASIN ID
- LM3 LOT ID
- FLOW ARROW

KEY MAP



SUMMERLIN WEST VILLAGE 29

EX DB5 DETENTION BASIN

3-C PROPOSED GRAND PARK DETENTION BASIN

GRAPHIC SCALE
1000 0 500 1000 2000
1" = 1000'

NORTH

THE HOWARD HUGHES CORPORATION
1980 FESTIVAL PLAZA DRIVE, SUITE 300
LAS VEGAS, NV 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REVISION	BY	DATE
ADDENDUM #1	JYA	8/2017

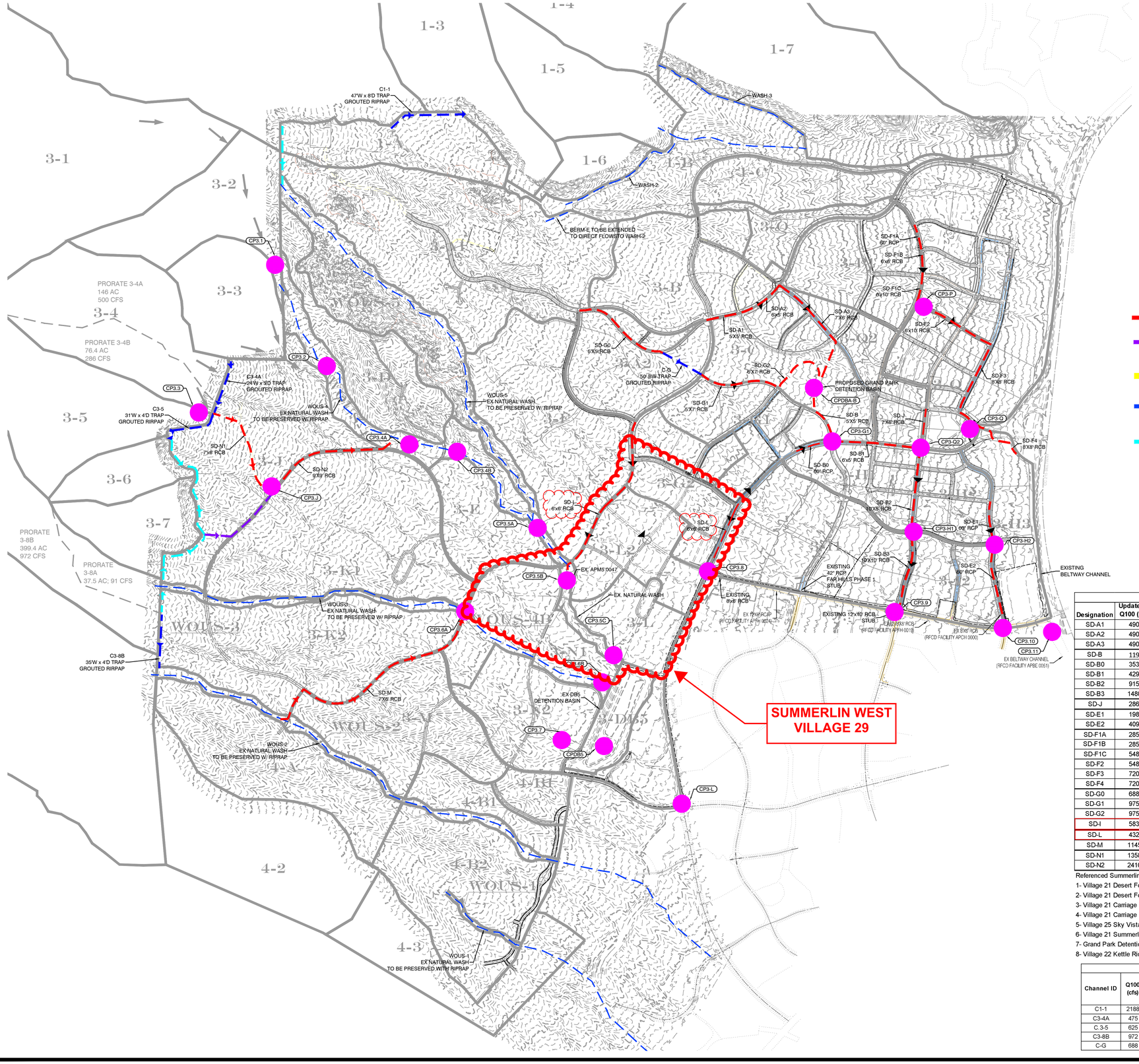
2019 UPDATE #2 TO SUMMERLIN WEST PLANNING AREA

A.6.3
DB5/Alta Tributary

DRAWN BY: PLM
DESIGNED BY:
CHECKED BY:
PROJECT NO: 7809
DATE: 11/2018
SCALE: 1" = 1000'
HORIZ. DATUM:

SHEET
A.6.3
OF SHEETS
DRAWING NO.

H:\7809\Drainage\10_UPZ ADD1\A Figures\A.6.3 DB5-Alta Tributary\A.6.3_DB5-Alta Tributary.dwg



VTN NORTH

GRAPHIC SCALE

1000 0 500 1000 2000

1" = 1000'

LEGEND

- REGIONAL STORM DRAIN FACILITY
- ANTICIPATED LOCAL STORM DRAIN
- EXISTING FACILITY ALIGNMENT
- REGIONAL OPEN CHANNEL / WASH FACILITIY
- ANTICIPATED LOCAL CHANNEL
- CONCENTRATION POINT
- BASIN BOUNDARY
- 3-A ONSITE BASIN
- 3-1 OFFSITE BASIN

REGIONAL FLOOD CONTROL FACILITY SUMMARY TABLE

Designation	Update #2 Q100 (cfs)	Previous Q100 (cfs)	Basin/CP	Size	Type	Velocity	Remarks
SD-A1	490	628	3-B	5'x5'	RCB	33.03	
SD-A2	490	628	3-B	6'x5'	RCB	33.70	
SD-A3	490	1255	3-B	7'x6'	RCB	31.48	
SD-B	119	184	GPDB	5'X5'	RCB	N/A	Reference 7
SD-B0	353	407	3-G1	60"	RCP	28.5	Reference 7
SD-B1	429	529	CP3-G1	6'x5'	RCB	N/A	
SD-B2	915	958	CP3-H1	10'x8'	RCB	N/A	Reference 2
SD-B3	1480	1496	CP3-H1, 3-I1	10'x10'	RCB	N/A	Reference 1
SD-J	286	204	3-Q2	7'x6'	RCB	13.11	Reference 6
SD-E1	198	197	3-H2	60"	RCP	N/A	Reference 4
SD-E2	409	408	3-H2, 3-I2	60"	RCP	N/A	Reference 3
SD-F1A	285	596	3-O, 1/3 3-P1	60"	RCP	N/A	Reference 8
SD-F1B	285	596	3-O, 1/3 3-P1	6'x6'	RCB	N/A	Reference 8
SD-F1C	548	596	CP3-P	6'x5'	RCB	N/A	Reference 8
SD-F2	548	596	CP3-P	6'x10'	RCB	28.23	
SD-F3	720	779	CP3-Q	8'x8'	RCB	17.12	
SD-F4	720	779	CP3-Q	8'x8'	RCB	19.38	
SD-G0	688	N/A	3-A1	5'x5'	RCB	32.74	
SD-G1	975	332	CP3.A	5'x7'	RCB	34.92	
SD-G2	975	332	CP3.A	6'x7'	RCB	33.44	
SD-I	583	476	3-F	6'X6'	RCB	18.13	
SD-L	432	416	3-G2	6'x6'	RCB	13.30	Reference 5
SD-M	1145	N/A	3-8	7'x6'	RCB	34.02	
SD-N1	1358	N/A	CP3.3	7'x6'	RCB	34.96	
SD-N2	2410	N/A	CP3.J	9'x9'	RCB	34.94	

Referenced Summerlin West Technical Drainage Studies:

1- Village 21 Desert Foothills Drive (Far Hills to Street A)
2- Village 21 Desert Foothills Drive (Redpoint to Summerlin Pkwy)
3- Village 21 Carriage Hill Drive (Far Hills to Street A)
4- Village 21 Carriage Hill Drive (Redpoint to Summerlin Pkwy)
5- Village 25 Sky Vista Drive Improvments- Phase 1 (DS5120A) by GCW
6- Village 21 Summerlin Parkway Extension
7- Grand Park Detention Basin
8- Village 22 Kettle Ridge Drive

REGIONAL CHANNEL SUMMARY

Channel ID	Q100 (cfs)	EG Slope	Modified Slope	# of 3' Drops for New Slope	Normal Depth	Min Freeboard	Channel Dimensions					
							Depth (ft)	Velocity (ft/s)	Side Slopes	Bottom Width (ft)	Top Width (ft)	Riprap
C1-1	2188	5.1%	1.5%	25	5.7	1.65	8.0	14.55	2:1/2:1	15	47	Grouted
C3-4A	475	2.8%	-	-	3.08	1.46	4.5	12.69	2:1/2:1	6	24	Grouted
C.3-5	625	9.1%	4.5%	17	2.16	1.48	4.0	14.94	2:1/2:1	15	31	Grouted
C3-8B	972	4.7%	3.1%	12	3.07	1.54	5.0	15.00	2:1/2:1	15	35	Grouted
C-G	688	7.7%	-	-	0.99	1.33	2.5	13.12	3:1/3:1	50	65	Grouted

REVISION	BY	DATE	REV

CLV

THE HOWARD HUGHES COMPANY, LLC
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

2019 UPDATE #2 TO SUMMERLIN WEST PLANNING AREA A.6.5 REGIONAL FLOOD CONTROL FACILITIES MAP

DRAWN BY:
DESIGNED BY:
CHECKED BY:
PROJECT NO: 7809
SCALE:
HORIZ.
VERT.

SHEET
A.6.5
OF SHEETS
DRAWING NO.

H:\7809\Drainage\10_UPD ADD\A Figures\A.6.5 - Regional Flood Control Facility Map\A.6.5_Regional Flood Control Facility Map UPD.dwg 12/13/2019 10:37 AM rachelr

Update #1 to the Master Conceptual Drainage Study for

Summerlin West Village 25

Las Vegas, Nevada

W.O. # 7919

Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: April 14, 2020
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: **Master Conceptual Drainage Study – Update #1** **For Summerlin West Village 25**		**COPIES TO:** VTN Nevada
Cross Streets:	Sky Vista Drive and Far Hills Avenue		Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5104F.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-22-101-001, 137-21-000-002		CCRFCD
Zoning Action:	MDR-75107 & PMP-74780		
FEMA Flood Zone	YES	NO X	
Proposed Storm Drain	YES X	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	2/20/2019	2/27/2019 & 3/20/2019	Not Approved	$400.00	503292: $400
2nd Submittal	4/4/2019	4/17/2019	Not Approved	$400.00	3081574: $400
3rd Submittal	4/25/2019	5/9/2019	Conditional Approval	$400.00	3105175: $400
CCRFCD	6/10/2019	6/18/2019	Concurrence Recv'd	N/C	N/C
4th Submittal	12/26/2019	1/23/2020	Conditional Approval	$100.00	3686588: $100
CCRFCD	3/23/2020	4/14/2020	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	**$1,300.00**	----

REMARKS:

4th Submittal: Update to revise the layout of V25 to match the changes to the overall Summerlin West Planning Area land plan

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

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

1. The *Grand Park Detention Basin* is proposed to regulate and meter outflow to match the previously approved downstream flow conditions at the junction of *Far Hills* storm drain and the *Beltway Channel*. Without the *Grand Park Detention Basin*, there will be a net increase in flows at the *Beltway Channel* downstream of *Far Hills* intersection exceeding the previously approved flow.

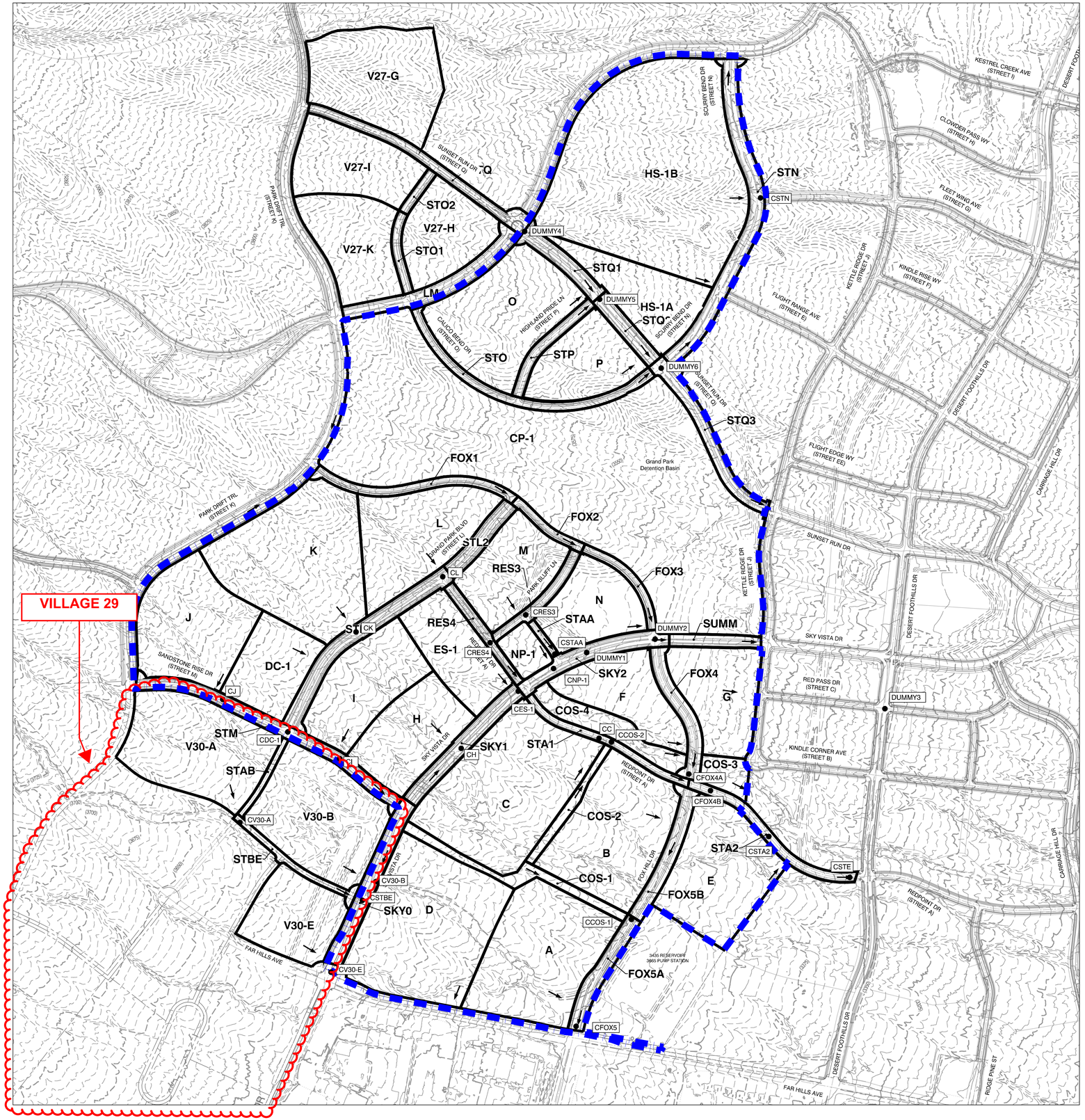
   A technical drainage study for the analysis, design and construction plans for the *Grand Park Detention Basin* must be submitted and approved by the City prior to the individual onsite parcel developments.

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

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

END OF REMARKS
WSP/AYS

T/R/S: T20S/R59E/22
AREA K-22



LEGEND

- VILLAGE 25 BOUNDARY
- BASIN BOUNDARY
- W51 BASIN DESIGNATION
- CW51 ● CONCENTRATION POINT
- FLOW ARROW

GRAPHIC SCALE
400 0 200 400 800
1" = 400'

NORTH

ULTIMATE CONDITION HEC-1 SUMMARY TABLE

BASIN ID	Area (a.c.)			Q100 (cfs)		
	Update #1	Previous	Difference	Update #1	Previous	Difference
J	16.90	16.90	0.00	69	69	0.00
STM	4.76	4.76	0.00	20	20	0.00
CJ	-	-	N/A	89	-	N/A
DC-1	9.42	15.02	-5.60	35	56	-21.00
CDC-1	-	-	N/A	124	184	-60.00
I	13.23	13.23	0.00	53	53	0.00
CI	-	-	N/A	176	274	-98.00
SKY0	4.15	4.15	0.00	15	14	1.00
V30-B	20.53	N/A	N/A	83	N/A	N/A
CV30B	-	N/A	N/A	273	N/A	N/A
V30-A	19.05	N/A	N/A	80	N/A	N/A
STAB	0.80	N/A	N/A	3	N/A	N/A
CV30-A	-	N/A	N/A	83	N/A	N/A
STBE	1.67	N/A	N/A	8	N/A	N/A
CSTBE	-	N/A	N/A	364	N/A	N/A
V30-E	10.36	N/A	N/A	44	N/A	N/A
CV30-E	-	N/A	N/A	408	N/A	N/A
SKY1	3.91	3.91	0.00	16	16	0.00
H	12.11	12.11	0.00	48	48	0.00
CH	-	-	N/A	64	64	0.00
ES-1	10.20	10.20	0.00	42	42	0.00
CES-1	-	-	N/A	105	106	-1.00
SKY2	3.78	3.78	0.00	17	17	0.00
NP-1	2.70	2.70	0.00	9	9	0.00
CNP-1	-	-	N/A	129	132	-3.00
STL1	5.60	7.86	-2.26	21	28	-7.00
K	25.71	21.91	3.80	101	86	15.00
CK	-	-	N/A	123	113	10.00
L	16.19	12.79	3.40	68	53	15.00
CL	-	-	N/A	187	167	20.00
RES4	1.60	1.60	0.00	7	7	0.00
CRES4	-	-	N/A	194	174	20.00
RES3	1.97	1.97	0.00	9	9	0.00
M	11.09	10.88	0.21	47	46	1.00
CRES3	-	-	N/A	248	229	19.00
STAA	0.44	0.44	0.00	2	2	0.00
CSTAA	-	-	N/A	248	231	17.00
N	9.91	9.91	0.00	40	40	0.00
CP-1	93.32	94.28	-0.96	270	282	-12.00
STL2	2.26	N/A	N/A	9	N/A	N/A
FOX1	2.91	3.39	-0.48	12	14	-2.00
FOX2	1.67	1.06	0.61	8	5	3.00
FOX3	1.51	1.51	0.00	7	7	0.00
SUMM	1.65	1.65	0.00	7	7	0.00
G	11.44	11.44	0.00	45	45	0.00
D	27.15	27.15	0.00	105	105	0.00
FOX5B	3.19	3.19	0.00	12	12	0.00
COS-1	3.48	3.48	0.00	9	9	0.00
CCOS-1	-	-	N/A	20	20	0.00
FOX5A	3.15	3.15	0.00	11	11	0.00
A	21.35	21.35	0.00	81	81	0.00
CFOX5	-	-	N/A	111	111	0.00
C	26.54	26.54	0.00	99	99	0.00
STA1	2.29	2.29	0.00	10	10	0.00
CC	-	-	N/A	109	109	0.00
COS-2	1.72	1.72	0.00	5	5	0.00
CCOS-2	-	-	N/A	114	114	0.00
FOX4	3.20	3.20	0.00	14	14	0.00
F	10.44	10.44	0.00	43	43	0.00
COS-4	5.04	5.04	0.00	16	16	0.00
CFOX4A	-	-	N/A	73	73	0.00
B	19.86	19.86	0.00	76	76	0.00
CFOX4B	-	-	N/A	263	263	0.00
STA2	2.84	2.84	0.00	12	12	0.00
CSTA2	-	-	N/A	275	275	0.00
COS-3	2.40	2.40	0.00	8	8	0.00
E	17.14	17.14	0.00	65	65	0.00
CSTE	-	-	N/A	348	348	0.00
V27-G	18.08	N/A	N/A	71	N/A	N/A
V27-I	11.97	N/A	N/A	39	N/A	N/A
STO2	0.76	N/A	N/A	3	N/A	N/A
STQ	4.13	N/A	N/A	19	N/A	N/A
CSTQ	-	N/A	N/A	132	N/A	N/A
V27-K	11.98	N/A	N/A	49	N/A	N/A
STO1	1.24	N/A	N/A	6	N/A	N/A
CSTO1	-	N/A	N/A	54	N/A	N/A
LM	4.65	N/A	N/A	21	N/A	N/A
V27-H	10.40	N/A	N/A	38	N/A	N/A
STQ1	2.49	2.49	0.00	11	11	0.00
O	19.18	19.18	0.00	46	46	0.00
STP	2.05	2.05	0.00	9	9	0.00
STQ2	2.11	2.11	0.00	10	10	0.00
P	10.31	10.31	0.00	42	42	0.00
STO	4.10	4.10	0.00	17	17	0.00
STQ3	4.22	4.22	0.00	18	18	0.00
STN	7.67	7.67	0.00	27	27	0.00
HS-1A	11.70	11.70	0.00	47	47	0.00
HS-1B	49.79	49.79	0.00	198	195	3.00
CSTN	-	-	N/A	269	266	3.00

REV	DATE	BY	REVISION

THE HOWARD HUGHES CORPORATION
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

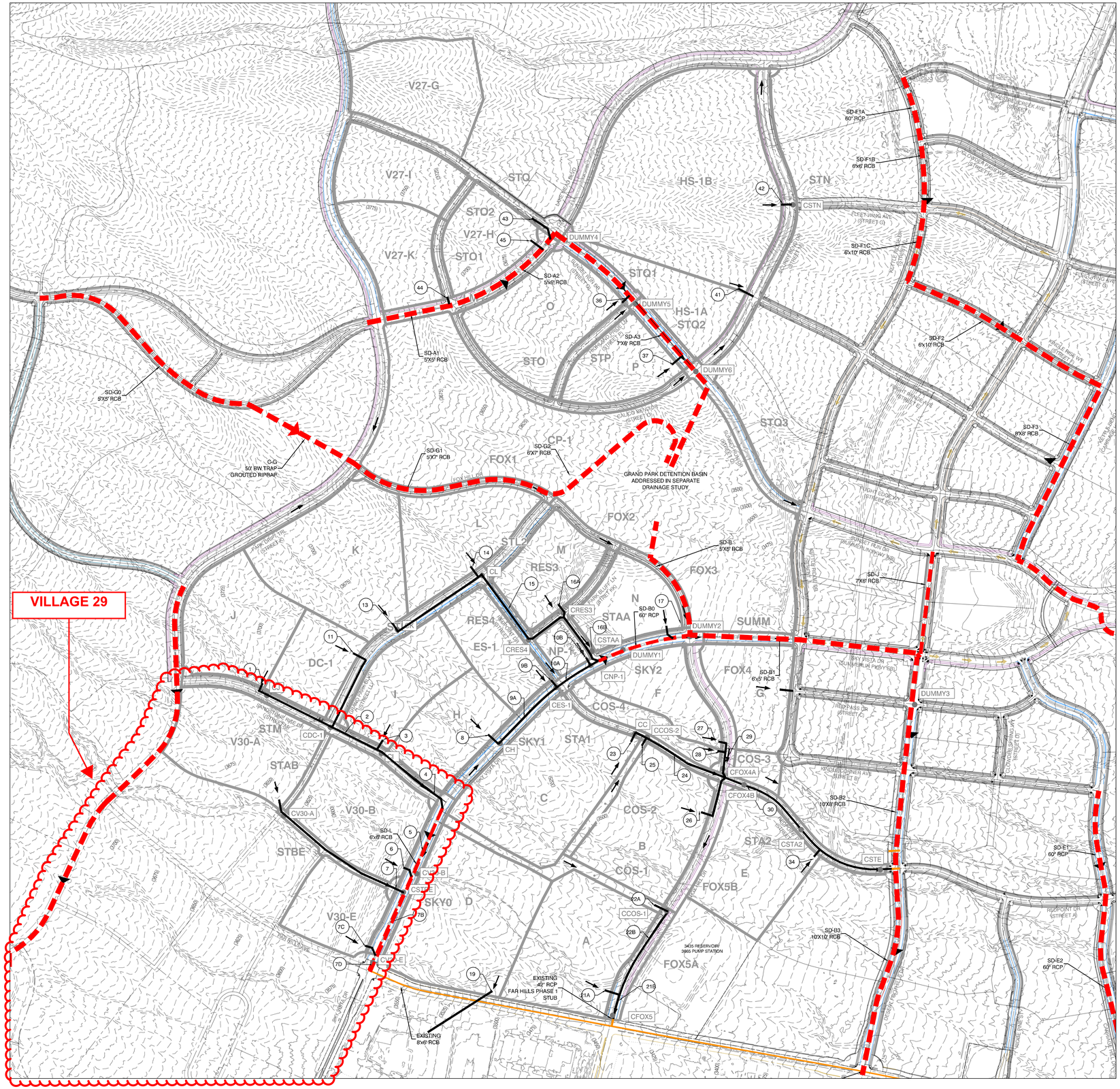
FIGURE 6
ULTIMATE CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 25

DRAWN BY: JYA — DECEMBER 2019
DESIGNED BY: JYA — DECEMBER 2019
CHECKED BY: JYA — DECEMBER 2019
PROJECT NO: 7919
SCALE: 1" = 400' HORIZ. N/A VERT.

SHEET
OF SHEETS
DRAWING NO.
FIG 6

H:\7919\Drainage\5_UP11A_Figures\Figure 6 - Village 25 Drainage Basin Map.dwg



GRAPHIC SCALE

400 0 200 400 800

1" = 400'

NORTH

LEGEND

- CCRFCD STORM DRAIN ALIGNMENT
- EXISTING FACILITY
- VILLAGE 25 LOCAL STORM DRAIN
- W51 — BASIN DESIGNATION
- CONCENTRATION POINT
- (1) — LOCAL FACILITY DESIGNATION
- DEVELOPED CONDITION FLOW ARROW

Facilities adjacent to V29

VILLAGE 25 LOCAL FLOOD PROTECTION FACILITIES

Facility #	Design Slope %	Q100 cfs	Tributary Basin/CP	Facility	Velocity fps
1	1.00%	39	J	30" RCP	9.51
2	6.00%	89	CJ	48" RCP	23.35
3	0.70%	53	I	36" RCP	8.98
4	6.00%	176	CI	48" RCP	28.00
5	0.50%	176	CI	6'X6' RCB	10.38
6	1.00%	83	V30-B	42" RCP	11.68
7	1.00%	83	CV30-A	42" RCP	11.68
7B	0.50%	364	CSTBE	6'X6' RCB	12.26
7C	1.00%	44	V30-E	36" RCP	10.08
7D	0.50%	408	CV30-E	6'X6' RCB	12.54
8	6.00%	48	H	36" RCP	20.09
9A	0.50%	64	CH	42" RCP	8.37
9B	0.99%	42	ES-1	36" RCP	9.93
10A	6.00%	105	CES-1	42" RCP	24.59
10B	5.78%	9	NP-1	24" RCP	12.81
11	1.00%	35	DC-1	30" RCP	9.38
13	0.90%	101	K	42" RCP	11.20
14	1.00%	68	L	42" RCP	11.23
15	5.98%	187	CL	42" RCP	28.14
16A	6.00%	47	M	24" RCP	19.79
16B	4.05%	248	CSTAA	48" RCP	25.86
17	2.55%	40	N	30" RCP	14.00
19	0.50%	105	D	36" RCP	24.04
21A	1.00%	81	A	42" RCP	11.63
21B	2.02%	111	CFOX5	42" RCP	16.42
22A	4.00%	9	COS-1	24" RCP	11.23
22B	1.00%	20	CCOS-1	24" RCP	8.13
23	0.50%	99	C	48" RCP	9.21
24	5.13%	114	CCOS-2	48" RCP	23.60
25	0.50%	5	COS-2	24" RCP	4.50
26	1.00%	76	B	48" RCP	11.59
27	1.33%	43	F	30" RCP	10.92
29	1.50%	73	CFOX4A	36" RCP	13.07
30	5.50%	263	CFOX4B	54" RCP	29.95
31	4.27%	8	COS-3	24" RCP	11.12
34	0.50%	65	E	42" RCP	8.38
36	1.00%	46	O	36" RCP	10.18
37	1.00%	42	P	36" RCP	9.97
41	1.00%	47	HS-1A	36" RCP	10.22
42	1.00%	198	HS-1B	54" RCP	14.09
43	1.00%	132	CSTQ	48" RCP	12.97
44	1.00%	49	V27-K	36" RCP	10.31
45	1.00%	38	V27-H	30" RCP	9.49

REVISION | BY | DATE | REV

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FIGURE 7
LOCAL STORM DRAIN FACILITIES MAP

SUMMERLIN WEST VILLAGE 25

DRAWN BY: JYA — DECEMBER 2019
DESIGNED BY: JYA — DECEMBER 2019
CHECKED BY: JYA — DECEMBER 2019
PROJECT NO: 7919
SCALE: 1"=400' HORIZ. NA VERT.

SHEET
OF SHEETS
DRAWING NO.

H:\7919\Drainage\5_UP1\A_Figures\Figure 7 - Local Flood Control Facilities Map V25-REV.dwg

RESPONSE TO COMMENTS FOR THE TECHNICAL DRAINAGE STUDY FOR VILLAGE 24A DETENTION BASIN MODIFICTIONS

62052-3080

May 2020

Prepared for:

The Howard Hughes Company, LLC
10845 Griffith Peak Drive, Suite 160
Las Vegas, Nevada 89135
Phone: (702) 791-4300

GCW
ENGINEERS \ SURVEYORS

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: September 21, 2020
TO: **Land Development Services** Department of Building & Safety				FROM: Peter Jackson, CFM Flood Control Section Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin Detention Basin #5 Modifications**			**COPIES TO:** GCW
Cross Streets:	NWC of Sky Vista Drive & Alta Drive			Howard Hughes Company LLC
File Number:	F:\Depot\DSMemos\DS5225C.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-28-810-001, 137-33-512-003			CCRFCD
Zoning Action:	N/A			
FEMA Flood Zone	YES	X	NO	
Proposed Storm Drain	YES	X	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	12/02/2019	01/02/2020	See Comments Below	$400.00	3652617: $400
2nd Submittal & Supplemental	5/7/2020 & 6/24/2020	7/2/2020	See Comments Below	$400.00	1465751: $400
3rd Submittal & Supplemental	7/26/2020 & 9/15/2020	9/21/2020	See Comments Below	$400.00	$400
			TOTAL FEES (LDDRS):	**$1,200.00**	**----**

REMARKS: The Submittals cover the proposed modifications to the existing Summerlin Detention Basin #5. The detention basin modifications are changing the basin parameters for flow, required storage and improved inlet structures. This detention basin is no longer proposed as a multi-use facility. The ultimate goal is to make this a publicly owned and maintained facility. Currently, this facility is privately maintained.

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

	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
X	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
X	is conditionally approved subject to State of Nevada, Division of Water Resources – Dam Satety.

The following projects address the overall flow impacts to the Summerlin West Planning Area.

Summerlin West Grand Park Detention Basin (GPDB)
Summerlin West Grand Park Detention Basin – Inlet Pipe
Summerlin Detention Basin #5 Modifications (DB #5)
Summerlin Detention Basin #5 Temporary Diversion Berm (DS 5357)
Summerlin West Planning Area Master Plan
Summerlin West Planning Area V27 Regional Facilities (V27 RF)
Summerlin West WOTUS-5 Diversion Facility

1. The report has identified that the existing MPU Facility APM5 0047 (berm and culvert) does not have the capacity to convey the total flows (neither existing nor ultimate) in its current configuration. Additionally the downstream interim drainage facility within the MPU Facility APM5 0008 alignment does not have the capacity to convey the total flows as well. This impact is being addressed within a separate technical drainage study for the Summerlin Detention Basin #5 Temporary Diversion Berm (DS 5357). The associated Temporary Diversion Berm improvements are not included with these Detention Basin Modifications.

2. Summerlin Detention Basin #5 is within the FEMA Special Flood Hazard Area, Zone AE. The detention basin modifications are changing the basin parameters for flow and required storage. The FEMA Flood Zone impacts show an increase in the BFE of 0.64-feet. While this is still below the existing spillway elevation, this site is within an AE Flood Zone and therefore requires a LOMR submittal once the proposed construction is complete. The LOMR shall be based upon the Ultimate Flow Rates and using the "as-built" information to verify the new BFE for Summerlin Detention Basin #5. The LOMR shall be approved prior to release of the bonds. The bond shall include a line item to cover the LOMR in the amount of $50,000.

3. The flows from MPU Basin DB54-1 (Ult. Basin 3-1) route to DB #5 per the Master Plan as addressed in the Summerlin West WOTUS-5 Diversion Facility Drainage Study (DS5250).

4. The Detention Basin in the Ultimate Condition has three major inlet structures. The proposed modifications to DB #5 include the ultimate facility (concrete inlet structures) for the three major inlet structures. Inlet Structure #1 is designed to accommodate the existing 4,779 cfs flow rate, the ultimate flow rate is 4,350 cfs. Inlet Structure #2 is designed to accommodate the ultimate 3,617 cfs flow rate. Inlet Structure #3 is designed to accommodate the interim 1,418 cfs flow rate, the ultimate flow rate is 724 cfs.

5. The site is an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

6. The proposed Summerlin Detention Basin #5 (J-754) Modifications must be approved by the *State of Nevada, Division of Water Resources, Dam Safety (DWR)* prior to the issuance of any construction permits. Continue to coordinate the Detention Basin #5 Modifications with the State.

7. The intent of Howard Hughes Company is to construct the Summerlin Detention Basin #5 Modifications with the associated collection facilities to update the CCRFCD Master Plan facilities and then dedicate them to the City of Las Vegas upon completion. Summerlin Detention Basin #5 shall be dedicated to the City as *Flood Control Right-of-Way*. The total area of the dedication shall be of sufficient size to meet the public operational needs and address expansion of the facility. The dedication needs to include the entire impact area of the dam construction as well as incorporate access and maintenance activities. The maintenance activities include staging for equipment and a temporary storage area for sediment removal. The recommended staging area is the flat clear area on the detention basin side of the spillway.

8. Provide an Exhibit of the proposed *Flood Control Right-of-Way*. Include the area between the spillway and Alta Drive as *Flood Control Right-of-Way*. This is shown as a Common Lot as part of Village 24. Flood Control understands that Summerlin desires to have landscape enhancements in the area between the Alta Right-of-Way and the spillway. This would require a Maintenance & Liability Agreement through Land Development. Once the Drainage Study is Conditionally Approved, contact Land Development to start the process.

9. Access roads shown for City use located outside of the Flood Control Right-of-Way shall be dedicated access easements. Review and verify access locations for Flood review prior to submittal of easements. The easements shall be dedicated prior to acceptance of the facilities by the City.

10. All proposed improvements associated with Summerlin Detention Basin #5 shall be bonded and inspected. This project, as a MPU facility, shall require that the inspection personnel by approved by the City. This project shall require Special Inspection. Coordinate the requirements of and the Agreements needed for Special Inspection with the Building Department.

11. Prior to the adoption and acceptance of the detention basin as a *City of Las Vegas, Department of Public Works* facility, Summerlin Detention Basin #5 shall remain a private facility owned and maintained by Summerlin.

12. The detention basin will require the submittal and approval of an updated *Emergency Action Plan* (EAP) for this regional facility. The EAP format shall meet the City of Las Vegas submittal requirements for inclusion with our overall EAP. Contact Flood Control for sample format requirements. The EAP must be approved by the *City of Las Vegas* and then submitted and approved by the *State of Nevada, Division of Water Resources - Dam Safety* prior to the release of any improvement bonds for the related detention basin improvements. The bonded improvements shall include a line item for the EAP in the amount of $50,000.

13. Provide complete *Plans and Project Specifications* for approval by the *City of Las Vegas*. Provide a copy of the Geotechnical Report for the detention basin. The Structural Plans and Details shall be a part of the Civil Improvement Plan set. This project is considered as a *Capital Improvement Project* (CIP) with developer funding.

14. Structural plans for the proposed storm drain improvements and pertinent flood control facilities must be submitted for review. Coordinate the submittal requirements with the *Building Department* for processing. Provide a copy of the *Building Department* approval to Flood Control prior to final approval of the drainage study. The engineer must provide a copy of *Building Department* approval of the structures to CCRFCD before they will issue concurrence.

15. The approved plans shall include the complete Specifications approved by DWR and the Building Department.

16. The proposed improvements show drainage facilities of a size that must be reviewed for access and maintenance concerns. The engineer must submit an extra set of improvement plans to the *City Streets & Sanitation Department* for their review and comments. *Streets & Sanitation Department's* approval must be secured prior to the subject drainage study approval.

Plan Comments:

17. PP-Sheets: Label the elevations of the concrete access roads at each crossing to include the beginning and end elevations to match the Grading Plans.

18. Sheet DT-5: Revise the Detail to show the 3-wire Post and Cable. Remove the leader showing the brace being drilled for the cable. Call out that the cable shall lay flat against the brace.

19. Revise the Post and Cable Railing Detail on the DT-Sheets and the S-Sheets to show the 3-wire Post and Cable configuration. Include the Post and Cable Railing for all walls with fall hazard.

20. Sheet S4, Section B references the Post and Cable Railing Detail as 9/DT7 which does not exist. Review and coordinate the Post and Cable Railing Detail to the Construction notes.

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/PBJ

T/R/S: T20S/R59E/28 & 33
AREA K-28

REGIONAL FLOOD CONTROL DISTRICT

Steven C. Parrish, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

Lawrence L. Brown, III
Chair
Clark County

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City of Las Vegas

Isaac Barron
City of North Las Vegas

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City of Boulder City

December 3, 2020

Mr. Oh Sang Kwon, P.E.
City of Las Vegas Department of Public Works
333 North Rancho Drive
Las Vegas, NV 89106

DISTRICT CONCURRENCE: SUMMERLIN DETENTION BASIN 5 MODIFICATIONS (DS5225C) (RFCD No. 20-13660)

Dear Mr. Kwon:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated December 2, 2019, Addendum No. 1 dated May 7, 2020, Addendum No. 2 dated July 26, 2020, Supplement No. 1 dated June 24, 2020, and Supplement No. 2 dated September 15, 2020 for above-mentioned project as submitted by GCW, INC. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Department of Public Works dated September 21, 2020.

District concurs with acceptance of this Technical Drainage Study by City of Las Vegas Department of Public Works with the following condition(s):

> Note that per District's Policies and Procedures Manual, Section VIII.D.13 Uniform Regulations for the Control of Drainage, the Lead Entity shall provide As-Built plans or record drawings to the District after completion and final inspection of such privately installed flood control facilities that have a regional flood control significance.

District's review of this project was limited to issues of Regional Flood Control Significance as defined in *Uniform Regulations for the Control of Drainage*. As noted in study, site resides in a Special Flood Hazard Area (SFHA) designated as "Zone AE" per the effective Flood Insurance Rate Map (FIRM). Therefore, consultant should be advised that this acceptance does not serve to amend the FIRM or remove the SFHA.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by GCW, INC. may be superseded. Compliance with regulatory elements and design standards specified in *Uniform Regulations for the Control of Drainage* does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for information, data, or conclusions presented by consulting engineers. We, therefore, make no warranties, either expressed or implied, in conducting this review.

STEVEN C. PARRISH, P.E.
General Manager/Chief Engineer

BY: Ching Wang (Dec 3, 2020 11:29 PST)
Ching C. Wang, P.E.
Senior Civil Engineer

CCW:jr

c: Mohammad Masih Edalat, P.h.D., P.E., GCW, INC.

P:\Letters and Memos\Local Drainage\Land Development & Drainage\2020\L-20-13660as_built.doc

STEVE SISOLAK
Governor

STATE OF NEVADA

BRADLEY CROWELL
Director

ADAM SULLIVAN, P.E.
Acting State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
901 South Stewart Street, Suite 2002
Carson City, Nevada 89701-5250
(775) 684-2800 • Fax (775) 684-2811
http://water.nv.gov

December 31, 2020

Steve Jones, P.E.
GCW Engineering
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146

Re: Permit Approval for the alteration of the Summerlin Detention Basin #5, filed under J-770, (NV10499)

Dear Mr. Jones:

On July 27, 2020, this office received an application for a safety of dams permit for the alteration of an existing detention basin located in Clark County, Nevada.

Please find enclosed the **approved application J-770** for the proposed alteration. Your copy of the approved application with supporting documents bearing the endorsement of the State Engineer is enclosed. Please review attachment "A" of the authorization for due dates and submittal items to be filed to the State Engineer. Please note that this dam is classified as a **High Hazard Structure** due to the downstream development and embankment heights.

You are responsible for periodic inspections of the embankments and impoundments. Any future alterations or modification to the impoundments must be approved by the State Engineer. Please report any slumps, sloughs, seeps or unusual observations to the State Engineer immediately.

Should you have any questions, please feel free to contact this office by calling (775-684-2800) or emailing cthorson@water.nv.gov .

Sincerely,

Christopher Thorson, P.E.
Chief, Dam Safety

CMT/sg
Enclosure: Approval of Permit w/Application Submittal
cc: April Chapman, Howard Hughes Corporation, Email
Todd Myers, Clark County Regional Flood Control, E-mail

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES

Filed 7/27/20

J- 776

NV 10499

APPLICANT MUST NOT FILL IN ABOVE BLANKS

APPLICATION FOR APPROVAL OF THE PLANS AND SPECIFICATIONS FOR THE CONSTRUCTION, RECONSTRUCTION OR ALTERATION OF A DAM

This Application Involves in No Way the Right to Appropriate Water
To secure the right to appropriate water, application should be made to the State Engineer on forms which will be furnished upon request.

I, Steve Jones (Name of applicant) of 1555 South Rainbow Boulevard (Address) Las Vegas, NV 89146, hereby make application for the approval of

Plans and Specifications for the Alteration (Construction, reconstruction, alteration) of Summerlin Detention Basin #5, J-754 (Name of dam) dam.

The owner of the proposed dam is The Howard Hughes Company, LLC (Name of owner)

of 10845 Griffith Peak Drive, Suite 160, Las Vegas (Address) State of Nevada, 89135

If the owner is a corporation, give name and address of president and secretary:
Grant Herlitz, President
13355 Noel Road, 22nd Floor, Dallas, TX 75240, Phone Number: (214)741-7744

The applicant is acting for the owner in the legal capacity of Agent (Agent, Lessee, Trustee, etc.)

Location of Dam

1. The source of water to be stored is Unnamed wash which is a tributary of Gowan Watershed, and the proposed dam to be located within the NW ¼, NW ¼, Sec. 33 T. 20, R. 59 E., M.D.B.&M. in Clark County, Nevada further described as being at Latitude 36.173693 N. Longitude 115.373585 W. (at a point pursuant to NAC 535.210(6b).

Description and Dimensions of Dam

(If for an alteration, the data given below is for the altered dam)

2. Type of dam Earth (Concrete arch or gravity, earth, rockfill, etc.) 3. Length of crest 2980 ft.
4. Height stream bed to spillway crest 42 ft. 5. Height foundation to spillway crest N/A ft.
6. Freeboard 6 (Spillway crest to top) ft. 7. Thickness at top 12 ft. 8. Thickness at bottom 310 ft.
9. Slope upstream* 3:1 10. Slope downstream* 3:1 11. Upstream facing Earthen (Concrete or rock paving, etc.)
*This information to be supplied for earth or rockfill dams.
12. Amount of material in dam 0 (No change in alteration cu. yds. 13. Estimated Cost $0.00
14. Spillway data Concrete broad crested weir. 22,107 cfs capacity (Type, capacity, etc.)
15. Outlet data (2) 7'X5.5' RCBC 359.75 LF @ 3.4%. 1,906 cfs capacity for WS @ spillway crest elevation (Type, capacity, etc.)

$1,200 filing fee must accompany this application

16. Elevation of crest of dam 3569 ft above NAVD 88 datum
Approximate elevation to be given if true elevation not available

17. Area of reservoir at spillway level 25.9 acres. 18. Capacity of reservoir 487 ac. ft.

General Information

19. State the purpose of the dam Flood Control
Diversion only; storage only; storage and diversion; debris storage, flood control, etc.

20. State the use that is to be made of water None
municipal, domestic, irrigation, power, mining and milling, recreation, stockwatering or none

21. Engineers

GCW, Inc.
1555 South Rainbow Boulevard
Las Vegas, NV 89146
Phone: (702)804-2000

Name and address of Engineers preparing plans

22. If the proposed dam is to be built under Federal supervision, state what department has jurisdiction.
N/A

23. The maps, plans and specifications accompanying this application are a part thereof.

[Signed] [signature]

this 26th day of June, 2020

APPROVAL OF APPLICATION NO. 770, INCLUDING PLANS AND SPECIFICATIONS

This Is to Certify That Application No. 770, including plans and specifications for the Summerlin Detention Basin #5 dam has been examined and the same is hereby approved, subject to the following conditions:

See Attachment A

Witness my hand and seal this _____ day

of _____, 20____

[signature] P.E.

State Engineer

FILE IN TRIPLICATE

ATTACHMENT "A"

Permit terms for the Alteration of Summerlin Detention Basin #5

1) This Permit is issued for the modification of the existing structure. This permit is a modification of the original dam permit J-449 and subsequent alterations approved under J-537 and J-754. This dam is classified as a High Hazard dam due to downstream development. All applicable permit terms under J-449, J-537 and J-754 remain in effect.

2) If actual construction of the structure has not commenced within one year after the date of this approval, the approval becomes void and a new application is required for approval. Alternatively, the dam owner can timely submit a request for an extension of time before one year with the accompanying fees.

3) The dam owner is responsible for having a Nevada Registered Engineer provide design and construction oversight for the work approved under this permit to ensure that the dam alterations are constructed in conformance with the approved plans and specifications.

4) If human remains, human burials, or burial claims are discovered during the course of construction, work must cease and immediately contact the appropriate law enforcement agency and the State Historic Preservation Office per NRS 383.170.1(a).

5) Upon completion, but no later than December 30, 2021, the permittee shall submit to the State Engineer a signed Proof of Completion certifying that the project was constructed as per approved plans and specifications. The certification shall be accompanied by a complete full size set of record drawings (as built plans), final specifications and a summary of the work and tests performed that is to include a documented listing of any changes to design or work execution. Actions taken in response to any failed test shall be described in each report.

6) Upon satisfactory review of the completion report and proof of completion, the State Engineer will issue an amended Authorization to Impound.

7) The owner shall perform, at their expense, any work necessary to maintain and operate the impoundment in a sensible manner to safeguard life and property. The owner is responsible for making any alterations that may become necessary in the future due to changes in design conditions.

8) This office, its officials or employees assume no liability for the information, data or conclusions presented by the consulting engineer. Therefore no warranty, either expressed or implied, has been made in conduct of this review.

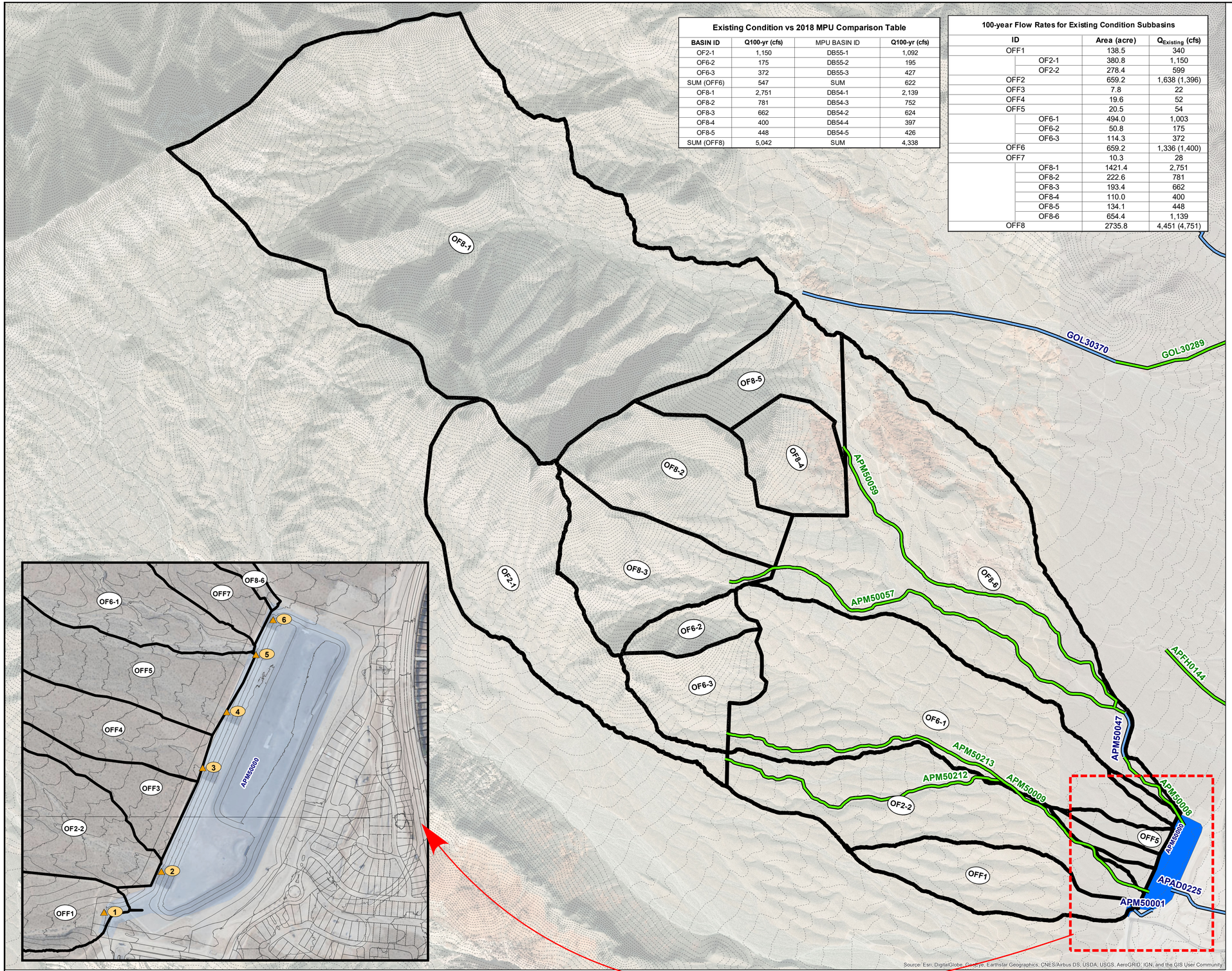
9) This approval does not waive the necessity of obtaining other required permits from any applicable Federal, State or local agencies.

Existing Condition vs 2018 MPU Comparison Table

BASIN ID	Q100-yr (cfs)	MPU BASIN ID	Q100-yr (cfs)
OF2-1	1,150	DB55-1	1,092
OF6-2	175	DB55-2	195
OF6-3	372	DB55-3	427
SUM (OFF6)	547	SUM	622
OF8-1	2,751	DB54-1	2,139
OF8-2	781	DB54-3	752
OF8-3	662	DB54-2	624
OF8-4	400	DB54-4	397
OF8-5	448	DB54-5	426
SUM (OFF8)	5,042	SUM	4,338

100-year Flow Rates for Existing Condition Subbasins

ID		Area (acre)	$Q_{Existing}$ (cfs)
OFF1		138.5	340
	OF2-1	380.8	1,150
	OF2-2	278.4	599
OFF2		659.2	1,638 (1,396)
OFF3		7.8	22
OFF4		19.6	52
OFF5		20.5	54
	OF6-1	494.0	1,003
	OF6-2	50.8	175
	OF6-3	114.3	372
OFF6		659.2	1,336 (1,400)
OFF7		10.3	28
	OF8-1	1421.4	2,751
	OF8-2	222.6	781
	OF8-3	193.4	662
	OF8-4	110.0	400
	OF8-5	134.1	448
	OF8-6	654.4	1,139
OFF8		2735.8	4,451 (4,751)



NORTH

1,000 0 1,000 2,000 Feet

1 in = 1,000 ft

Legend

- 40ft_Contour2018
- Existing Basins
- Subbasins
- Inflow Points

CCRFCD Basins

STATUS

- COM
- CON
- PRO
- TN1
- TN2

CCRFCD Facilities

STATUS

- COM
- CON
- PRO
- TN1
- TN2

100-year Flow Rates for Existing Condition Subbasins

ID	Area (acre)	$Q_{Existing}$ (cfs)
OFF1	138.5	340
OFF2	659.2	1,396
OFF3	7.8	22
OFF4	19.6	52
OFF5	20.5	54
OFF6	659.2	1,400
OFF7	10.3	28
OFF8	2735.8	4,751
Total (CP)	**4250.8**	**7,201**

THIS EXHIBIT SHOWS EXISTING CONDITION DRAINAGE MAP FOR A PORTION OF VILLAGE 29

DATE:

REV	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP

PROJECT NO. 62025-3080

DESIGN:
DRAWN:
CHECK:

PLOT DATE: 04/05/2020
PLOT TIME: 12:13:51 PM

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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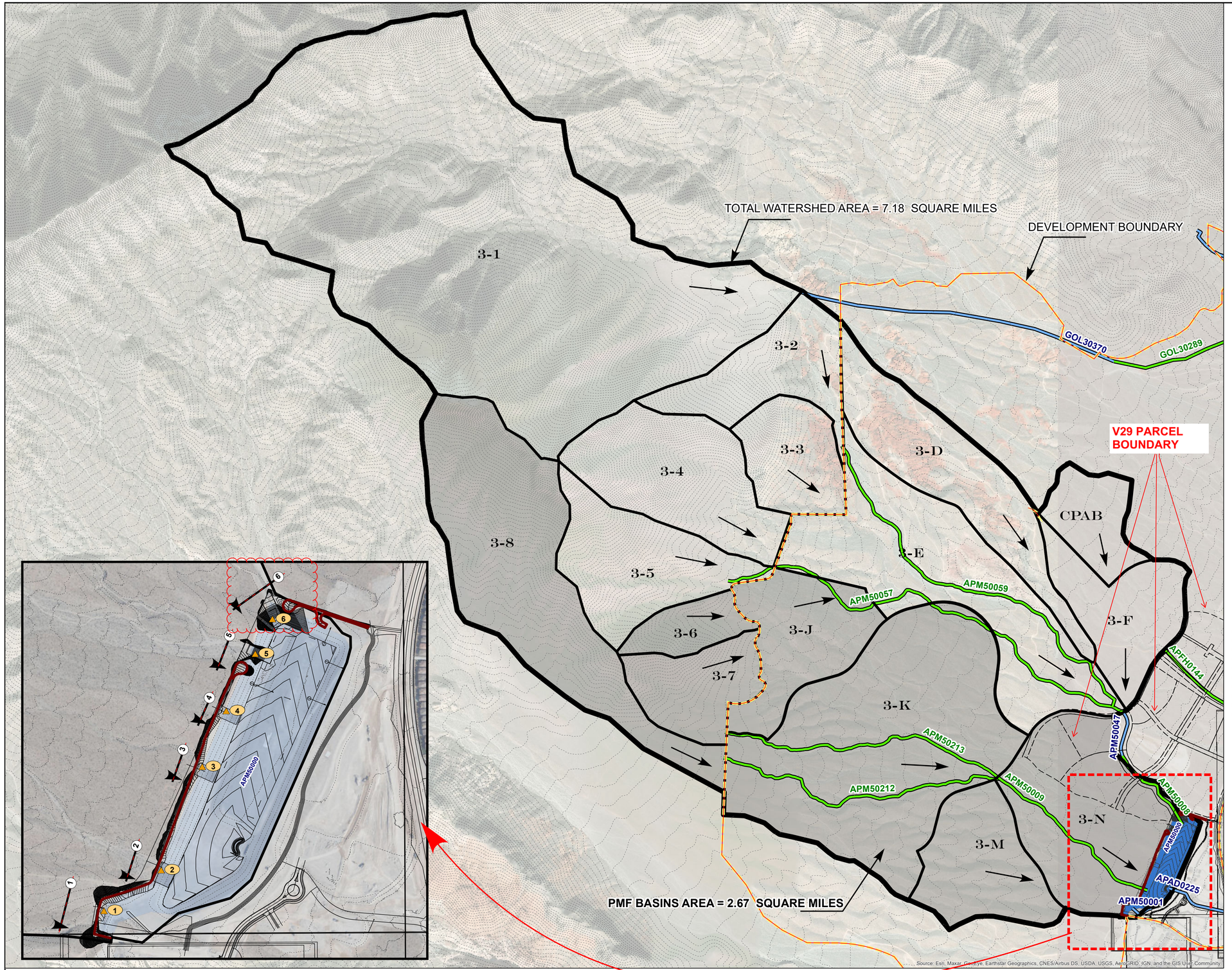
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24A DETENTION BASIN MODIFICATIONS

EXISTING CONDITION DRAINAGE MAP

DRAWING
FIG7
1 OF 1 SHTS



NORTH

1,000 0 1,000 2,000 Feet

1 in = 1,000 ft

Legend

- Flow Direction
- Access Roads
- Dev Boundary
- 20-ft Contour 2018

CCRFCD Facilities

STATUS

- COM
- CON
- PRO
- TN1
- TN2
- V_Boundry
- 1-ft Contours (Proposed)

CCRFCD Basins

STATUS

- COM
- CON
- PRO
- TN1
- TN2
- Cross Section
- Inflow Points

100-year Flow Rate Comparison Table (At Each Inflow Slope)

Inflow Point	$Q_{Existing}$ 100-yr (cfs)	$Q_{Ultimate}$ 100-yr (cfs)	Q_{Design} 100-yr (cfs)
1	340	0	-
2	1,418	724	-
3	52	0	-
4	54	0	-
5	1,400	3,617	-
→ 6	4,779	4,350	-
Total (CP)	7,201	8,184	7,084

Ultimate vs Design PMF Flow Rate

$Q_{Ultimate}$ PMF (cfs)	Q_{Design} PMF (cfs)
23,286	15,716

100-YEAR FLOW CHARACTERISTICS PROPOSED CONDITIONS

Cross Section	Slope (%)	Q_{100} (cfs)	Depth (ft)	Velocity (ft/s)	Note	Tributary
(1)	3.8	340.0	0.8	5.4	Wash	OFF1
(1)	2.0	340.0	0.6	8.6	Road	OFF1
(2)	3.9	1418.0	2.2	9.1	Wash	OFF2 + OFF3
(2)	2.0	1418.0	0.8	11.9	Road	OFF2 + OFF3
(3)	5.4	52.0	0.6	5.2	Wash	OFF4
(3)	2.0	52.0	0.3	5.4	Road	OFF4
(4)	5.7	54.0	0.6	4.6	Wash	OFF5
(4)	2.0	54.0	0.3	4.7	Road	OFF5
(5)	2.3	3617.0	4.0	11.3	Wash	NA
(6)	4.0	4779.0	6.2	14.9	Wash	OFF7 + OFF8

INFLOW POINT 6 (CP3.5C FROM SWPA) IS DESIGNED FOR 4,779 CFS

DATE:

REV	DATE	DESCRIPTION	DATE	AGEN-APP	DATE	GCW-APP

PROJECT NO. 62025-3080

DESIGN:
DRAWN:
CHECK:

PLOT DATE: 01/04/2021
PLOT TIME: 5:42:32 PM

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2999
gcwengineering.com

F:\Projects\600\62029-300\Division\Fctl\Figures\GIS\V29 Master Plan\Fig8 ULTIMATE CONDITION DRAINAGE MAP.mxd
MEdalat

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24A DETENTION BASIN MODIFICATIONS

ULTIMATE CONDITION DRAINAGE MAP

DRAWING
FIG8
1 OF 1 SHTS

UPDATE #3 TO THE TECHNICAL DRAINAGE STUDY FOR VILLAGE 23B SKY VISTA DRIVE ALTA DRIVE TO FAR HILLS AVENUE

62023B-240

November 2019

Prepared for:

The Howard Hughes Company, LLC
10845 Griffith Peak Drive, Suite 160
Las Vegas, NV 89135
Phone: (702) 791-4300

GCW 50 YEARS
ENGINEERS \ SURVEYORS 1969-2019

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: April 21, 2020
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: **Summerlin V23B Sky Vista Dr - Alta to Far Hills – Update #3**			**COPIES TO:** GCW, Inc.
Cross Streets:	Sky Vista Drive from Alta to Far Hills			The Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS4980J.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017			CCRFCD
Zoning Action:	MDR-72841			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES X	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	4/11/2018	4/23/2018 & 5/3/2018	Not Approved	$400.00	495088: $400
2nd Submittal	7/3/2018	7/20/2018 & 7/24/2018	Conditional Approval	$400.00	497102: $400
CCRFCD	8/20/2018	9/4/2018	Concurrence Recv'd	N/C	N/C
3rd Submittal	12/20/2018	1/17/2019	Not Approved	$100.00	501989: $100
4th Submittal	1/30/2019	2/13/2019	Approved	N/C	N/C
5th Submittal	4/22/2019	5/9/2019	Approved	$100.00	3099214: $100
6th Submittal	11/27/2019	12/17/2019	Not Approved	$100.00	3658371: $100
7th Submittal	1/2/2020 & 1/30/2020	2/6/2020	Conditional Approval	$400.00	3694352: $400
CCRFCD	3/26/2020	4/21/2020	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	**$1,500.00**	**----**

REMARKS:

6th & 7th Submittals: Update #3 and Addendum

5th Submittal: Update #2 to revise the size and slope of a stub at Station 363+05.60

3rd & 4th Submittals: Update & Supplement to connect the 2nd outfall pipe from DB5 to the Sky Vista Drive Storm Drain System and the Relocation of an existing stub

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

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

The following comments are repeated until they are complete:

1. The project proposed to build temporary drainage facilities including drainage berms/ditches along predominantly the west side of the proposed *Sky Vista Drive*. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control Section* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact *City Land Development Section* (702-229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berms/ditches are no longer necessary and can be removed.

2. Since the street and the associated storm drain facilities will eventually be dedicated to the ***City of Las Vegas***, the engineer/developer must coordinate with *City of Las Vega Streets & Sanitation Department* for their review and approval for maintenance issues prior to the final acceptance of the subject improvement plans.

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

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

END OF REMARKS
WSP/AYS

T/R/S: T20S/R59E/22
AREA K-22

NOTE:
REFER TO SUMMERLIN WEST MPU STUDY
FOR CONTRIBUTING WATERSHED TO DB5

EXISTING DETENTION BASIN DB5

SKY VISTA DRIVE

ALTA DRIVE

HIGH POINT

FAR HILLS AVENUE

CCRFCD FACILITY APAD 0225

CCRFCD FACILITY APAD 0203

CCRFCD FACILITY APAD 0146 EX 10X8 RCB

CCRFCD FACILITY APM5 0009

CCRFCD FACILITY APM5 0008

CCRFCD FACILITY APM5 0047

CCRFCD FACILITY APM5 0056

CCRFCD FACILITY APM5 0057

CCRFCD FACILITY APM5 0059

CCRFCD FACILITY APH4 0144

CCRFCD FACILITY APF2 0000

EX 5.0' TYPE "CM2" DI

EXISTING DITCH

EX 12.5' TYPE "CM2" DI

EX 24" RCP

EX 12.5' TYPE "CM2" DI

24" RCP

10.0' TYPE "CM2" DI#1

7.5' TYPE "CM2" DI#2

60" RCP

60RCP

60" RCP

42" RCP

10.0' TYPE "CM2" DI#4

54" RCP

5.0' TYPE "CM2" DI#6

EX 66" RCP

5.0' TYPE "CM2" DI#6

XOFF1

XOFF2

XOFF3

XOFF4

XOFF5

XOFF6

XOFF7

XOFF8

XOFF9

XOFF10

XOFF11

XOFF12

CPB

CP5

CPA

CP4

CP2A

CP2

CPC

RD1

RD2

WSPG 1740.151

WSPG 1985.956

WSPG 3759.376

WSPG 3892.186

WSPG 4773.246

(1365 CFS)

(1162 CFS)

(112 CFS)

(354 CFS)

(116 CFS)

INTERIM CONDITIONS 100-YEAR DITCH CHARACTERISTICS

Ditch	Slope (%)	Q_{100} (cfs)	Depth of flow (ft)	Freeboard (ft)	Total Depth (ft)	Velocity (ft/s)	Bottom Width (ft)
2	2.0	100	0.45	0.55	1.0	4.82	45
3	1.7	18	0.59	0.91	1.5	4.54	5
4	1.6	37	0.63	0.87	1.5	4.95	10
6	3.0	12	0.21	1.29	1.5	3.58	15
7	3.7	23	0.3	1.20	1.5	4.89	15
8	4.1	33.4	0.27	1.23	1.5	4.87	25
9	0.9	28	0.88	1.12	2	4.17	5
10	2.6	32.7	0.41	0.59	1	4.98	15

CONCENTRATION POINT SUMMARY

Point ID	Tributary Sources	Area (mi^2)	Q_{100} (cfs)	Q_{10} (cfs)
CP2A	XOFF10, XOFF11, XOFF12	0.18	280	102
CP2	RD1, CP2A	0.18	287	106
CP4	XOFF6, XOFF7, XOFF8, XOFF9	0.09	112	30
60RCP	60" RCP DB5 outflow	6.72	332	156
CPA	CP4, 60RCP	6.82	354	162
CP5	CPA, XOFF2, XOFF3, XOFF4, XOFF5	6.87	367	165
CPB	CP5, 7X5	6.87	2163	1477
CPC	CPB, XOFF1, RD2	6.92	2178	1481

INTERIM CONDITION
SUBBASIN FLOW RATE SUMMARY

Subbasin ID	Area (acres)	Q_{100} (cfs)	Q_{10} (cfs)
XOFF1	23.4	61	23
XOFF2	21.6	53	18
XOFF3	4.3	9	2
XOFF4	1.1	2	1
XOFF5	5.6	12	4
XOFF6	31.2	65	20
XOFF7	15.1	23	5
XOFF8	3.4	5	1
XOFF9	9.9	18	4
XOFF10	41.9	99	34
XOFF11	43.1	107	40
XOFF12	28.3	75	29
RD1	2.1	8	4
RD2	10.1	35	18
7X5	-	1797	-

LEGEND

- ST2 — SUBBASIN NAME
- SUBBASIN BOUNDARY
- CP1 — CONCENTRATION POINT
- FLOW DIRECTION
- 12——12 — CROSS SECTION
- LOCAL SD FACILITY
- EX MPU FACILITY
- (XX CFS) — STORM DRAIN FLOW RATE

NORTH

GRAPHIC SCALE
250 0 125 250
(IN FEET)
1 inch = 250 ft.

THIS EXHIBIT SHOWS EXISTING CONDITION DRAINAGE MAP FOR A PORTION OF VILLAGE 29

% COMPLETE

DATE:

	DESCRIPTION	DATE	APP'D
REV.		DATE	AGEN. APP'D
		DATE	GCW APP'D

PROJECT NO. 620238-240
DESIGN:
DRAWN: Masih Edalat
CHECK:
PLOT DATE: 12-12-18
PLOT TIME: 07:52:16

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\620238-240\Division\Exhibits\Figures\Update\Figs_INT.dwg

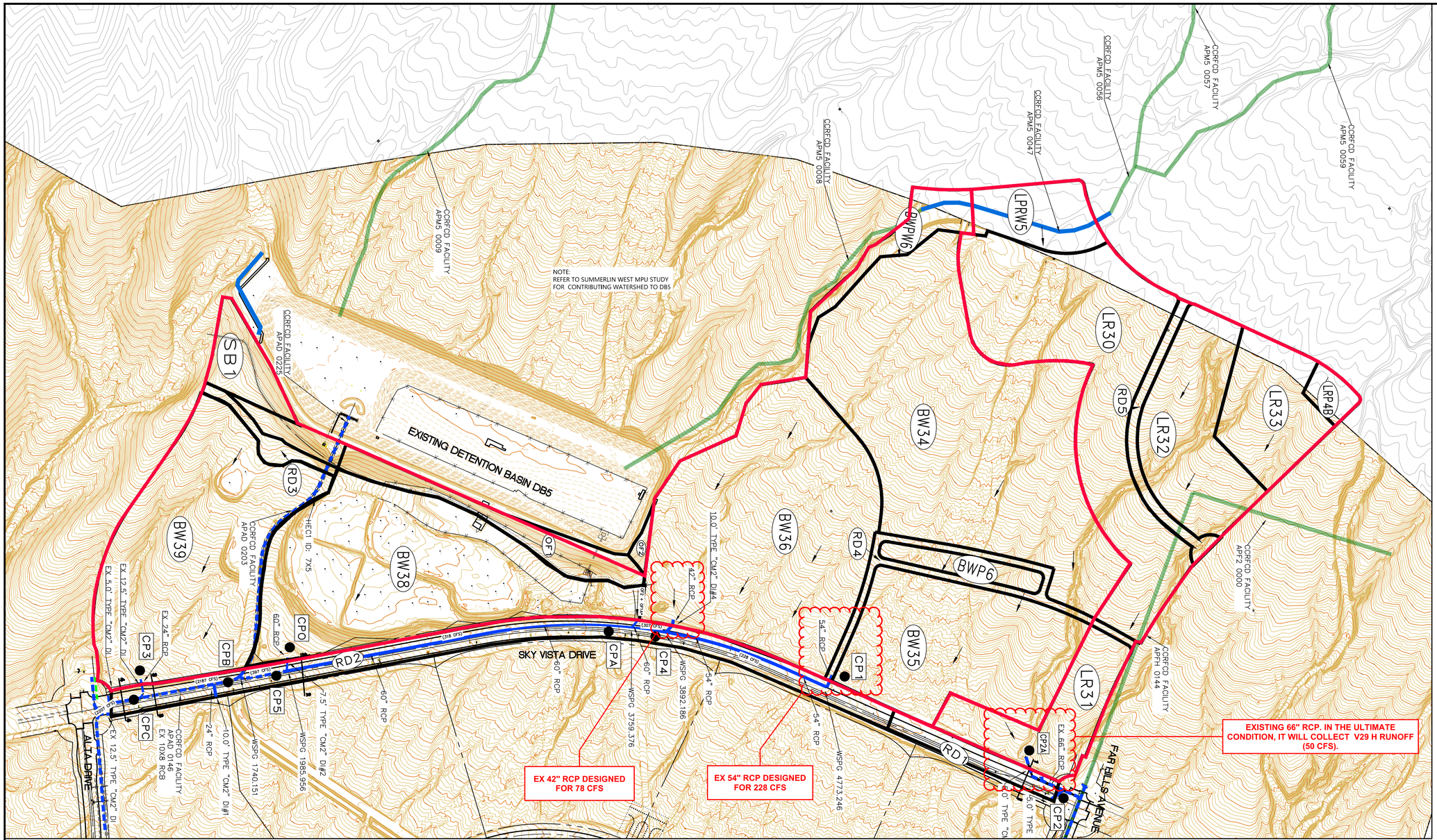
THE HOWARD HUGHES PROPERTIES, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

FIGURE 5
INTERIM CONDITION DRAINAGE MAP

DRAWING
FIG5
1 OF 1 SHTS

HDR#
HTE: 00-00000



NOTE:
OFFSITE SUBBASIN DELINEATIONS AND LAND USES ARE BASED ON SUMMERLIN WEST MPU.

* Reference from The Starling Summerlin Village 24A Parcel O Study. Note that OF1A is half of OF1.

100-YEAR FLOW CHARACTERISTICS
ULTIMATE CONDITIONS

Location	Slope (%)	Q_{100} (cfs)	Depth (ft)	Velocity (ft/s)	D*V	Tributary
1-1 Half	0.83	4.50	0.39	2.60	1.01	RD1
2-2	4.32	36.00	0.46	6.52	3.00	RD2
3-3 West Half	3.00	10.60	0.42	5.10	2.14	DI#2 Bypass
4-4 East Half	3.00	9.00	0.40	4.95	1.98	DI#1 Bypass
4-4 West Half	3.00	2.00	0.28	3.2	0.9	EX 12.5' CM2 DI Bypass

ULTIMATE CONDITION
CONCENTRATION POINT SUMMARY

Point ID	Tributary Sources	Area (mi^2)	Q_{100} (cfs)	Q_{10} (cfs)
CP1	BWPW6, BW35, BWP6, BW34, & RD4	0.09	228	110
CP2A	LR31, LR30, LR32, LR33, LRP4B, RD5 & LPRW5	0.09	199	93
CP2	CP2A & RD1	0.09	207	95
CP3	SB1, RD3, & BW39	0.04	100	48
CP4	CP1 & BW36	0.14	307	136
CP5	CPA & BW38	0.14	397	186
CPA	CP4 & OF1A & OF2	0.14	318	141
CPB	CP5 & DB 7X5 RCBC	6.89	2187	1491
CPC	CP3, RD2, & CPB	6.95	2207	1502

ULTIMATE CONDITION
SUBBASIN FLOW RATE SUMMARY

Subbasin ID	Area (acres)	Q_{100} (cfs)	Q_{10} (cfs)
BW34	35.8	139	67
BW35	15.8	61	30
BWP6	1.9	6	2
BWPW6	2.9	10	4
BW36	28.4	78	31
OF1	4.7	18	8
BW38	22.2	80	37
BW39	22.0	84	41
LR30	25.0	80	37
LR31	6.6	25	12
LR32	10.3	39	19
LR33	6.7	26	13
LRP4B	1.1	4	2
LPRW5	4.2	16	7
RD1	2.1	9	5
RD2	10.1	36	19
RD3	1.3	6	3
RD4	2.8	12	6
RD5	2.0	9	5
SB1	2.9	10	4
60RCP	-	332	-
7X5	-	1797	-
OF2	0.4	2	1

LEGEND

- (ST2) SUBBASIN NAME
- SUMMERLIN WEST MPU LARGE BASIN BOUNDARY
- SUBBASIN BOUNDARY
- CP1 CONCENTRATION POINT
- FLOW DIRECTION
- 12——12 CROSS SECTION
- PROP SD FACILITY
- EX SD FACILITY
- (XX CFS) STORM DRAIN FLOW RATE

NORTH

GRAPHIC SCALE
250 0 125 250
(IN FEET)
1 inch = 250 ft.

% COMPLETE

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP	DATE:

PROJECT NO.
620238-240
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 11-21-19
PLOT TIME: 09:33:17

GCW
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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Mashi Edalat

THE HOWARD HUGHES PROPERTIES, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

FIGURE 6
ULTIMATE CONDITION DRAINAGE MAP

DRAWING
FIG6
1 OF 1 SHTS

LOT#:
HTE: 00-00000

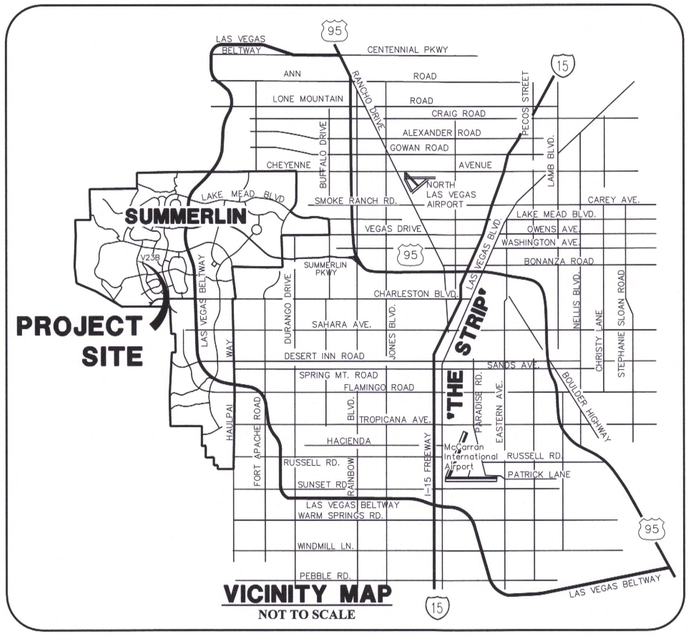
SUMMERLIN

SM

VILLAGE 23B
SKY VISTA DRIVE IMPROVEMENTS
ALTA DRIVE TO FAR HILLS AVENUE
2018

A.P.N. 137-22-000-017 (PORTION), 137-34-111-010, 137-34-111-011, 137-27-410-002, 137-27-310-002, 137-27-210-004

SID NO. 810 PROJECTS 8A, 8B, AND 8C



VICINITY MAP
NOT TO SCALE

OWNER/DEVELOPER

THE HOWARD HUGHES COMPANY, LLC
10801 W. CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89135
OFFICE PHONE NO. (702) 791-4300

ENGINEER

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

Call before you Dig — Avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600 and CLARK COUNTY TRAFFIC OPERATIONS 1-702-455-6000

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

FAST — Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

MICHAEL FANG, P.E. 24464 — DATE 1/2/20

APPROVED FOR CONSTRUCTION

CITY OF LAS VEGAS FIRE DEPARTMENT — DATE

CLV PLANNING DEPARTMENT

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

CITY OF LAS VEGAS PLANNING DEPARTMENT — DATE

THE HOWARD HUGHES COMPANY, LLC

KEVIN ORROCK — DATE
TITLE: VICE PRESIDENT

ALLEN PAVELKA, PE, PE# 9029 — DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS". THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 126398 FIRST APPROVED DATE: 10/22/18
LVVWD APPROVED FIRE FLOW: TOTAL 1500 GPM / ON SITE N/A GPM
(SHEETS: 1-6, 9-23, 28-37, 44-46, 34A) 3

UTILITY/AGENCY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

CENTRAL TELEPHONE CO. DBA CENTURYLINK — DATE

THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY — DATE

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY – TRANSMISSION ENGINEERING — DATE

ORIGINALLY SIGNED 09-27-2018

SOUTHWEST GAS CORPORATION — DATE

CLV# 107V7418 L18-01503-R001

STATE OF NEVADA — PROFESSIONAL ENGINEER — MICHAEL FANG — Exp. 06/30/2020 — CIVIL — No. 24464 — DATE 1/2/20

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP
1	11/28/18	REVISED SHEETS 2, 9-14, 17-18, 25, 28A, 28-29			
2	04/15/19	REVISED SHEETS 2, 10, 11, 14, 25, 28, 31			
3	07/15/19	REVISED SHEETS 2, 9-11, 18, 23, 26, 28A, 33			
4	11/26/19	ADDED SHEETS 34A, 41A, 42A, 42B			
A	11/26/19	REVISED SHEETS 2, 9-11, 13-16, 25, 28A, 28			

PROJECT NO. 62023B-240
DESIGN: LG/MB
DRAWN: LG/MB
CHECK: JLJ
PLOT DATE: 01-02-20
PLOT TIME: 09:08:07

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

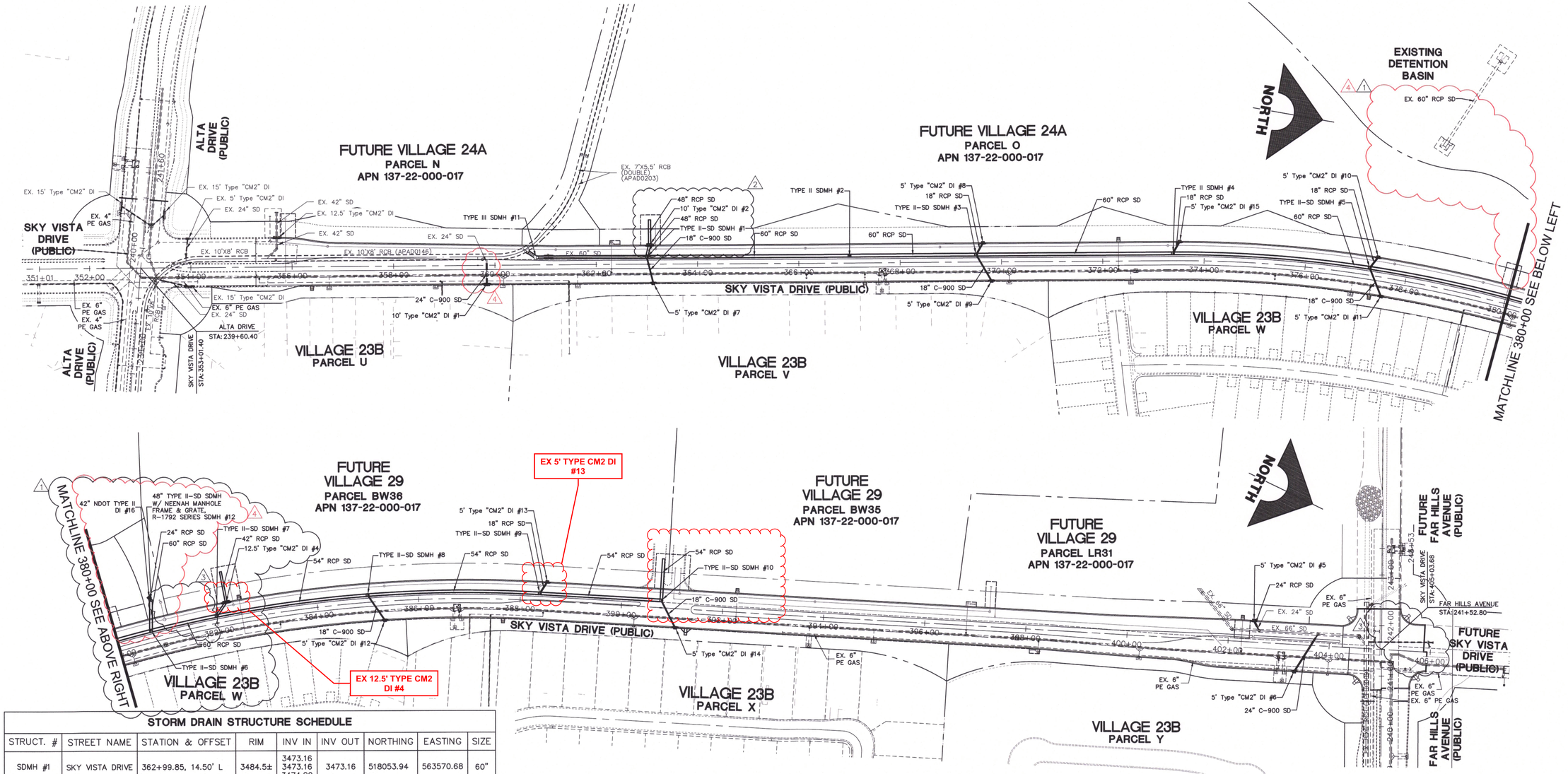
F:\Projects\600\62023B-240\DWG\Production\240-C1.dwg
Alexander Santiago

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

COVER SHEET

DRAWING
1
1 OF 46 SHTS



STORM DRAIN STRUCTURE SCHEDULE

STRUCT. #	STREET NAME	STATION & OFFSET	RIM	INV IN	INV OUT	NORTHING	EASTING	SIZE
SDMH #1	SKY VISTA DRIVE	362+99.85, 14.50' L	3484.5±	3473.16 3473.16 3474.20	3473.16	518053.94	563570.68	60"
SDMH #2	SKY VISTA DRIVE	366+99.85, 14.50' L	3501.5±	3487.25	3487.25	518447.07	563496.85	60"
SDMH #3	SKY VISTA DRIVE	369+50.00, 14.50' L	3508.5±	3496.08 3498.74 3498.74	3496.08	518692.92	563450.67	60"
SDMH #4	SKY VISTA DRIVE	373+38.67, 14.50' L	3518.8±	3507.07 3508.54	3507.07	519074.98	563378.93	60"
SDMH #5	SKY VISTA DRIVE	377+26.43, 14.50' L	3529.0±	3518.72 3519.09 3519.09	3518.72	519462.47	563338.43	60"
SDMH #6	SKY VISTA DRIVE	380+68.98, 14.46' L	3538.1±	3525.44 3525.44	3525.44	519806.44	563352.90	60"
SDMH #7	SKY VISTA DRIVE	382+01.01, 14.50' L	3541.6±	3528.73 3528.73	3528.73	519937.98	563370.98	60"
SDMH #8	SKY VISTA DRIVE	385+00.00, 14.50' L	3549.4±	3538.49 3541.21	3538.49	520231.08	563437.46	60"
SDMH #9	SKY VISTA DRIVE	388+37.90, 14.50' L	3556.2±	3544.44 3547.15	3544.44	520550.04	563554.04	60"
SDMH #10	SKY VISTA DRIVE	390+78.40, 14.50' L	3560.5±	3548.65 3552.80	3548.65	520769.84	563651.67	60"
SDMH #11	SKY VISTA DRIVE	360+81.49, 15.07' L	3475.1±	3463.66	3463.66	517839.23	563610.43	60"
SDMH #12	SKY VISTA DRIVE	380+83.45, 73.39' L	3540.0±	3531.95	3531.95	519827.74	563296.02	48"

STORM DRAIN STRUCTURE SCHEDULE

STRUCT. #	STREET NAME	STATION & OFFSET	RIM	INV IN	INV OUT	NORTHING	EASTING	SIZE
DI #1	SKY VISTA DRIVE	359+83.59, 38.00' R	3470.8±		3465.72	517752.81	563680.66	10'
DI #2	SKY VISTA DRIVE	363+05.60, 38.00' L	3484.7±	3474.61	3474.61	518055.26	563546.53	10'
~~DI #3~~	~~SKY VISTA DRIVE~~	~~380+00.00, 37.89' L~~	~~3436.2±~~	~~3526.30~~	~~3526.30~~	~~519739.33~~	~~563322.86~~	~~12.5'~~
DI #4	SKY VISTA DRIVE	382+24.45, 37.97' L	3542.2±	3532.20	3532.20	519965.26	563351.80	12.5'
DI #5	SKY VISTA DRIVE	402+48.84, 42.84' L	3560.0±		3550.13	521851.01	564100.90	5'
DI #6	SKY VISTA DRIVE	403+33.69, 53.83' R	3559.1±		3552.88	521889.31	564223.69	5'
DI #7	SKY VISTA DRIVE	363+12.70, 38.00' R	3485.0±		3479.60	518076.26	563619.91	5'
DI #8	SKY VISTA DRIVE	369+63.56, 38.00' L	3508.7±		3501.45	518701.91	563425.07	5'
DI #9	SKY VISTA DRIVE	369+80.31, 38.00' R	3509.2±		3503.70	518732.40	563496.67	5'
DI #10	SKY VISTA DRIVE	377+39.77, 38.00' L	3529.3±		3521.80	519475.39	563314.62	5'
DI #11	SKY VISTA DRIVE	377+57.41, 38.00' R	3529.8±		3524.44	519494.38	563390.29	5'
DI #12	SKY VISTA DRIVE	385+30.89, 38.00' R	3550.0±		3544.60	520245.59	563496.54	5'
DI #13	SKY VISTA DRIVE	388+51.46, 38.00' L	3556.4±		3549.86	520571.98	563538.07	5'
DI #14	SKY VISTA DRIVE	391+08.71, 38.00' R	3561.5±		3556.09	520776.23	563711.96	5'
DI #15	SKY VISTA DRIVE	373+51.90, 38.00' L	3519.0±		3511.25	519083.94	563353.43	5'
DI #16	SKY VISTA DRIVE	380+81.07, 77.75' L	3539.3±		3532.48	519825.80	563291.41	3.5'

SOUTHWEST GAS APPROVAL

SOUTHWEST GAS CORPORATION DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 126398 FIRST APPROVED DATE: 10/22/18

Call before you Dig — Avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600 and Clark County Traffic Operations 1-702-455-6000

Avoid hitting overhead power lines. It's costly. CALL BEFORE YOU DIG OVERHEAD 1-702-227-2929

FAST — Call before you UnderGround 1-702-432-5300 Freeway and Arterial System of Transportation

CLV# 107V7418 L18-01503-R001

STATE OF NEVADA — PROFESSIONAL ENGINEER — MICHAEL FANG — Exp. 06/30/2021 — CIVIL — No. 24465 — DATE: 1/2/20

REV	DATE	DESCRIPTION	ASEN APP	DATE	GCW APP
1	11/28/18	ADDED WATER LATERAL, REVISED SD LATERAL			
2		CHANNEL GRADING AND ADDED NEW SHEET 26A			
3	04/15/19	UPSIZED SDDI #4			
4	07/15/19	REVISED SD & SS LATERAL			
5		REMOVED W LATERAL, ADJ STA. 381+90.05			
6	11/07/19	REVISED CONNECTION TO DR 4/5 OUTFALL &			
		SD LATERAL @ STA 359+66.01			

PROJECT NO. 62023B-240
DESIGN: LG/MB
DRAWN: LG/MB
CHECK: JLJ
PLOT DATE: 01-02-20
PLOT TIME: 09:09:57

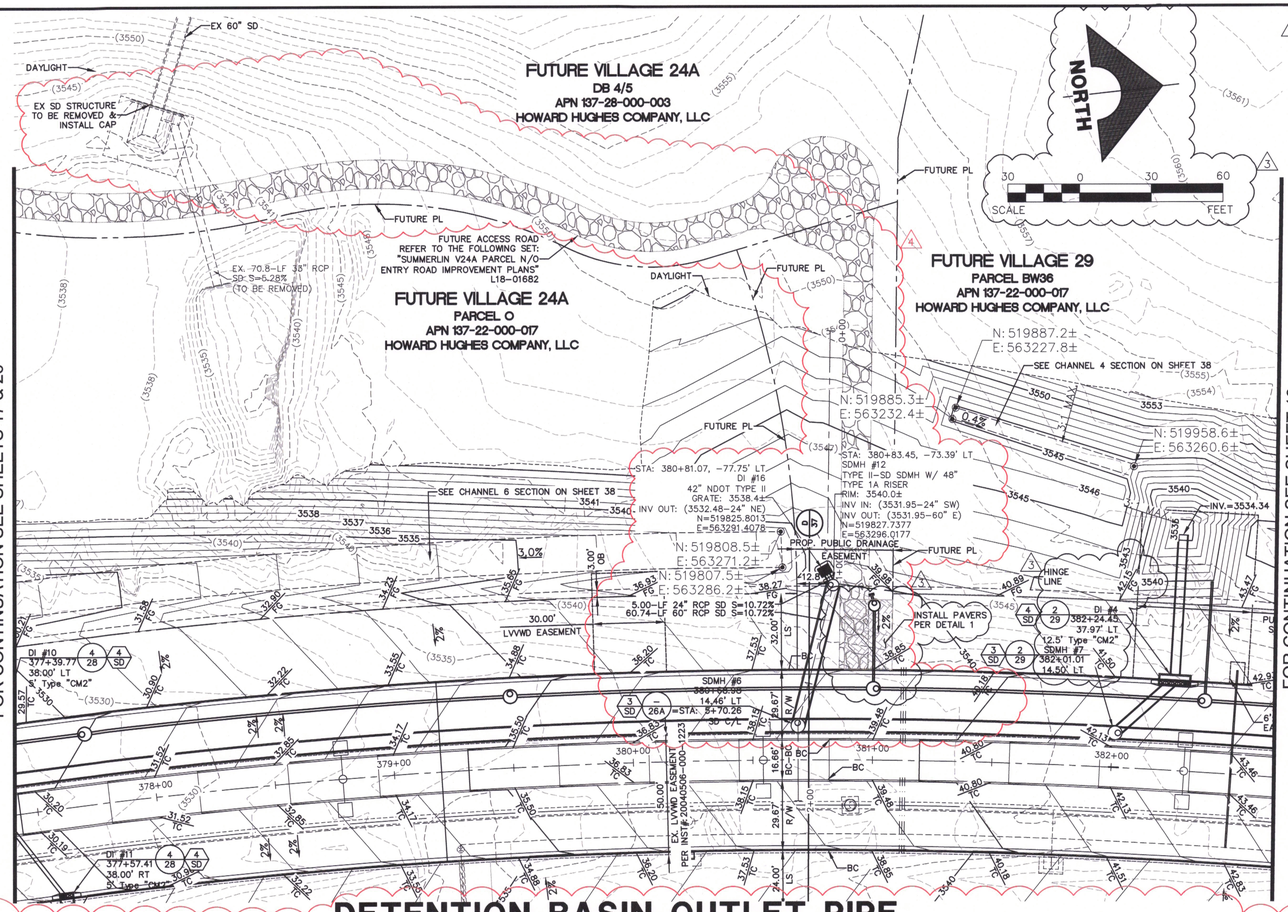
GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS
F:\Projects\600\62023B-240\DWG\Production\240-MP2.dwg
Alexander Santiago

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

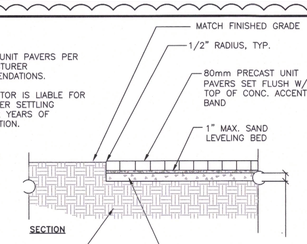
MASTER UTILITY PLAN - STORM DRAIN

DRAWING 10
10 OF 46 SHTS



NOTES:

1. INSTALL UNIT PAVERS PER MANUFACTURER RECOMMENDATIONS.
2. CONTRACTOR IS LIABLE FOR ANY PAVER SETTLING WITHIN 2 YEARS OF INSTALLATION.



PAVERS SECTION — 1

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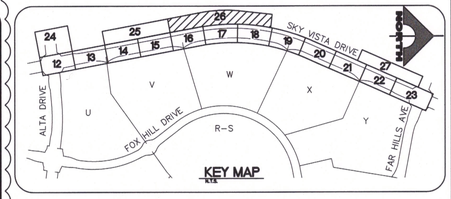


KEY MAP

STORM DRAIN CONSTRUCTION NOTES:

1 SD — INSTALL TYPE I MANHOLE PER USD DWG. NO. 403
2 SD — INSTALL TYPE II MANHOLE PER USD DWG. NO. 405.1
3 SD — INSTALL TYPE II-SD MANHOLE PER USD DWG. NO. 405.2
4 SD — INSTALL TYPE "CM2" DROP INLET PER USD DWG. NO. 412.1 AND 421
5 SD — REMOVE PLUG AND CONNECT TO EX STORM DRAIN LINE (CONTRACTOR TO VERIFY SIZE, INVERT AND LOCATION OF EX STORM DRAIN PRIOR TO CONSTRUCTION)
6 SD — BASE AND WALLS TO BE CAST-IN-PLACE MONOLITHIC POUR. SEAL BETWEEN WALLS AND ROOF TO BE KENT SEAL, OR APPROVED EQUAL.
7 SD — INSTALL TYPE "C" DROP INLET PER USD DWG. NO. 413 AND 421
8 SD — INSTALL TEMPORARY PLUG AND CAP
9 SD — INSTALL TYPE III MANHOLE PER USD DWG. NO. 406

BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
5LV09–34NE6	RIVET AND PLATE IN TOP OF CURB @ NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA DRIVE	3304.45 (FEET)	1007.197 (METERS)

NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM. PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS.

BASIS OF BEARINGS

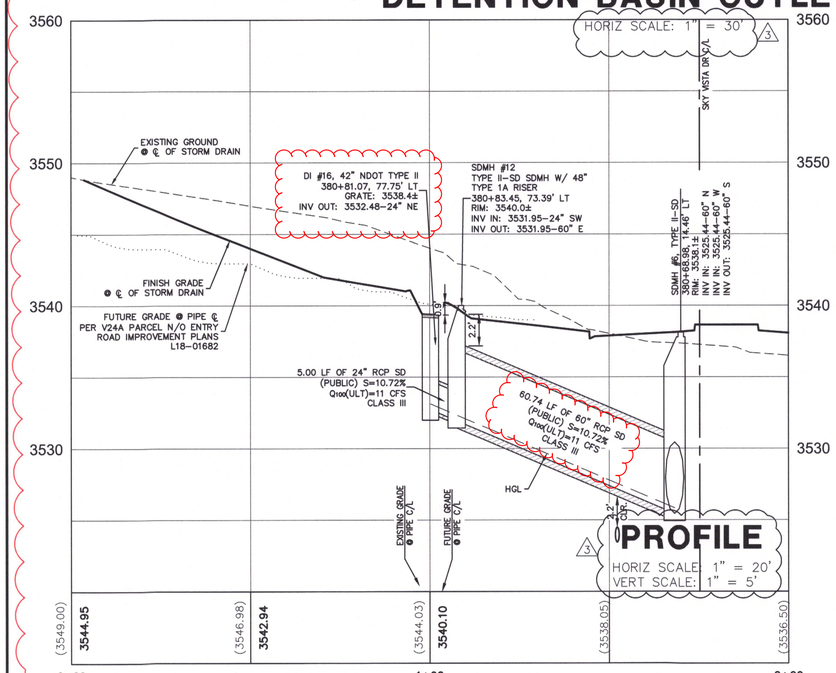
NORTH 89°45'05" EAST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 28 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA

Call before you Dig — Avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600 or CLARK COUNTY TRAFFIC OPERATIONS 1-702-455-6000

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

FAST — Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

DETENTION BASIN OUTLET PIPE



PROFILE

HORIZ SCALE: 1" = 20'
VERT SCALE: 1" = 5'

CLV# 107V7418 L18-01503-R001

NO.	DATE	DESCRIPTION
1	11/28/18	ADDED WATER LATERAL, REVISED SD LATERAL
2	08/27/19	REMOVED W LATERAL AT STA. 381+90.05, CHANNEL DRAWING AND ADDED NEW SHEET 26A
3		UPSIZED SDDI #4
4	08/27/19	REMOVED W LATERAL AT STA. 381+90.05
5		ADDED PAVERS SECTION DETAIL
6	10/07/19	REVISED CONNECTION TO DB 4/5 OUTFALL
7		REMOVED GRADING

	DATE	APP
KREN		
GCW		

PROJECT NO. 62023B-240
DESIGN: LG/MB
DRAWN: LG/MB
CHECK: JJ
PLOT DATE: 01-02-20
PLOT TIME: 09:22:39

STATE OF NEVADA — PROFESSIONAL ENGINEER — MICHAEL FANG — Exp. 06/30/2021 — CIVIL — No. 24457 — DATE: 1/2/20

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\620238-240\DWG\Production\240-PP2.dwg
Alexander Santiago

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

OFFSITE STORM DRAIN PLAN AND PROFILE

DRAWING 26A 1
26A OF 46 SHTS

RESPONSE TO COMMENTS FOR THE TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS PHASE 1

62025-203

May 2019

Prepared for:

Hughes Howard Company, LLC
10801 Charleston Blvd., 3Rd Floor
Las Vegas, Nevada 89146
Phone: (702) 791-4300

GCW 50 YEARS
ENGINEERS \ SURVEYORS 1969-2019

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: June 8, 2020
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: **Summerlin V25 Sky Vista Drive Improvements – Phase 1 – Update #3**			**COPIES TO:** GCW Engineers / Surveyors
Cross Streets:	Sky Vista Drive between Far Hills & Redpoint			Howard Hughes Company
File Number:	F:\Depot\DSMemos\DS5120G.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-101-001			CCRFCD
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	**X**	
Proposed Storm Drain	YES	NO	**X**	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	4/8/2019	4/22/2019	Not Approved	$400.00	3083957: $400
2nd Submittal	5/9/2019	5/29/2019	Conditional Approval	$400.00	3127113: $400
3rd Submittal	7/25/2019	8/8/2019	Conditional Approval	$400.00	3504685: $400
CCRFCD	8/20/2019	9/3/2019	Concurrence Recv'd	N/C	N/C
4th Submittal	10/15/2019	10/29/2019	Approved	$100.00	3610986: $100
5th Submittal	12/19/2019	1/9/2020	Approved	$100.00	3682451: $100
6th Submittal	5/27/2020	6/8/2020	See Comments Below	$100.00	3861243: $100
			TOTAL FEES (LDDRS):	**$1,500.00**	**----**

REMARKS:

6th Submittal: Update #3 for minor changes in island curbs and SDMH, DI relocation

5th Submittal: Update #2 to increase the size of two storm drain laterals

4th Submittal: Update to replace DI #1.1 with different type

3rd Submittal: Response to CCRFCD comments

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

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

1. The *Update* stated that SDMH #12B and the 14.36 ft stretch of the 36"-RCP in *Redpoint Drive* was originally proposed to be constructed with the study and plans of *Summerlin V25 Redpoint Drive, Park Bluff Lane, Foxtail Pass Way Improvements* (DS 5200) but instead will be installed by this *Update*.

   An Update to DS 5200 shall be submitted to the *City Flood Control* to match the proposed revisions.

The following conditions are repeated until they are complete:

2. Replace the proposed NDOT Type 3 inlet with Type DM (L=5').
3. All offsite interim flood control facilities such as but not limited to berms/ditches and temporary sump are privately owned and to be privately maintained by the *Howard Hughes Company*.
4. The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed ***Sky Vista Drive***. Prior to final plan approval the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City of Las Vegas Flood Control* for approval. Once the drainage study is conditionally approved, the engineer should contact the *City's Land Development Section* (229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update / letter will be required to justify that the offsite berms / channels are no longer necessary and can be removed.

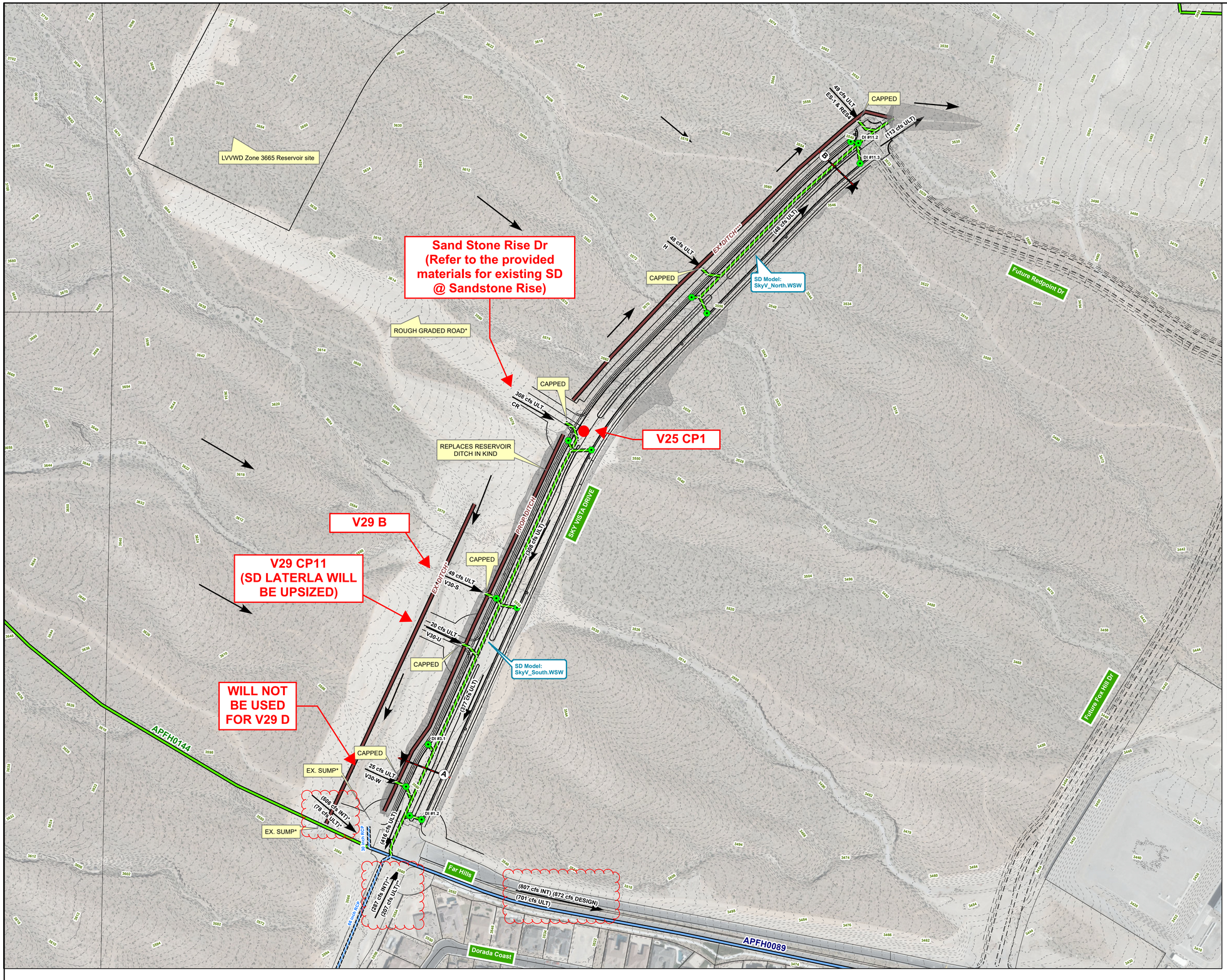
NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional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

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

END OF REMARKS

ays

T/R/S: T20S/R59E/22
AREA K-22



NORTH

240 0 240 Feet

1 in = 150 ft

Legend

- DI
- Cross Section
- EX SD
- Proposed SD
- Ditch
- Flow Direction
- 1-ft Contours
- 2-ft Contour 2016

CCRFCD Facilities

STATUS

- COM
- CON
- PRO
- TN1
- TN2

100-YEAR STREET FLOW CHARACTERISTICS

Cross Section	Slope (%)	Q_{100} (cfs)	Depth (ft) / HW Elevation	Velocity (ft/s)	D*V	NOTE
(A)	0.5	7.0	0.49	2.13	1.0	Half Street
(B)	1.8	8.0	0.43	3.59	1.5	Half Street

ULTMATE CONDITION FLOW SUMMARY

* Referenced from the Master Drainage Study for Village 25

BASIN ID	Q_{100} (cfs)	Area (acres)
ES1	42	10.2
RES4	7	1.6
H	48	12.1
CR	308	-
V30-U	20	4.7
V30-W	25	6.84
V30-S	49	12.02

NOTE: * REFERENCED FROM THE RESERVOIR STUDY
** REFERENCED FROM THE V23B SKY VISTA STUDY
*** REFERENECED FROM THE V21 REDPOINT STUDY

DATE:
GCW APP.
DATE
AGEN APP.
DATE
DESCRIPTION
DATE
REV.

PROJECT NO.
62025-203

DESIGN:
DRAWN:
CHECK:
PLOT DATE: 05/09/2019
PLOT TIME: 9:36:09 AM

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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medalat

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
FAR HILLS AVENUE TO REDPOINT AVENUE

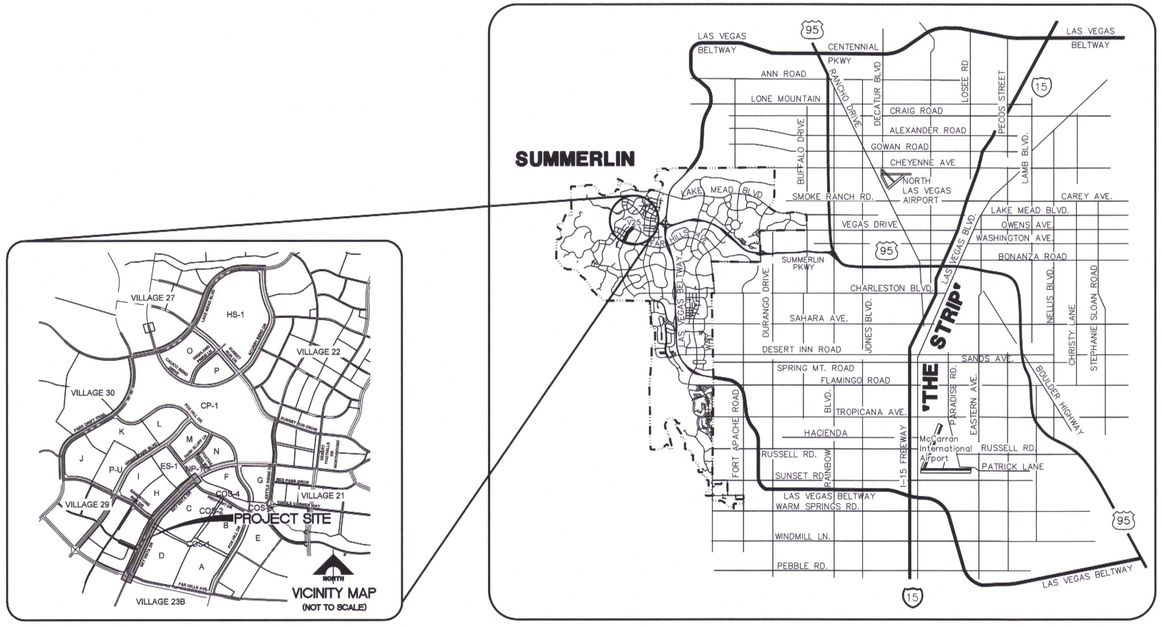
INTERIM CONDITION DRAINAGE MAP

DRAWING
FIG5
1 OF 1 SHTS

SUMMERLIN

SM

VILLAGE 25
SKY VISTA DRIVE IMPROVEMENTS
(FAR HILLS AVENUE TO REDPOINT DRIVE)
FUTURE SID PROJECT
A.P.N. 137-22-301-001
2019



SHEET INDEX		
NO.	DWG	DESCRIPTION
1	G1	COVER SHEET
2	G2	PROJECT DATA SHEET
3	G3	GENERAL NOTES
4	HC1	HORIZONTAL CONTROL 1
5	HC2	HORIZONTAL CONTROL 2
6	MU1	MASTER UTILITY PLAN – WATER
7	MU2	MASTER UTILITY PLAN – STORM DRAIN
8	MU3	MASTER UTILITY PLAN – SEWER
9	MG	MASTER GRADING PLAN
10	GD1	GRADING PLAN 1
11	GD2	GRADING PLAN 2
12	PP1	PLAN AND PROFILE 1
13	PP2	PLAN AND PROFILE 2
14	PP3	PLAN AND PROFILE 3
15	PP4	PLAN AND PROFILE 4
16	PP4A	PLAN AND PROFILE 4A
17	PP5	PLAN AND PROFILE 5
18	PP5A	PLAN AND PROFILE 5A
19	PP6	PLAN AND PROFILE 6
20	PP6A	PLAN AND PROFILE 6A
21	PP7	PLAN AND PROFILE 7
22	PP7A	PLAN AND PROFILE 7A
23	LP1	LATERAL PROFILES 1
24	LP2	LATERAL PROFILES 2
25	LP3	LATERAL PROFILES 3
26	LP4	LATERAL PROFILES 4
27	LP5	LATERAL PROFILES 5
28	DT1	TYPICAL DETAILS & SECTIONS 1
29	DT2	TYPICAL DETAILS & SECTIONS 2
30	DT3	TYPICAL DETAILS & SECTIONS 3
31	DT4	UTILITY DETAILS 1
32	DT5	UTILITY DETAILS 2
33	DT6	UTILITY DETAILS 3
34	TR1	SIGNAGE AND STRIPING PLAN 1
35	TR2	SIGNAGE AND STRIPING PLAN 2
36	TR3	SIGNAGE AND STRIPING PLAN 3
37	TR4	SIGNAGE AND STRIPING PLAN 4
38	SL1	STREETLIGHT AND ELECTRICAL PLAN 1
39	SL2	STREETLIGHT AND ELECTRICAL PLAN 2
40	SL3	STREETLIGHT AND ELECTRICAL PLAN 3
41	SL4	STREETLIGHT AND ELECTRICAL PLAN 4
42	SL5	STREETLIGHT AND ELECTRICAL PLAN 5
43	SL6	STREETLIGHT AND ELECTRICAL PLAN 6
44	S1	GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS
45	S2	JUNCTION STRUCTURE 6'X6' RCB TO EX. 8'X6' RCB
46	S3	JUNCTION STRUCTURE 48" RCP TO 6'X6' RCB

OWNER/DEVELOPER

THE HOWARD HUGHES COMPANY, LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
OFFICE PHONE NO. (702) 791-4300

ENGINEER

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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FAST
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1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

CAUTION TO CONTRACTOR

THE CONTRACTOR SHALL BE RESPONSIBLE TO INVESTIGATE AND VERIFY THE ACTUAL LOCATION AND DEPTH OF ALL EXISTING UNDERGROUND FACILITIES AT LEAST 48 HOURS IN ADVANCE OF THE PERFORMANCE OF ANY WORK.

THE HOWARD HUGHES COMPANY, LLC

KEVIN ORROCK — DATE
VICE PRESIDENT

DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

MICHAEL FANG, P.E. 24464 — DATE

CLV PLANNING DEPARTMENT

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

CITY OF LAS VEGAS PLANNING DEPARTMENT — DATE

ROSA CORTEZ, P.E. 17505 — DATE
ACTING CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS". THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 136472 — FIRST APPROVAL DATE: ____
LVVWD APPROVED FIRE FLOW: TOTAL 1,500 GPM / ON-SITE N/A GPM
SHEETS: G1–G3, MU1–MU3, PP1–PP7A, LP1–LP5, DT4–DT6

LAS VEGAS FIRE & RESCUE APPROVAL

LAS VEGAS FIRE & RESCUE — DATE

UTILITY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

CENTRAL TELEPHONE CO., DBA CENTURYLINK — DATE

THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY — DATE

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY – TRANSMISSION ENGINEERING — DATE

SOUTHWEST GAS CORPORATION — DATE

L#: L19–01120 | CLV#: 107V7884

STATE OF NEVADA — PROFESSIONAL ENGINEER — STEPHEN M JONES — No. 19639 — CIVIL — Exp. 06/30/2021 — DATE: 12/18/2019

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP
A	10/14/19	REVISED SHEETS 7, 12, 25				
B	12/18/19	REVISED SHEETS 2, 4, 10, 12, 14, 25, 41				

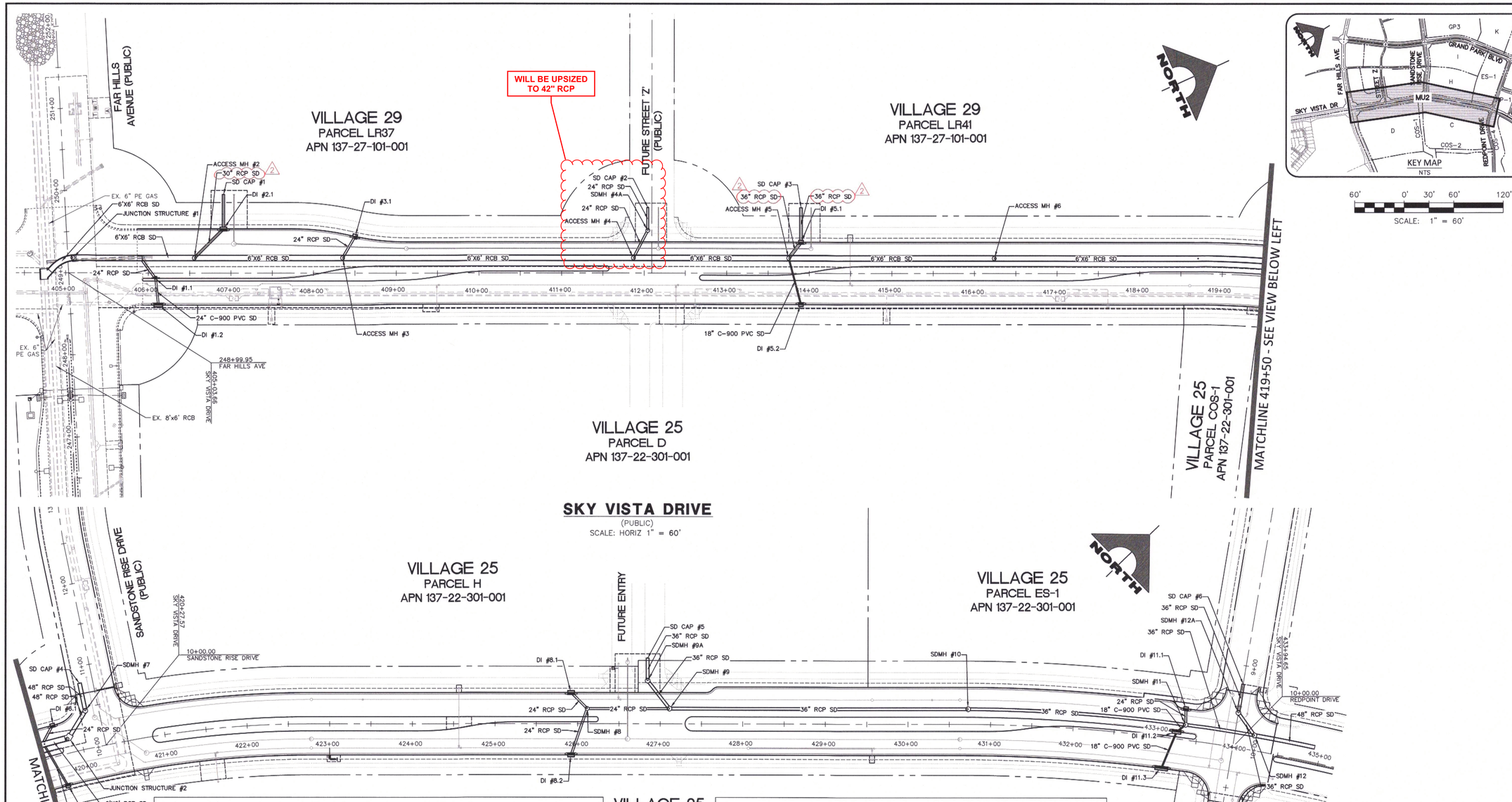
PROJECT NO. 62025-203
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 12-18-19
PLOT TIME: 15:29:48

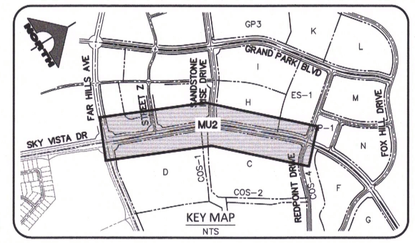
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\PROJECTS\6XX\62025-203\DWG\PRODUCTION\62025-203G01_GN.DWG — ALEXANDER SANTIAGO

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS (FAR HILLS AVENUE TO REDPOINT DRIVE)
COVER SHEET

DRAWING
G1
1 OF 46 SHTS





60' 0' 30' 60' 120'

SCALE: 1" = 60'

STORM DRAIN STRUCTURE SCHEDULE

STRUCT. #	STREET NAME	STATION & OFFSET	RIM	INV IN	INV OUT	NORTHING	EASTING	SIZE
ACCESS MH #2	SKY VISTA DRIVE	406+55.59, 18.45' LT	3561.4±	3546.91 3546.91	3546.91	1288630.13	866148.28	48"
ACCESS MH #3	SKY VISTA DRIVE	408+35.00, 18.45' LT	3561.6±	3547.81 3547.81	3547.81	1288793.62	866222.14	48"
ACCESS MH #4	SKY VISTA DRIVE	411+86.90, 18.43' LT	3563.3±	3549.57 3552.57	3549.57	1289114.31	866367.05	48"
ACCESS MH #5	SKY VISTA DRIVE	413+75.00, 18.42' LT	3564.2±	3550.51 3554.51 3552.58	3550.51	1289285.72	866444.50	48"
ACCESS MH #6	SKY VISTA DRIVE	416+23.80, 18.42' LT	3565.6±	3551.75	3551.75	1289512.45	866546.94	48"
JUNCTION STRUCTURE #1	SKY VISTA DRIVE	405+08.76, 18.45' LT	3560.6±	3546.17	3546.17	1288496.32	866087.82	48"
JUNCTION STRUCTURE #2	SKY VISTA DRIVE	419+85.86, 18.45' LT	3568.0±	3553.57	3553.57	1289841.23	866702.69	48"
SDMH #4A	SKY VISTA DRIVE	412+04.31, 52.00' LT	3563.6±	3553.35	3553.35	1289144.00	866343.62	48"
SDMH #7	SANDSTONE RISE DRIVE	10+45.68, 16.00' LT	3568.7±	3555.56	3555.56	1289878.49	866693.13	60"
SDMH #8	SKY VISTA DRIVE	426+11.65, 18.45' LT	3557.4±	3546.95 3546.95	3546.95	1290315.84	867114.56	48"
SDMH #9	SKY VISTA DRIVE	427+11.26, 18.45' LT	3554.3±	3542.38 3542.38	3542.38	1290387.21	867184.03	60"
SDMH #9A	SKY VISTA DRIVE	426+84.71, 52.49' LT	3555.3±	3546.70	3546.70	1290391.93	867141.12	60"
SDMH #10	SKY VISTA DRIVE	430+72.87, 18.47' LT	3546.1±	3533.28	3533.28	1290646.40	867436.32	60"
SDMH #11	SKY VISTA DRIVE	433+34.73, 18.45' LT	3541.7±	3530.18 3530.18 3530.18	3530.18	1290822.19	867633.40	60"
SDMH #12	SKY VISTA DRIVE	434+18.24, 18.42' LT	3539.9±	3528.75 3528.75	3528.75	1290872.65	867700.91	60"
SDMH #12A	REDPOINT DRIVE	9+57.74, 0.00'	3541.3±	3529.76	3529.76	1290877.89	867667.53	60"

STORM DRAIN DROP INLET SCHEDULE

STRUCT. #	STREET NAME	STATION & OFFSET	RIM	INV IN	INV OUT	NORTHING	EASTING	SIZE
DI #1.1	SKY VISTA DRIVE	406+08.96, 6.83' RT	3561.0±	3551.53	3551.53	1288577.22	866152.12	4.0' (1)
DI #1.2	SKY VISTA DRIVE	406+12.20, 39.00' RT	3559.8±		3552.00	1288566.93	866182.77	10.0'
DI #2.1	SKY VISTA DRIVE	406+90.99, 53.84' LT	3562.2±	3551.92	3551.92	1288676.96	866130.60	7.5'
DI #3.1	SKY VISTA DRIVE	408+50.00, 44.52' LT	3561.4±		3551.36	1288818.03	866204.57	5.0'
DI #5.1	SKY VISTA DRIVE	413+90.00, 38.00' LT	3564.3±	3555.78	3555.78	1289307.45	866432.83	5.0'
DI #5.2	SKY VISTA DRIVE	413+90.00, 38.00' RT	3564.3±		3556.66	1289276.16	866502.09	5.0'
DI #6.1	SKY VISTA DRIVE	419+70.70, 38.00' LT	3568.6±		3559.08	1289837.54	866678.01	5.0'
DI #6.2	SKY VISTA DRIVE	419+70.70, 38.00' RT	3567.2±		3560.60	1289800.05	866744.12	5.0'
DI #8.1	SKY VISTA DRIVE	425+92.10, 38.00' LT	3558.0±		3548.89	1290315.47	867086.91	7.5'
DI #8.2	SKY VISTA DRIVE	425+92.10, 38.00' RT	3558.0±		3547.85	1290262.46	867141.37	7.5'
DI #11.1	SKY VISTA DRIVE	433+32.54, 38.00' LT	3542.7±		3534.57	1290836.23	867619.61	5.0'
DI #11.2	SKY VISTA DRIVE	433+25.09, 8.33' LT	3541.9±	3531.80	3531.80	1290808.24	867632.01	10.0'
DI #11.3	SKY VISTA DRIVE	433+12.22, 38.00' RT	3541.0±		3532.12	1290764.02	867650.82	15.0'

SOUTHWEST GAS APPROVAL

SOUTHWEST GAS CORPORATION DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 136472 FIRST APPROVAL DATE:

LVVWD APPROVED FIRE FLOW: TOTAL 1,500 GPM / ON-SITE N/A GPM

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OR
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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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CALL BEFORE YOU DIG OVERHEAD
1-702-227-2929

L#: L19-01120 CLV#: 107V7884

SURVEYOR'S CERTIFICATION
STEPHEN M. JONES
Exp. 06/30/2021
CIVIL
No. 19639
STATE OF NEVADA
DATE: 12/18/2019

REV	DATE	DESCRIPTION	DATE AGEN APP	DATE	GCW APP
A	10/14/19	REVISED DROP INLET SIZE			
B	10/29/19	REVISED SDMH #9A TO FUTURE COS PARCELS			

PROJECT NO. 62025-203
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 12-18-19
PLOT TIME: 15:30:52

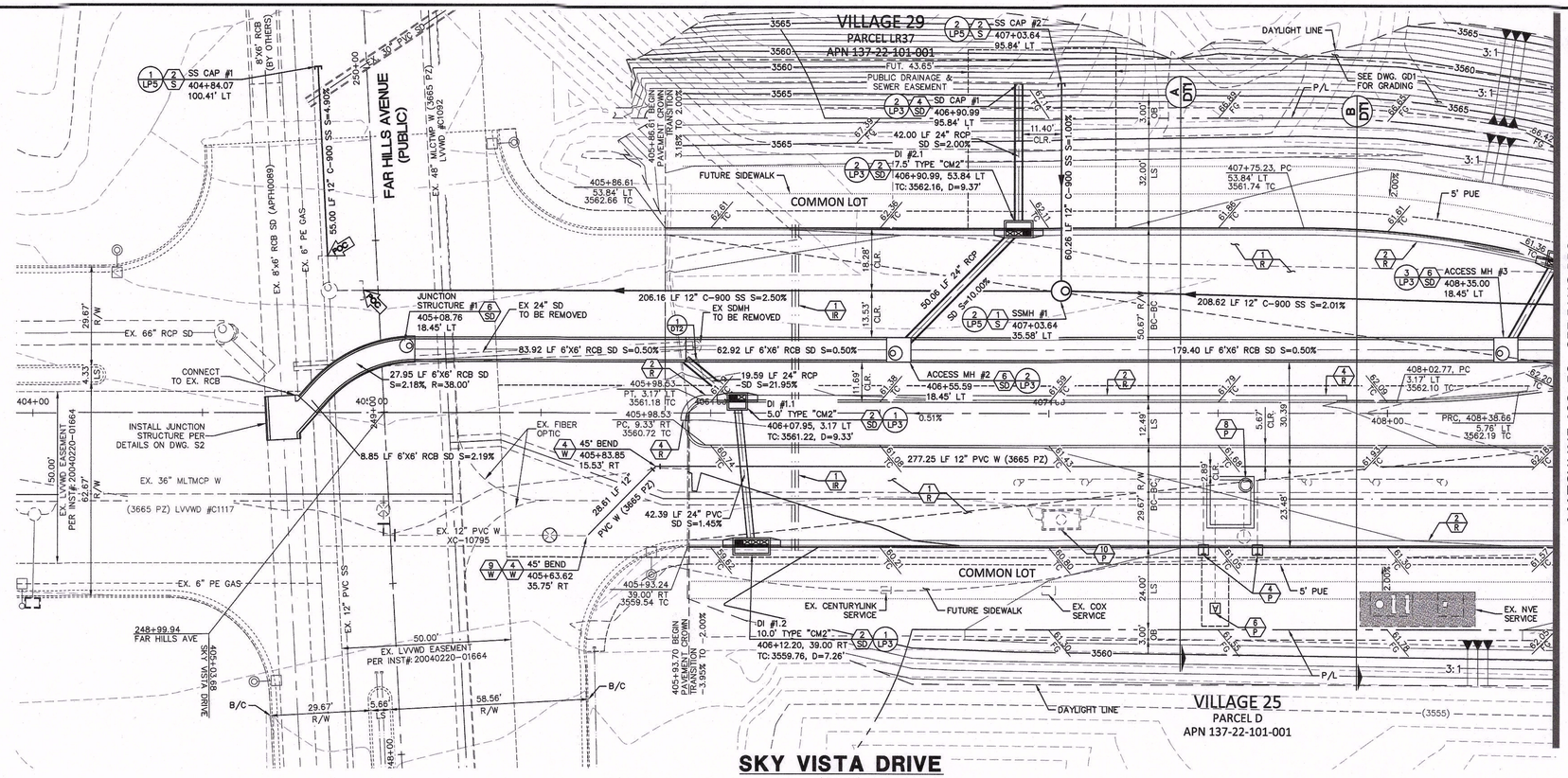
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\PROJECTS\6200\62025-203\GWC\PRODUCTION\62025-203CP4_MU2.DWG
ALEXANDER SANTIAGO

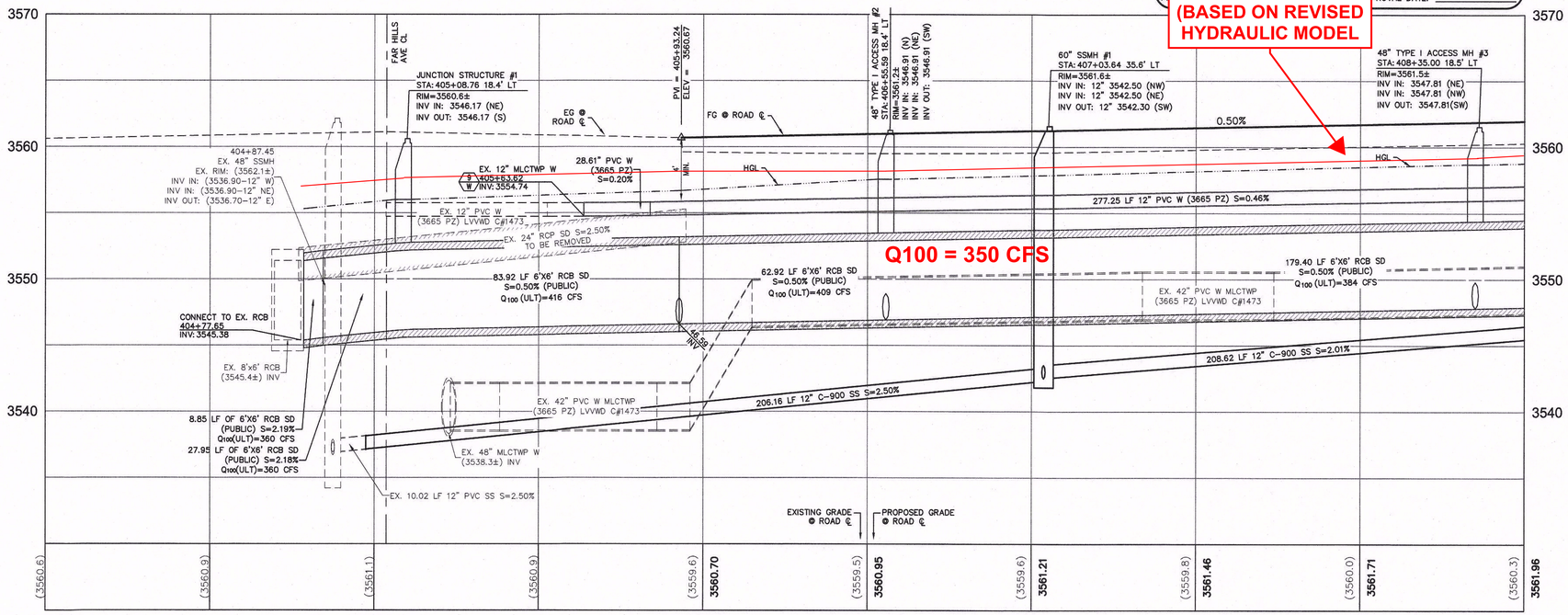
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
(FAR HILLS AVENUE TO REDPOINT DRIVE)

MASTER UTILITY PLAN - STORM DRAIN

DRAWING
MU2
7 OF 46 SHTS





DROP INLET NOTE:

ALL STORM DRAIN DROP INLETS ARE TO BE CONSTRUCTED PER THE REQUIREMENTS OF USDCCA DWG. NO. 421 (STORMWATER QUALITY MANAGEMENT STAMP AND SIGN DETAIL).

OFF-SITE FLOOD CONTROL NOTE:

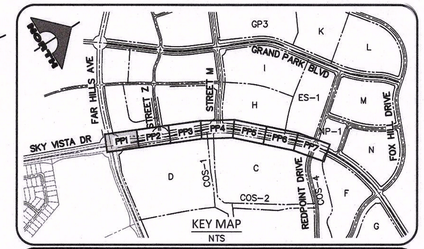
ALL OFF-SITE INTERIM FLOOD CONTROL FACILITIES SUCH AS, BUT NOT LIMITED TO, BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND ARE TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

FOR SKY VISTA DRIVE EXISTING IMPROVEMENTS FROM ALTA DRIVE TO FAR HILLS AVENUE, REFER TO THE FOLLOWING SET:
"SUMMERLIN VILLAGE 23B
SKY VISTA DRIVE IMPROVEMENTS ALTA DRIVE TO FAR HILLS AVENUE"
BY GCW, INC.
CLV #107V7418

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT-ENGINEERING SERVICES

PROVAL DATE:



PROTECTION CONSTRUCTION NOTES

1 P EXISTING PAVEMENT, PROTECT IN PLACE
2 P EXISTING CURB/GUTTER, PROTECT IN PLACE
3 P EXISTING PULLBOX, ADJUST TO FINISH GRADE
4 P EXISTING TEST STATION, ADJUST TO FINISH GRADE & RELOCATE TO BEHIND CURB IF NECESSARY.
5 P EXISTING BLOW-OFF, ADJUST TO FINISH GRADE PER UDACS PLT. NO. 37
6 P EXISTING AVAR, ADJUST TO FINISH GRADE PER UDACS PLT. NO. 38
7 P EXISTING GATE VALVE, ADJUST TO FINISH GRADE PER UDACS PLT. NO. 39
8 P EXISTING WATER VAULT MH, ADJUST TO FINISH GRADE PER UDACS PLT. NO. C-475
9 P EXISTING SSMH, ADJUST TO FINISH GRADE
10 P EXISTING WATER FIBER OPTIC SPLICE PIT PROTECT IN PLACE. RAISE TO FINAL GRADE PER DETAIL 5, 7 & 8 DWG. DT2
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ROADWAY CONSTRUCTION NOTES

1 R INSTALL A.C. PAVEMENT PER STREET SECTIONS, SEE DWG. DT1
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5 R CONSTRUCT SIDEWALK RAMP PER USD DWG. NO. 235 (CASE II)

WATER CONSTRUCTION NOTES

1 W INSTALL FIRE HYDRANT & ASSEMBLY PER UDACS PLT. NO. 40. FOR "DEEP" FIRE HYDRANTS SEE UDACS PL. NO. 41.
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IRRIGATION CONSTRUCTION NOTES

1 IR BANK "A": 1-6" & 2-4" SCH 40 PVC. PER DETAIL 4 DWG. DT2

BASIS OF BEARING AND COORDINATES

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE:LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DERIVED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.
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BENCHMARK

BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T9S,R59E,S34	3318.31 (FEET)	1,011.422 (METERS)

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811 OR 1-800-227-2600

FAST Call before you UnderGround 1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

CLV#:

STATE OF NEVADA
MICHAEL FANG
Exp. 06/30/2019
No. 24457
PROFESSIONAL ENGINEER
CIVIL
DATE: 05/06/2019

90% REVIEW - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP	DATE

PROJECT NO. 62025-203
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 05-06-19
PLOT TIME: 11:38:20

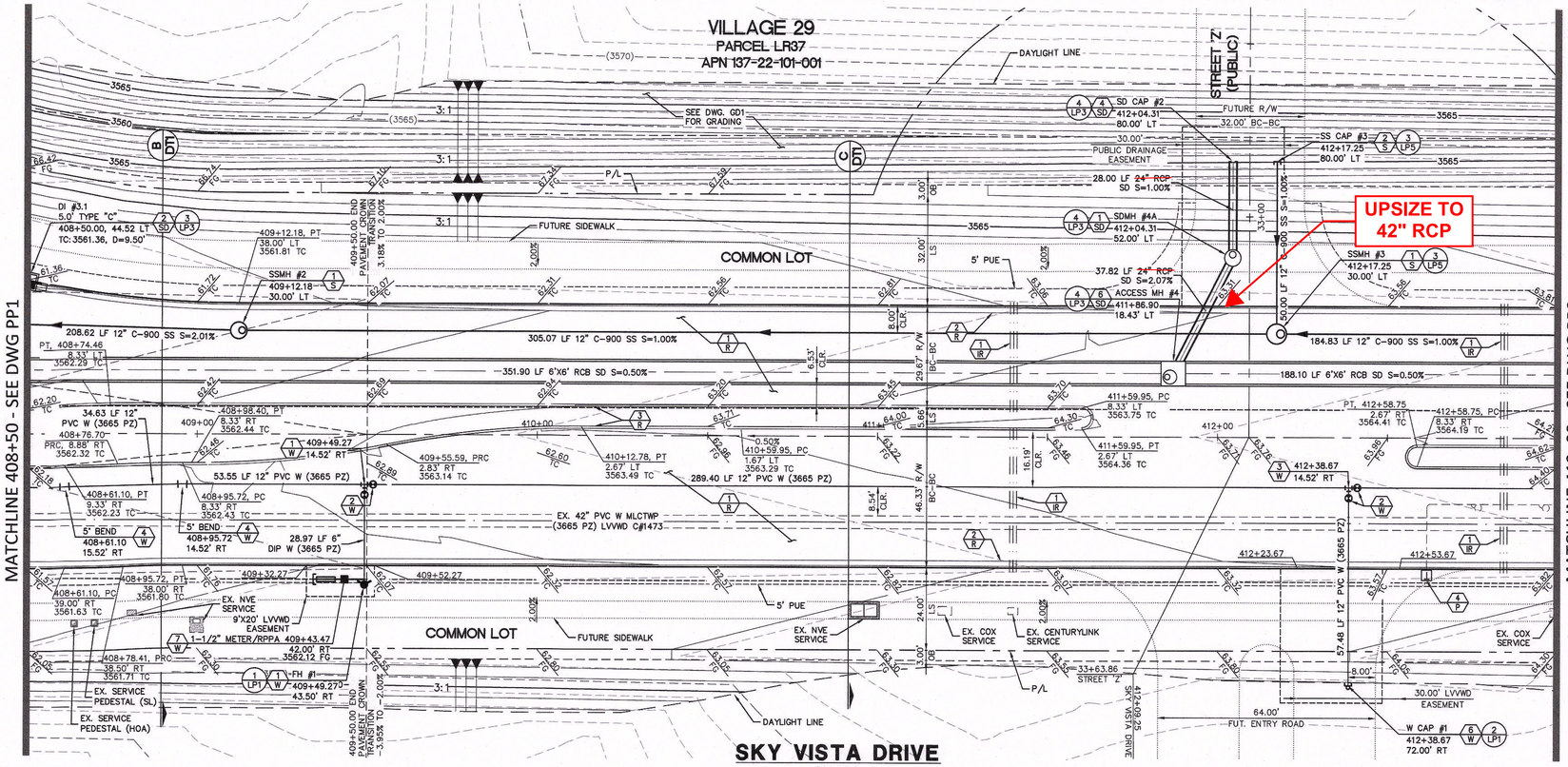
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\PROJECTS\62025-203\DWG\PRODUCTION\62025-203DTL_ZP.DWG
ALEXANDER SANTIAGO

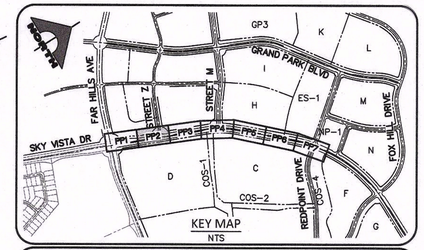
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
(FAR HILLS AVENUE TO REDPOINT DRIVE)

PLAN AND PROFILE 1

DRAWING
PP1
12 OF 43 SHTS





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DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
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BENCHMARK

BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T30S,R59E,S34	3318.31 (FEET)	1,011.422 (METERS)

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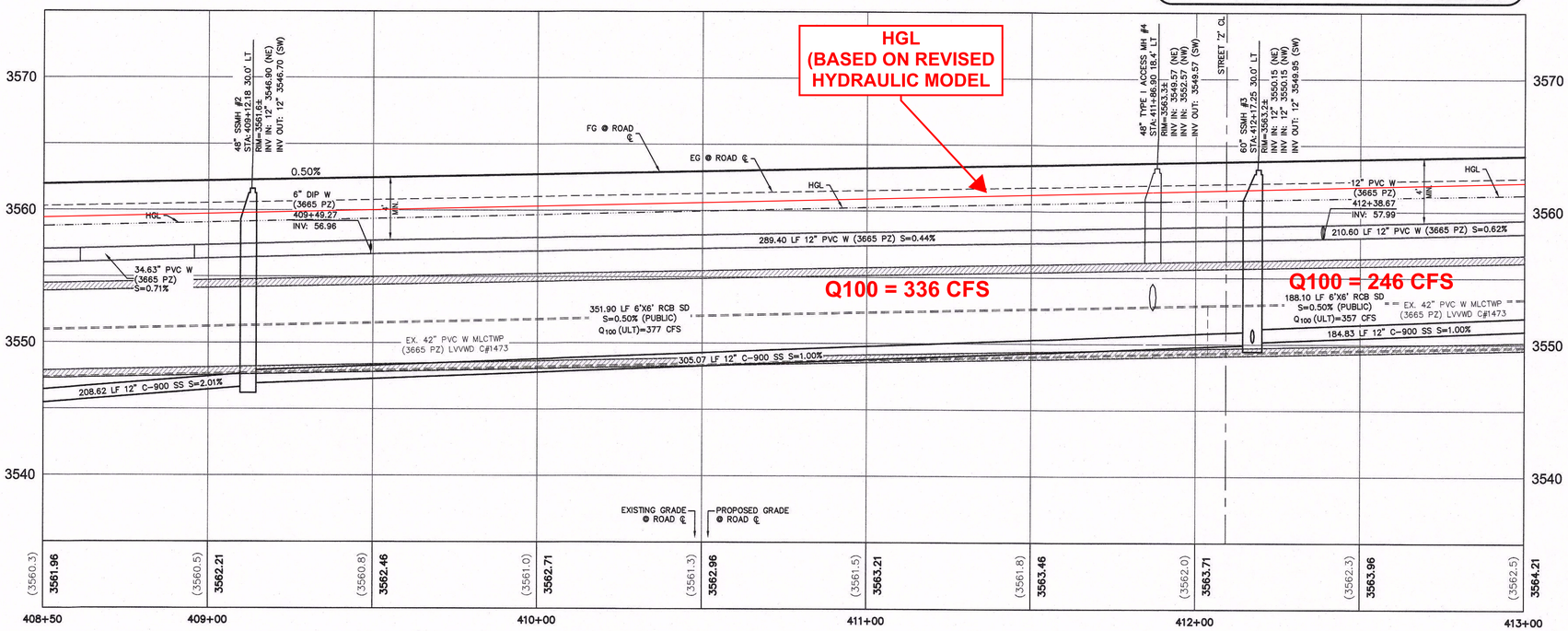
APPROVED FOR CONSTRUCTION
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. XXXXXX FIRST APPROVAL DATE:



GCV
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LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcvengineering.com

PROFESSIONAL ENGINEER - STATE OF NEVADA
MICHAEL FANG
Exp. 06/30/2019
No. 21446
CIVIL
DATE: 05/06/2019

90% REVIEW - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP	DATE

PROJECT NO. 62025-203
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 05-06-19
PLOT TIME: 11:38:58
ALEXANDER SANTIAGO

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
(FAR HILLS AVENUE TO REDPOINT DRIVE)

PLAN AND PROFILE 2

F:\PROJECTS\9000\62025-203\DWG\PRODUCTION\62025-203DDS_PP.DWG

DRAWING
PP2
13 OF 43 SHTS

CLV#:

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

MATCHLINE 413+00 SEE DWG PP2

MATCHLINE 417+50 - SEE DWG PP4

VILLAGE 29
PARCEL LR41
APN 137-22-101-001

SS CAP #3 413+90.00 80.00' LT

SS CAP #4 414+02.09 80.00' LT

DAYLIGHT LINE

FUT. 38.09'
PUBLIC DRAINAGE & SEWER EASEMENT

SEE DWG. GD1 FOR GRADING

42.00 LF 30" RCP SD S=2.00%

DI #5.1 5.0' TYPE "CM2" 413+90.00, 38.00 LT TC: 3564.27, D=7.99'

50.00 LF 12" C-900 SS S=2.00%

6'x9' LVVWD EASEMENT

FUTURE SIDEWALK

FH #2 414+49.27 43.50' LT

SSMH #4 414+02.09 30.00' LT

COMMON LOT

5' PUE

24.66 LF 30" RCP SD S=9.22%

184.83 LF 12" C-900 SS S=1.00%

ACCESS MH #5 413+75.00 18.42' LT

188.10 LF 6'X6' RCB SD S=0.50%

248.80 LF 6'X6' RCB SD S=0.50%

247.00 LF 6'X6' RCB SD S=0.50%

ACCESS MH #6 416+23.80 18.42' LT

413+55.25, PC TC, 2.67' RT 3564.89 TC

414+46.27

414+52.27

414+69.62, PT 8.33' LT 3565.54 TC

414+00

414+12.44, PRC 2.83' LT 3565.37 TC

58.02 LF 6" DIP W (3665 PZ)

415+00

416+00

417+00

417+12.81, PT 8.33' RT 3566.76 TC

0.50%

210.60 LF 12" PVC W (3665 PZ)

411.50 LF 12" PVC W (3665 PZ)

414+49.27 14.52' RT

EX. 42" PVC W MLCTWP (3665 PZ) LVVWD C#1473

58.38 LF 18" RCP SD S=2.64%

DI #5.2 5.0' TYPE "CM2" 413+90.00, 38.00 RT TC: 3564.28, D=7.72'

EX. NVE SERVICE

FUTURE SIDEWALK

EX. CENTURYLINK SERVICE

COMMON LOT

5' PUE

P/L

3:1

3560

3565

3570

(3559)

(3560)

(3563)

(3565)

DAYLIGHT LINE

SKY VISTA DRIVE

(PUBLIC)
SCALE: HORIZ 1" = 20'
VERT. 1" = 5'

20' 0' 10' 20' 40'

SCALE: 1" = 20'

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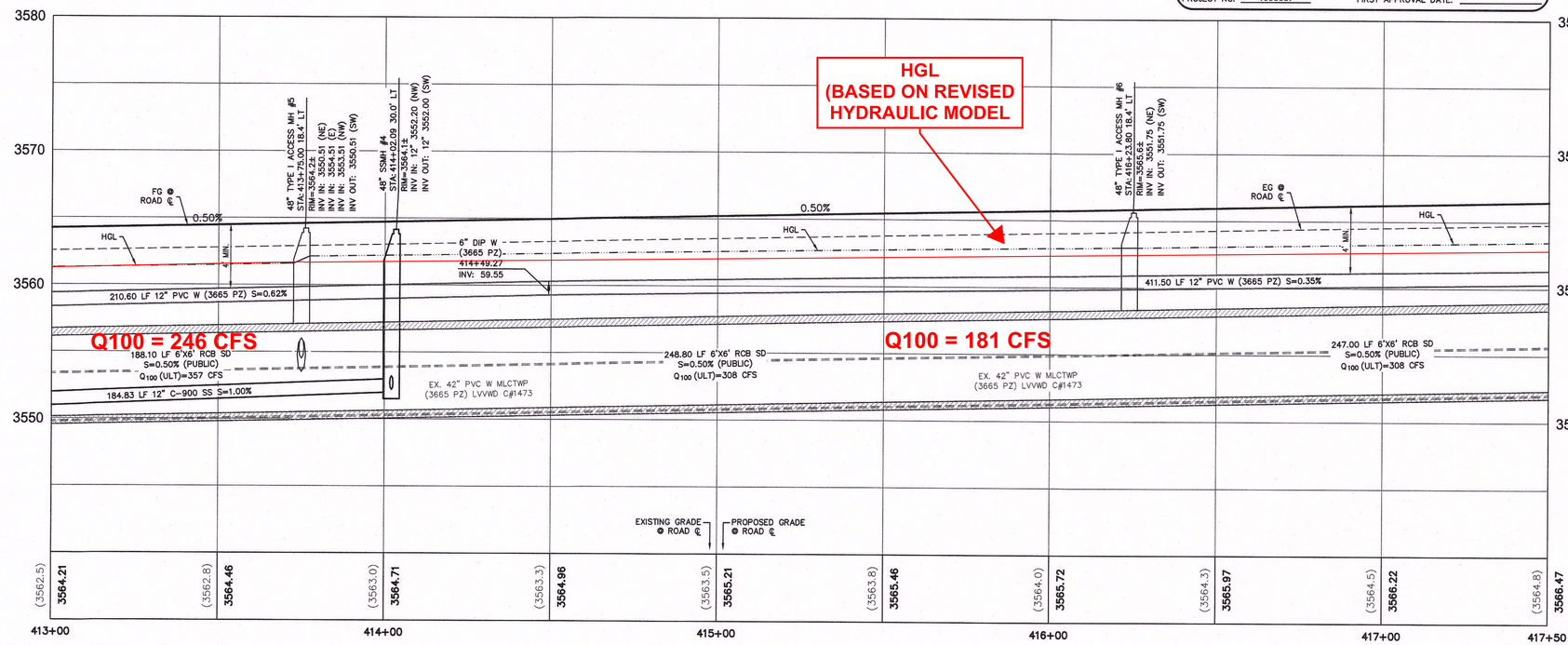
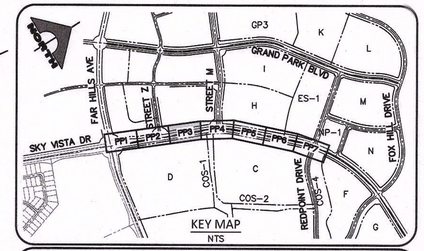
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVAL DATE:





KEY MAP
NTS

PROTECTION CONSTRUCTION NOTES

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DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T30S,R59E,S34	3318.31 (FEET)	1,011.422 (METERS)

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811 OR 1-800-227-2600

FAST Call before you UnderGround 1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

CLV#:

STATE OF NEVADA
ENGINEER
MICHAEL FANG
No. 21468
PROFESSIONAL
CIVIL
DATE: 05/06/2019

90% REVIEW - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	COM APP

PROJECT NO. 62025-203
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 05-06-19
PLOT TIME: 11:39:36

GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\PROJECTS\62025-203\DWG\PRODUCTION\62025-203CIS_PP.DWG

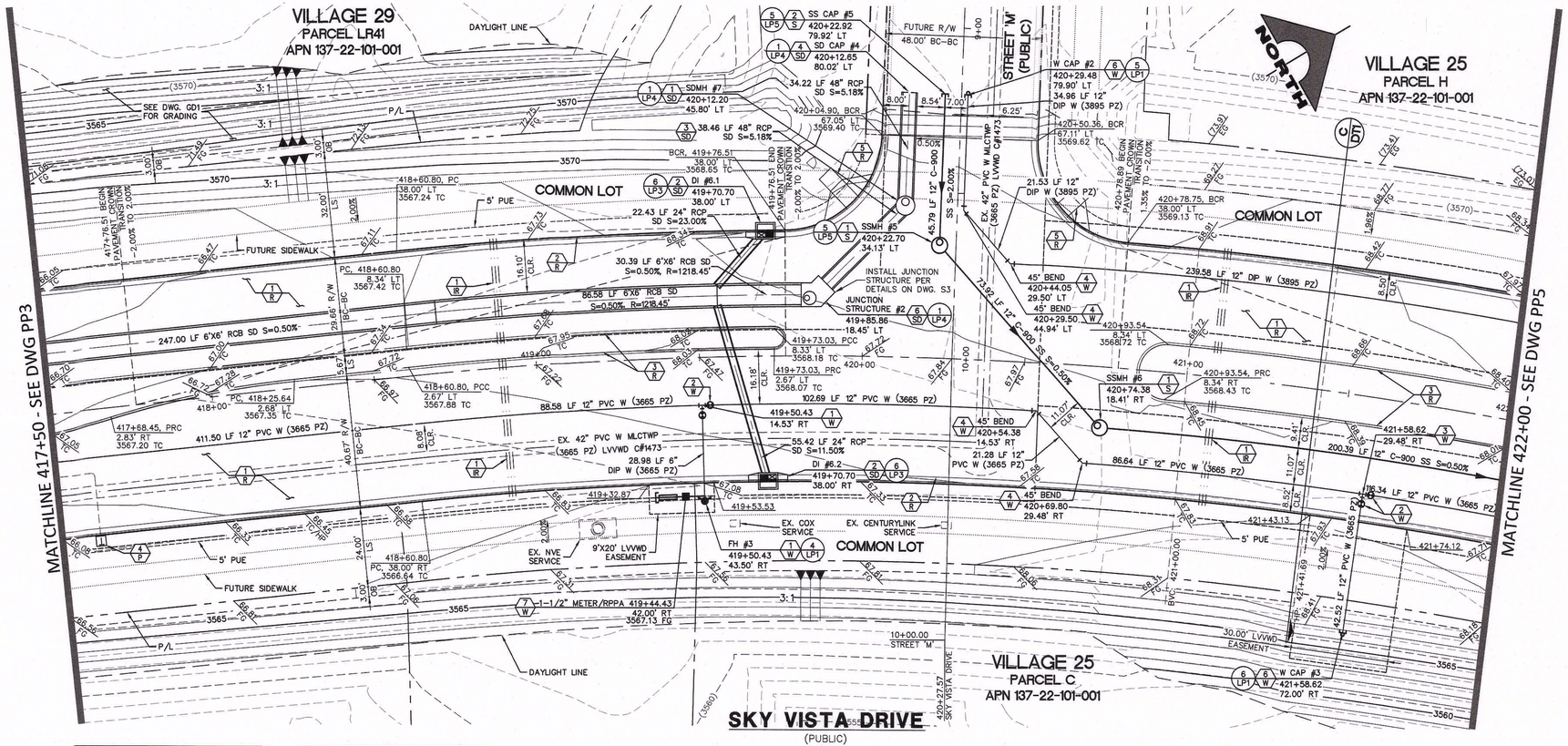
ALEXANDER SANTIAGO

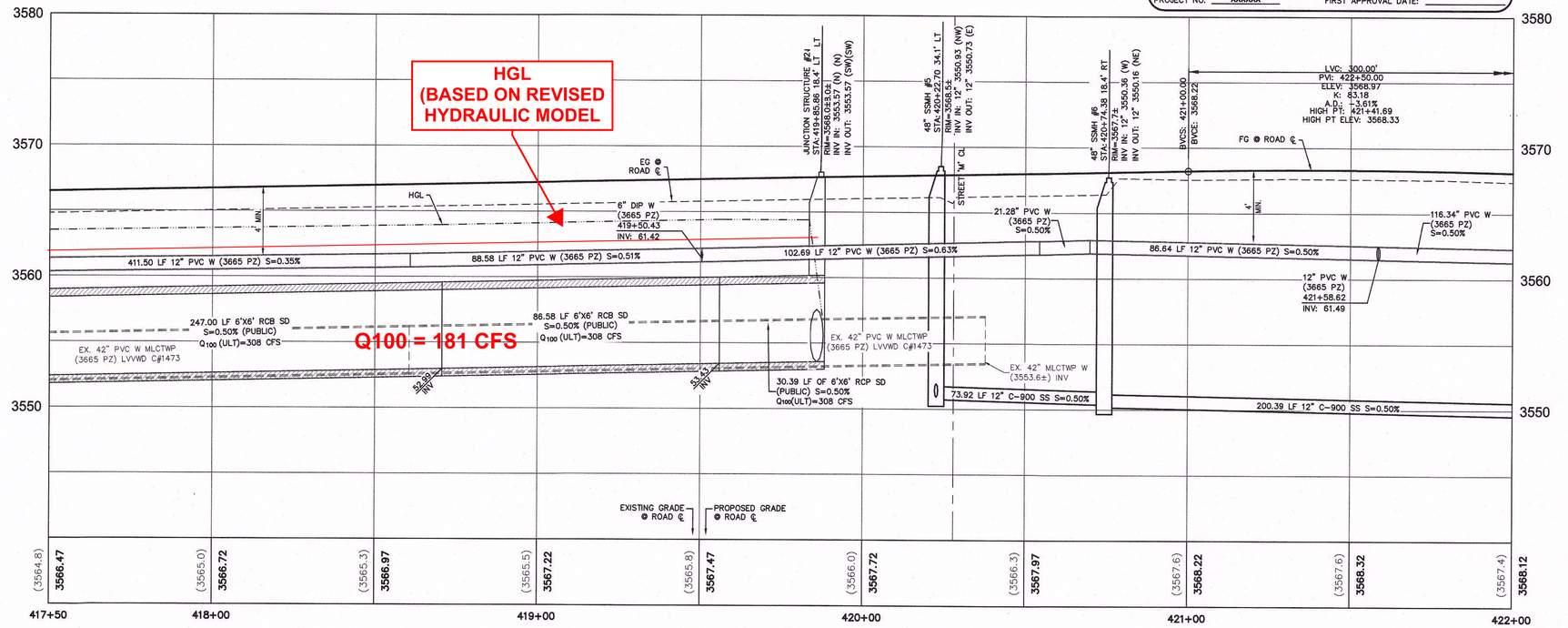
THE HOWARD HUGHES COMPANY, LLC

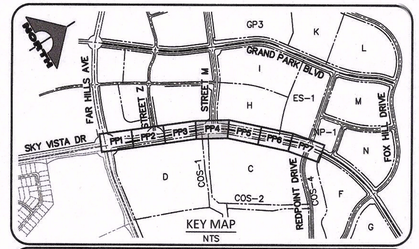
VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
(FAR HILLS AVENUE TO REDPOINT DRIVE)

PLAN AND PROFILE 3

DRAWING
PP3
14 OF 43 SHTS







DROP INLET NOTE:

ALL STORM DRAIN DROP INLETS ARE TO BE CONSTRUCTED PER THE REQUIREMENTS OF USDCCA DWG. NO. 421 (STORMWATER QUALITY MANAGEMENT STAMP AND SIGN DETAIL).

OFF-SITE FLOOD CONTROL NOTE:

ALL OFF-SITE INTERIM FLOOD CONTROL FACILITIES SUCH AS, BUT NOT LIMITED TO, BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND ARE TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

NOTE:

FOR 3895 PZ WATER LINE PROFILE VIEW, SEE DWG. PP4A

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVAL DATE:

PROTECTION CONSTRUCTION NOTES

1P EXISTING PAVEMENT, PROTECT IN PLACE
2P EXISTING CURB/GUTTER, PROTECT IN PLACE
3P EXISTING PULLBOX, ADJUST TO FINISH GRADE
4P EXISTING TEST STATION, ADJUST TO FINISH GRADE & RELOCATE TO BEHIND CURB IF NECESSARY.
5P EXISTING BLOW-OFF, ADJUST TO FINISH GRADE PER UDACS PLT. NO. 37
6P EXISTING AVAR, ADJUST TO FINISH GRADE PER UDACS PLT. NO. 38
7P EXISTING GATE VALVE, ADJUST TO FINISH GRADE PER UDACS PLT. NO. 39
8P EXISTING WATER VAULT MH, ADJUST TO FINISH GRADE PER UDACS PLT. NO. C-475
9P EXISTING SSMH, ADJUST TO FINISH GRADE
10P EXISTING WATER FIBER OPTIC SPLICE PIT PROTECT IN PLACE. RAISE TO FINAL GRADE PER DETAIL 5, 7 & 8 DWG. DT2
11P EXISTING WATER ACCESS MANHOLE PROTECT IN PLACE. RAISE TO FINAL PAVEMENT GRADE PER DETAIL 7 & 8 DWG. DT2

ROADWAY CONSTRUCTION NOTES

1R INSTALL A.C. PAVEMENT PER STREET SECTIONS, SEE DWG. DT1
2R INSTALL "L" TYPE CURB & GUTTER, SEE SUMMERLIN STD DWG. S-47
3R INSTALL "A" TYPE ISLAND CURB, SEE SUMMERLIN STD DWG. S-50
4R INSTALL CURB TRANSITION PER DETAIL 2 DWG. DT2
5R CONSTRUCT SIDEWALK RAMP PER USD DWG. NO. 235 (CASE II)

WATER CONSTRUCTION NOTES

1W INSTALL FIRE HYDRANT & ASSEMBLY PER UDACS PLT. NO. 40. FOR "DEEP" FIRE HYDRANTS SEE UDACS PL. NO. 41.
2W INSTALL GATE VALVE AND BOX PER UDACS PLT. NO. 30 AND 39
3W INSTALL TEE PER UDACS PLT. NO. 31
4W INSTALL HORIZONTAL BEND PER UDACS PLT. NO. 31 (SEE PLAN FOR ANGLE)
5W INSTALL REDUCER PER UDACS PLT. NO. 31
6W INSTALL CAP W/ 2" BLOW-OFF ASSEMBLY PER UDACS PLT. NO. 36
7W INSTALL 1-½" WATER METER AND 1-½" RPPA PER DETAIL 1 DWG. DT1
8W INSTALL VERTICAL BEND PER UDACS PLT. NO. 31 (SEE PROFILE FOR ANGLE)
9W REMOVE CAP AND BLOWOFF PER UDACS PLT. NO. 36 AND CONNECT TO EXISTING WATER LINE.

SEWER CONSTRUCTION NOTES

1S INSTALL SEWER MANHOLE PER DCS STD. DWG. 1A AND 1B
2S STUB AND CAP SEWER PIPE PER DETAIL 3, DWG. DT2
3S REMOVE PLUG & CONNECT TO SEWER LINE (CONTRACTOR TO VERIFY SIZE, INVERT, AND LOCATION OF EX. SEWER PRIOR TO CONSTRUCTION)

STORM DRAIN CONSTRUCTION NOTES

1SD INSTALL TYPE II-SD MANHOLE PER USD DWG. NO. 405.2
2SD INSTALL TYPE "CM2" DROP INLET PER USD DWG. NO. 412.1 AND 421
3SD INSTALL 1" SACRIFICIAL CONCRETE, MIN. 6000 PSI
4SD INSTALL TEMPORARY PLUG AND CAP
5SD REMOVE PLUG & CONNECT TO STORM DRAIN (CONTRACTOR TO VERIFY SIZE, INVERT, AND LOCATION OF EX. STORM DRAIN PRIOR TO CONSTRUCTION)
6SD INSTALL TYPICAL TYPE I ACCESS MANHOLE IN RCB PER DETAILS ON DWG. S1 AND USD DWG. NO. 403.1

IRRIGATION CONSTRUCTION NOTES

1IR BANK "A": 1-6" & 2-4" SCH 40 PVC. PER DETAIL 4 DWG. DT2

BASIS OF BEARING AND COORDINATES

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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BENCHMARK

BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T5OS,R59E,S34	3318.31 (FEET)	1,011.422 (METERS)

Call before you Dig
Avoid cutting underground utility lines. It's costly.
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FAST
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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
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1-702-227-2929

CLV#:

STATE OF NEVADA
ENGINEER
MICHAEL FANG
No. 24464
PROFESSIONAL
CIVIL
DATE: 05/06/2019

90% REVIEW - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	CCW APP	DATE

PROJECT NO. 62025-203
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 05-06-19
PLOT TIME: 11:40:19

ALEXANDER SANTIAGO

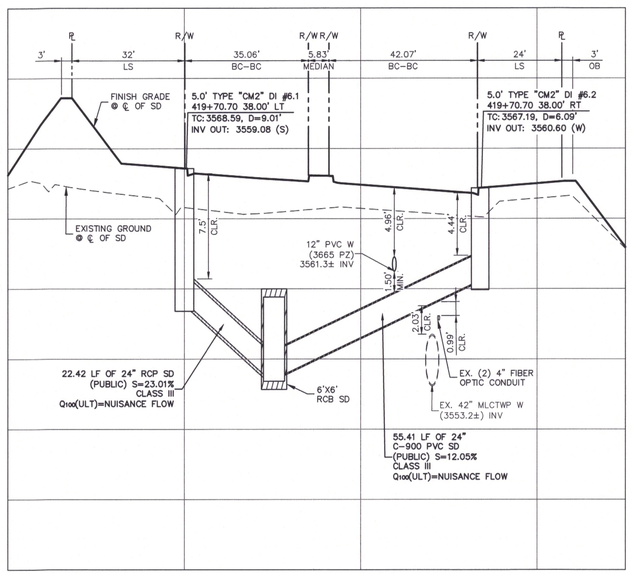
GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\PROJECTS\VDO\62025-203\DWG\PRODUCTION\62025-203CIDS_PP.DWG

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
(FAR HILLS AVENUE TO REDPOINT DRIVE)

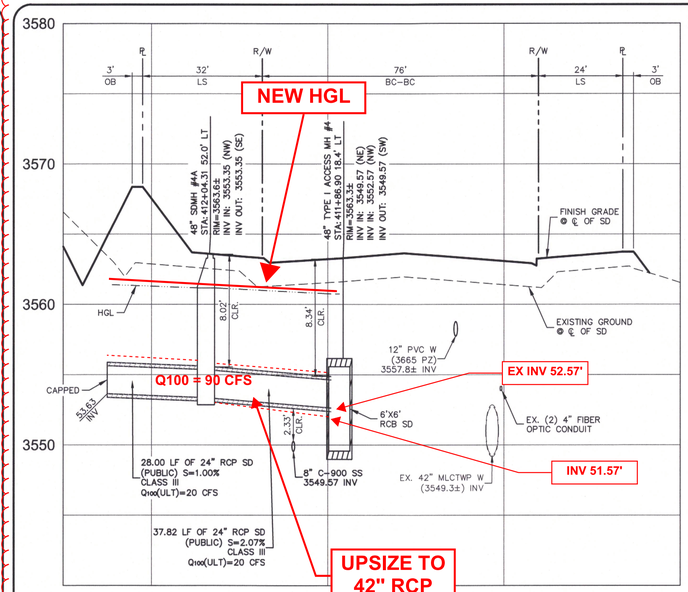
PLAN AND PROFILE 4

DRAWING
PP4
15 OF 43 SHTS



SKY VISTA DRIVE
SD LATERAL @ 419+55.92
SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING PP4

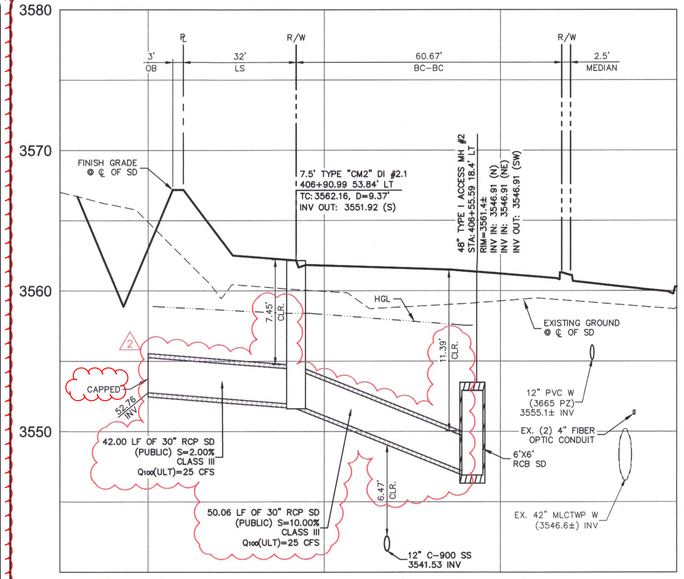
6



V29 CP11

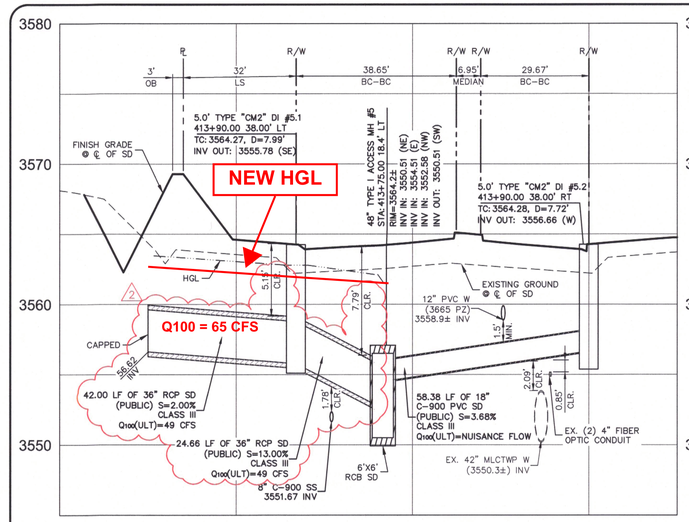
SKY VISTA DRIVE
SD LATERAL @ 411+86.90
SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING PP2

4



SKY VISTA DRIVE
SD LATERAL @ 406+55.59
SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING PP1

2



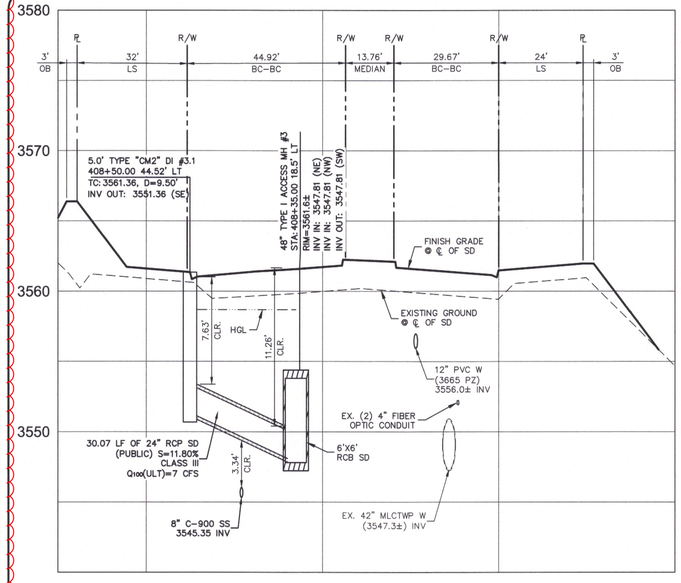
SKY VISTA DRIVE
SD LATERAL @ 413+75.00
SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING PP3

5

V29 B

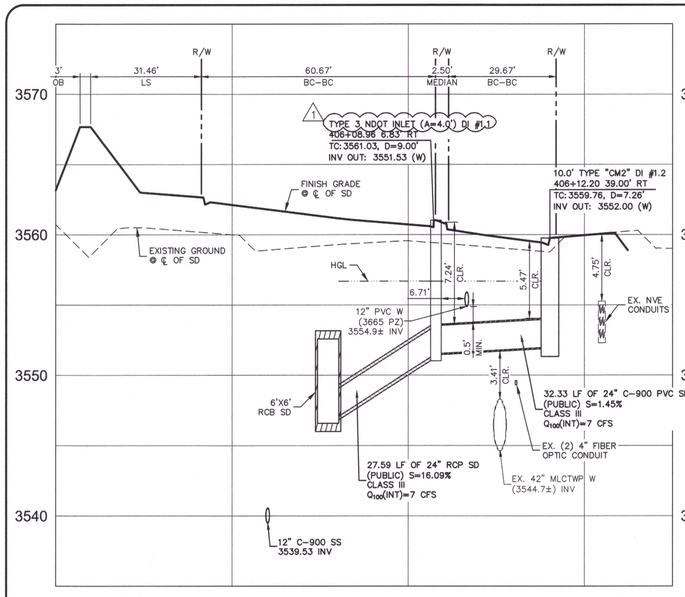
CONTROLLED LOW STRENGTH MATERIAL (CLSM)

PROTECT WATERLINES IN PLACE. WHENEVER A WATERLINE IS ABOVE A STORM DRAIN OR SEWER WHERE COMPACTION REQUIREMENTS UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CLASS I/CLASS II CONTROLLED LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY. ADDITIONAL HEALTH REGULATIONS MAY APPLY PER UDACS 2.22.



SKY VISTA DRIVE
SD LATERAL @ 408+35.00
SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING PP1

3



SKY VISTA DRIVE
SD LATERAL @ 405+92.68
SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING PP1

1

OFF-SITE FLOOD CONTROL NOTE

ALL OFF-SITE INTERIM FLOOD CONTROL FACILITIES SUCH AS, BUT NOT LIMITED TO, BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND ARE TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

DROP INLET NOTE

ALL STORM DRAIN DROP INLETS ARE TO BE CONSTRUCTED PER THE REQUIREMENTS OF USDCCA DWG. NO. 421 (STORMWATER QUALITY MANAGEMENT STAMP AND SIGN DETAIL).

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE:

CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB OR FLAT STRIP (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

CONSTRUCTION NOTE

IN AREAS WHERE THE EXCAVATION OR GROUND ELEVATION IS LESS THAN THREE (3) FEET, FROM THE TOP OF THE LVVWD TRANSMISSION MAIN; NO EXCAVATION EQUIPMENT, OTHER THAN HAND HELD EQUIPMENT WILL BE ALLOWED WITHIN TEN (10) FEET OF THE PIPELINE IN THESE AREAS. THE CONTRACTOR IS TO PLACE A CONCRETE BARRIER; I.E. JERSEY RAIL, TO IDENTIFY AND PROTECT THE "NO EQUIPMENT ZONE".

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 136472 FIRST APPROVAL DATE:

L#: L19-01120 CLV#: 107V7884

STATE OF NEVADA — PROFESSIONAL ENGINEER — STEPHEN M. JONES — CIVIL — No. 9368 — Exp. 06/30/2021 — DATE: 12/18/2019

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP	DATE
1	10/14/19	REVISED DROP INLET SIZE				
2	12/18/19	UPSIZED 36" PIPE FOR FUTURE V29 PARCELS				

PROJECT NO. 62025-203
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 12-18-19
PLOT TIME: 15:36:34

GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\PROJECTS\62025-203\DWG\PRODUCTION\62025-203CIVIL_LP.DWG — ALEXANDER SANTIAGO

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
(FAR HILLS AVENUE TO REDPOINT DRIVE)

LATERAL PROFILES 3

DRAWING
LP3
25 OF 46 SHTS

SUMMERLIN VILLAGE 25
IMPROVEMENT PLANS FOR:

SANDSTONE RISE DRIVE (STREET M)

SKY VISTA DRIVE TO PARK DRIFT TRAIL (STREET K)
FUTURE SID PROJECT

SUMMERLIN®

SHEET INDEX

1	COVER SHEET	
2	LEGEND AND ABBREVIATIONS	
3	GENERAL NOTES	
4	HORIZONTAL CONTROL PLAN	
5	MASTER DRAINAGE PLAN	
6	MASTER WATER PLAN	
7	MASTER SEWER PLAN	
8	SANDSTONE RISE DRIVE GRADING PLAN	STA 31+00 TO END
9	SANDSTONE RISE DRIVE PLAN AND PROFILE	STA 31+00 TO END
10	SANDSTONE RISE DRIVE GRADING PLAN	STA 27+00 TO STA 31+00
11	SANDSTONE RISE DRIVE PLAN AND PROFILE	STA 27+00 TO STA 31+00
12	SANDSTONE RISE DRIVE GRADING PLAN	STA 24+00 TO STA 27+00
13	SANDSTONE RISE DRIVE PLAN AND PROFILE	STA 24+00 TO STA 27+00
14	SANDSTONE RISE DRIVE GRADING PLAN	STA 20+00 TO STA 24+00
15	SANDSTONE RISE DRIVE PLAN AND PROFILE	STA 20+00 TO STA 24+00
16	SANDSTONE RISE DRIVE GRADING PLAN	STA 16+50 TO STA 20+00
17	SANDSTONE RISE DRIVE PLAN AND PROFILE	STA 16+50 TO STA 20+00
18	SANDSTONE RISE DRIVE GRADING PLAN	STA 12+00 TO STA 16+50
19	SANDSTONE RISE DRIVE PLAN AND PROFILE	STA 12+00 TO STA 16+50
20	SANDSTONE RISE DRIVE GRADING PLAN	BEGIN TO STA 12+00
21	SANDSTONE RISE DRIVE PLAN AND PROFILE	BEGIN TO STA 12+00
22	GRAND PARK BOULEVARD PLAN AND PROFILE	STA 10+00 TO STA 12+00
23	PARCEL J DRAINAGE SWALE	
24	STORM DRAIN LATERAL DETAILS	
25	WATER AND SEWER LATERAL DETAILS	
26	WATER LATERAL DETAILS	
27	STREET SECTIONS	
28	MISCELANEOUS DETAILS	
29	RESERVOIR ENTRY DETAILS	
30	WATER METER DETAILS	
31	STREETLIGHT PLAN	
32	TRAFFIC PLAN	

APPROVALS

HOWARD HUGHES COMPANY LLC, A DELAWARE LIMITED LIABILITY COMPANY

KEVIN T. ORROCK, VICE PRESIDENT — DATE

STEVEN FORD, P.E. #012175
CITY ENGINEER — DATE

CITY OF LAS VEGAS PLANNING DEPARTMENT — DATE

NOTE:
THIS PLAN CONFORMS TO THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT.

LAS VEGAS FIRE AND RESCUE — DATE

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK — DATE

THE AFFIXED CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES, AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 137065 FIRST APPROVED DATE: _____

LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL

SHEETS 1,2,3,6,9,11,13,15,17,19,21,22,25,26,27,28,30

NV ENERGY — DATE

NV ENERGY HAS ACKNOWLEDGED WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA UTILITY COMMISSION'S RULES AND REGULATIONS.

SOUTHWEST GAS CORPORATION — DATE

COX COMMUNICATIONS OF LAS VEGAS, INC — DATE

UTILITY NOTE

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

CALL BEFORE YOU DIG: 1-800-642-2444

THIS PROPERTY MAY HAVE STATIC WATER PRESSURE IN EXCESS OF 80 PSI. THE UNIFORM PLUMBING CODE REQUIRES THAT INDIVIDUAL, ON-SITE (PRIVATE) PRESSURE REDUCING VALVES BE INSTALLED WHENEVER THE PRESSURE EXCEEDS 80 PSI. PRV'S ARE THE DEVELOPER'S RESPONSIBILITY AND WILL NOTE BE INSPECTED OR INCLUDED IN THE ACCEPTANCE OF THE LAS VEGAS VALLEY WATER DISTRICT FACILITIES.

NOTICE OF INTENT NOTE

NOTE: ALL LAND SURFACE AREA DISTURBANCES OVER 1 ACRE REQUIRE A STORMWATER DISCHARGE PERMIT ISSUED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP). A PHASED CONSTRUCTION UNIT IN A CONTIGUOUS SUBDIVISION IS CONSIDERED UNDER CONSTRUCTION UNTIL ALL STRIPPED SURFACE AREAS HAVE BEEN COVERED BY PAVING, BUILDING CONSTRUCTION OR PLANTING. A STORMWATER DISCHARGE PERMIT APPLICATION AND ASSOCIATED INFORMATION MAY BE DOWNLOADED FROM THE WEB SITE: HTTP://WWW.STATE.NV.US/BWPC/STORM01.HTM PROJECTS THAT DISTURB MORE THAN ONE ACRE OF LAND MUST SUBMIT TO NDEP A "NOTICE OF INTENT" FOR INCLUSION UNDER STORMWATER PERMIT NO. NVR100000 ALONG WITH APPROPRIATE FILLING FEE.

NPDES PERMIT NOTE

THE ENGINEER SHOULD CONTACT THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP) TO OBTAIN A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT PRIOR TO CONSTRUCTION. ALL CONSTRUCTION PROJECTS ONE ACRE OR LARGER MUST APPLY FOR THE PERMIT THROUGH NDEP. ALL QUESTIONS REGARDING THE NPDES PERMIT REQUIREMENTS SHOULD BE DIRECTED TO THE NDEP AT (775) 687-9429.

FEMA FLOOD ZONE INFORMATION

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE X (UNSHADED) AS DEPICTED ON FLOOD INSURANCE RATE MAP (FIRM) PANEL 32003C2150E, DATED 9/27/2002. A ZONE X (UNSHADED) IS DESCRIBED AS AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN.

PROPOSED RIGHT-OF-WAY ACREAGE
2.72 AC.

PROPOSED DISTURBED AREA ACREAGE
7.33 A.C.

GEOTECHNICAL ENGINEER
PREPARED BY: NOVA GEOTECHNICAL & INSPECTION SERVICES
4480 W. HACIENDA AVENUE, SUITE 104, LAS VEGAS, NV 89118
PHONE: 702-873-3478
PROJECT NO.: G-19-026
DATED: MAY 9,2019

OWNER /DEVELOPER

OWNER

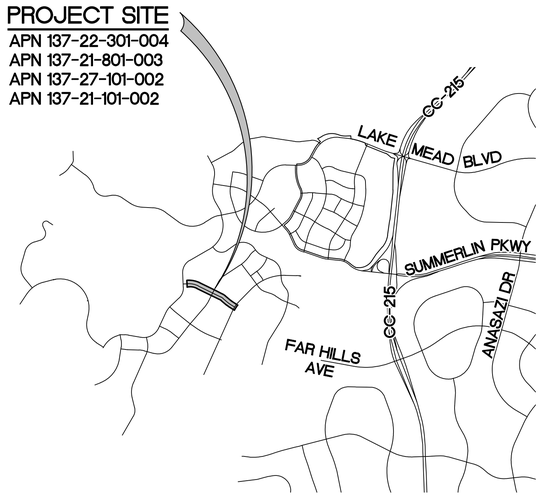
CONTACT: KEVIN ORROCK
HOWARD HUGHES COMPANY LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

ENGINEER / CONSULTANT

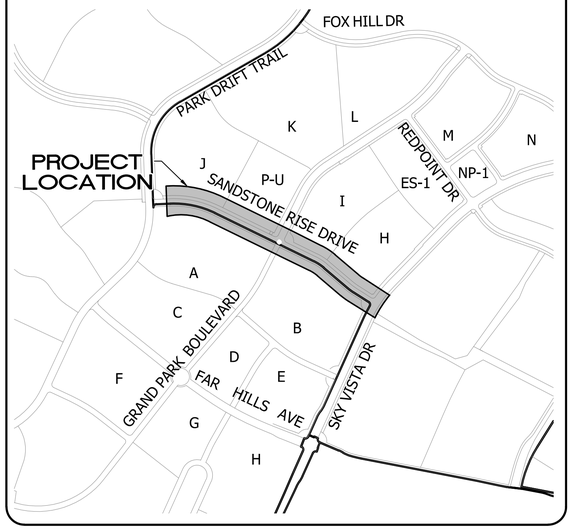
CIVIL

CONTACT: DAVID WILSON P.E.
ATKINS
2270 CORPORATE CIRCLE SUITE 200
HENDERSON, NEVADA 89074
(702) 263-7275

LOCATION MAP



VICINITY MAP



BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE
PROJECTION: TRANSVERSE MERCATOR STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID OF ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)
NOTES:

1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECTED AREA
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

LEGAL DESCRIPTION

BEING A PORTION OF LOT 2 AS SHOWN ON THE MAP THEREOF IN BOOK 124 OF PLATS, PAGE 51, OFFICIAL RECORDS, CITY OF LAS VEGAS CLARK COUNTY, NEVADA.

FAST Call before you UnderGround 1-702-432-5300 HYDROLOGY AND ARCHIVAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID BURYING OVERHEAD POWER LINES IN CONTU. Call 811 OR 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DIG OVERHEAD. 1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA — ANTHONY J. ORTIZ — EXP. 6-30-21 — CIVIL — NO. 18949 — 4/16/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 25
SANDSTONE RISE DRIVE (STREET M)
SKY VISTA DRIVE TO PARK DRIFT TRAIL (STREET K)

COVER SHEET

DESIGNED BY:	C. BLAKE
DRAWN BY:	C. BLAKE
CHECKED BY:	T. ORTIZ
HORIZ.:	NONE
VERT.:	NONE
DATE	APRIL 2020
DRAWING NO.	1/32
JOB NO.	100063656

107\5132
L20-00453

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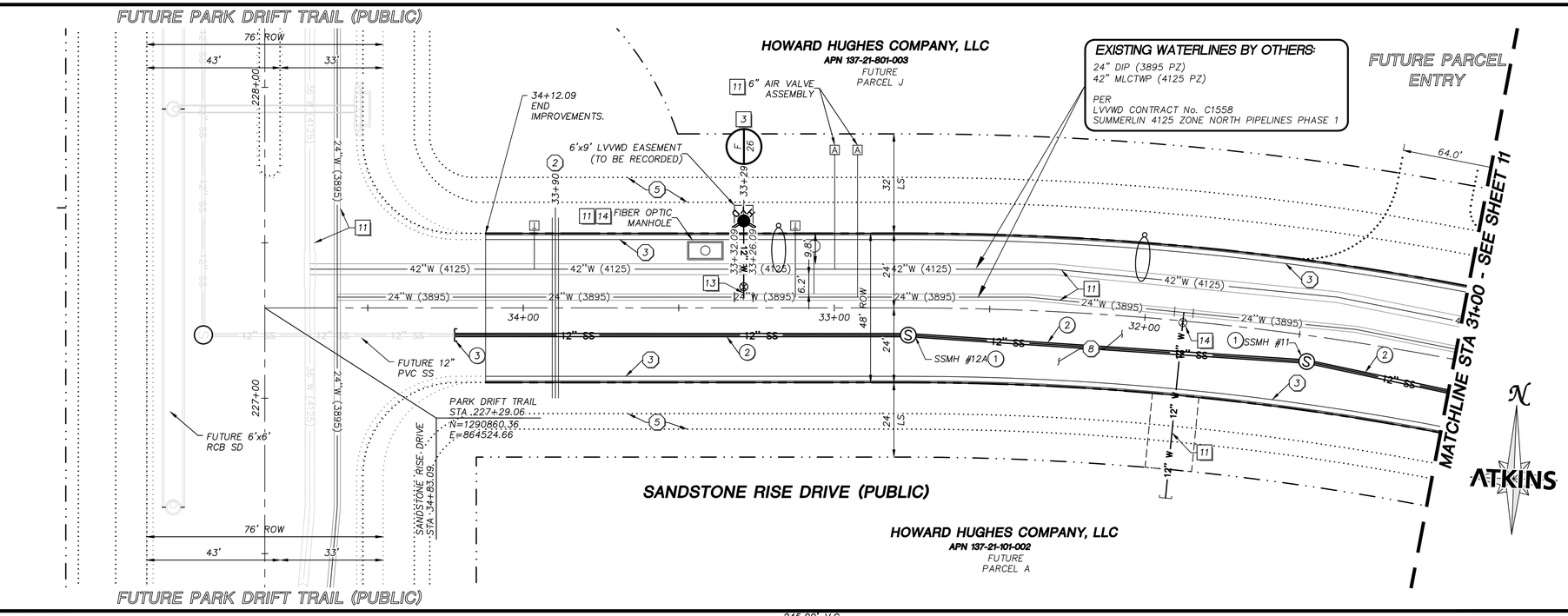

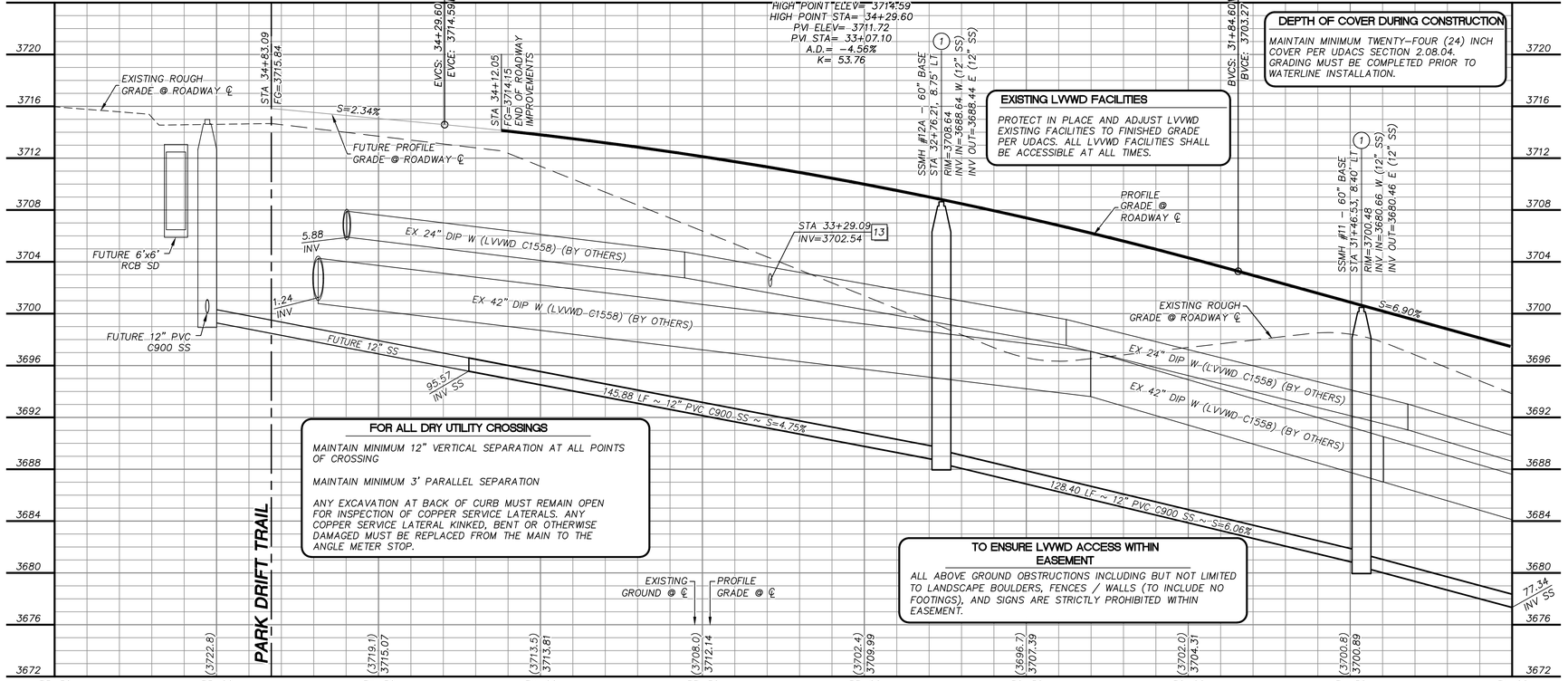

STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET 5 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1, #422 & #421. LENGTH PER PLAN
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11. EXISTING WATER LINE BY OTHERS
12. WATER MAIN JOINT DEFLECTION PER UDACS 2.07.01 AND 2.07.03
13. CONNECT TO EXISTING BLIND FLANGE
14. ADJUST EXISTING FACILITY TO GRADE PER UDACS
15. INSTALL 90° VERTICAL BEND PER UDACS PLATE #31

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3. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD #216
4. CONSTRUCT "A" TYPE ISLAND CURB PER CCAUSD #219
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7. CONSTRUCT SIDEWALK RAMP, PER DETAIL "A", SHEET 28
8. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE PER SOILS REPORT. SEE SHEET 27 FOR TYPICAL PAVEMENT SECTION.
9. CONSTRUCT SIDEWALK RAMP CASE II PER CCAUSD #235 AND DETAIL "B", SHEET 28

FOR ALL DRY UTILITY CROSSINGS

MAINTAIN MINIMUM 12" VERTICAL SEPARATION AT ALL POINTS OF CROSSING

MAINTAIN MINIMUM 3' PARALLEL SEPARATION

ANY EXCAVATION AT BACK OF CURB MUST REMAIN OPEN FOR INSPECTION OF COPPER SERVICE LATERALS. ANY COPPER SERVICE LATERAL KINKED, BENT OR OTHERWISE DAMAGED MUST BE REPLACED FROM THE MAIN TO THE ANGLE METER STOP.

EXISTING LVVWD FACILITIES

PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES.

DEPTH OF COVER DURING CONSTRUCTION

MAINTAIN MINIMUM TWENTY–FOUR (24) INCH COVER PER UDACS SECTION 2.08.04. GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION.

TO ENSURE LVVWD ACCESS WITHIN EASEMENT

ALL ABOVE GROUND OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO LANDSCAPE BOULDERS, FENCES / WALLS (TO INCLUDE NO FOOTINGS), AND SIGNS ARE STRICTLY PROHIBITED WITHIN EASEMENT.

GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"= 20'
5 0 2.5 5 10
VERTICAL: 1"= 5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 137065 FIRST APPROVED DATE: _____

LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL

GRADING PLAN CERTIFICATION

ANTHONY ORTIZ PE# 18849 04/16/2020 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DRAINAGE STUDY NO.: 5221

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET) FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-6300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES, IT'S QUIETLY. Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES, IT'S QUIETLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

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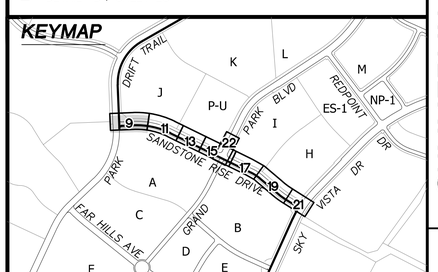
PROFESSIONAL ENGINEER – STATE OF NEVADA – ANTHONY J. ORTIZ – Exp. 6-30-21 – CIVIL – No. 18849
4/16/2020

KEYMAP



REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 25
SANDSTONE RISE DRIVE (STREET M)
SKY VISTA DRIVE TO PARK DRIFT TRAIL (STREET K)
SANDSTONE RISE DRIVE PLAN AND PROFILE STA 31H00 TO END

107Y5132 L20–00453	DESIGNED BY: G. BLAKE
DATE: APRIL 2020	DRAWN BY: G. BLAKE
DRAWING NO. 9/32	CHECKED BY: T. ORTIZ
	HORIZ.: 1"=20' VERT.: 1"=5'

JOB NO. 100063656

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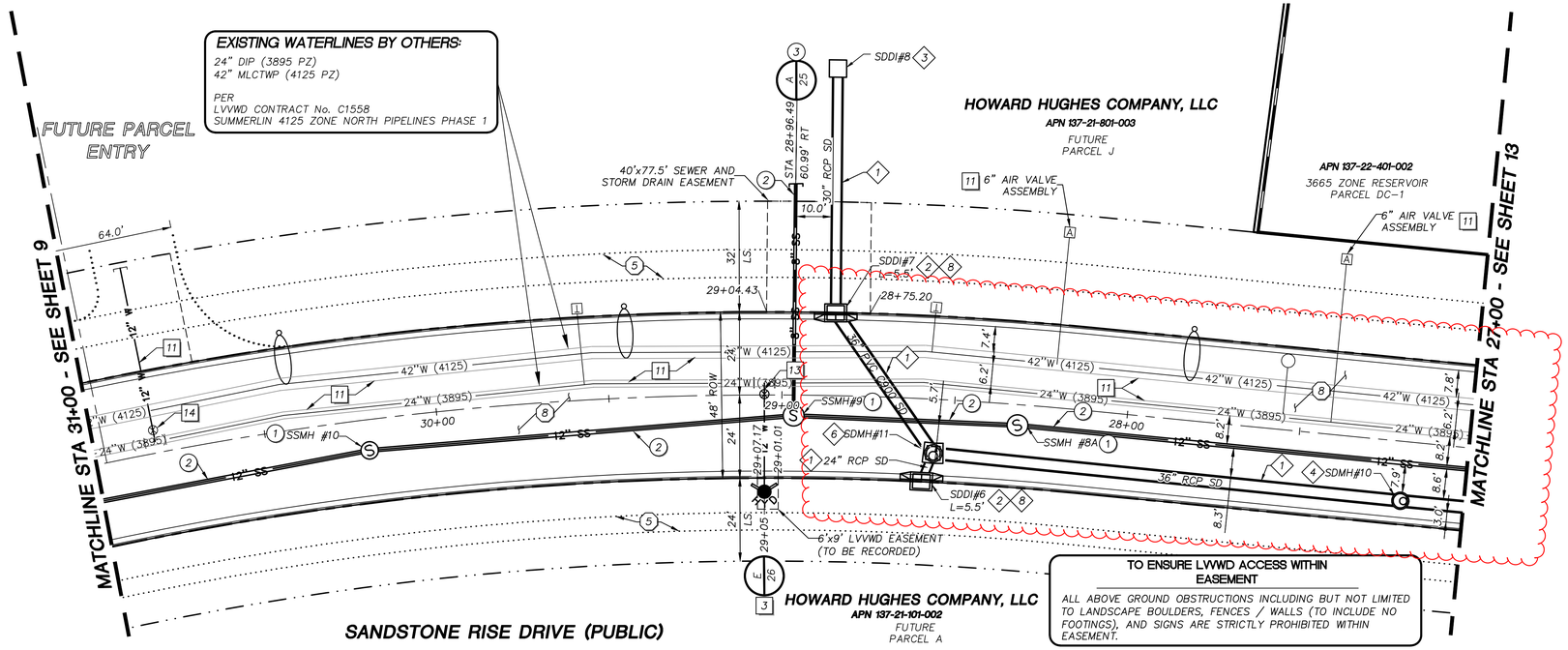

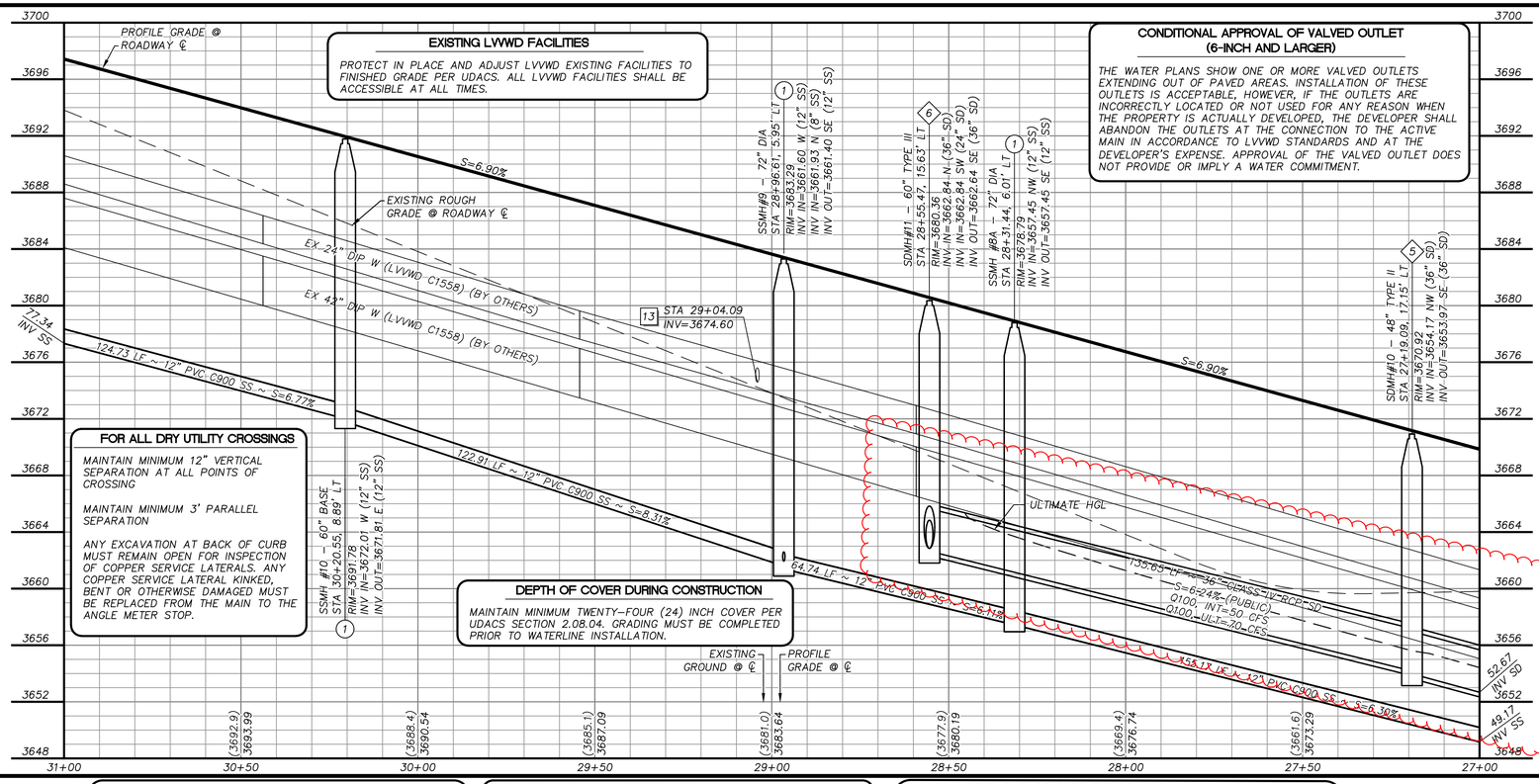

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20 0 10 20 40
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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 137065 FIRST APPROVED DATE: _____

LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL

GRADING PLAN CERTIFICATION

ANTHONY ORTIZ PE# 18849 04/16/2020 DATE

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T21S,R59E,S03

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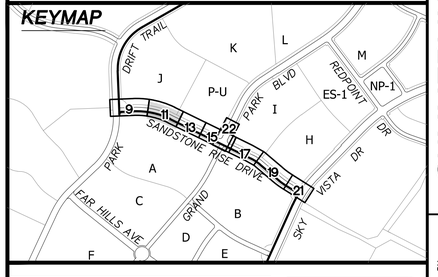

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NEVADA PROFESSIONAL ENGINEER-STATE OF NEVADA ANTHONY ORTIZ Exp. 6-30-21 CIVIL No. 18849
4/16/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

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SUMMERLIN VILLAGE 25
SANDSTONE RISE DRIVE (STREET M)
SKY VISTA DRIVE TO PARK DRIFT TRAIL (STREET K)

SANDSTONE RISE DRIVE PLAN AND PROFILE STA 27+00 TO STA 31+00

107\5132 L20-00453	
DATE:	APRIL, 2020
DRAWING NO.	11/32
DESIGNED BY:	G. BLAKE
DRAWN BY:	G. BLAKE
CHECKED BY:	T. ORTIZ
HORIZ.:	1"=20'
VERT.:	1"=5'
JOB NO.	100063656

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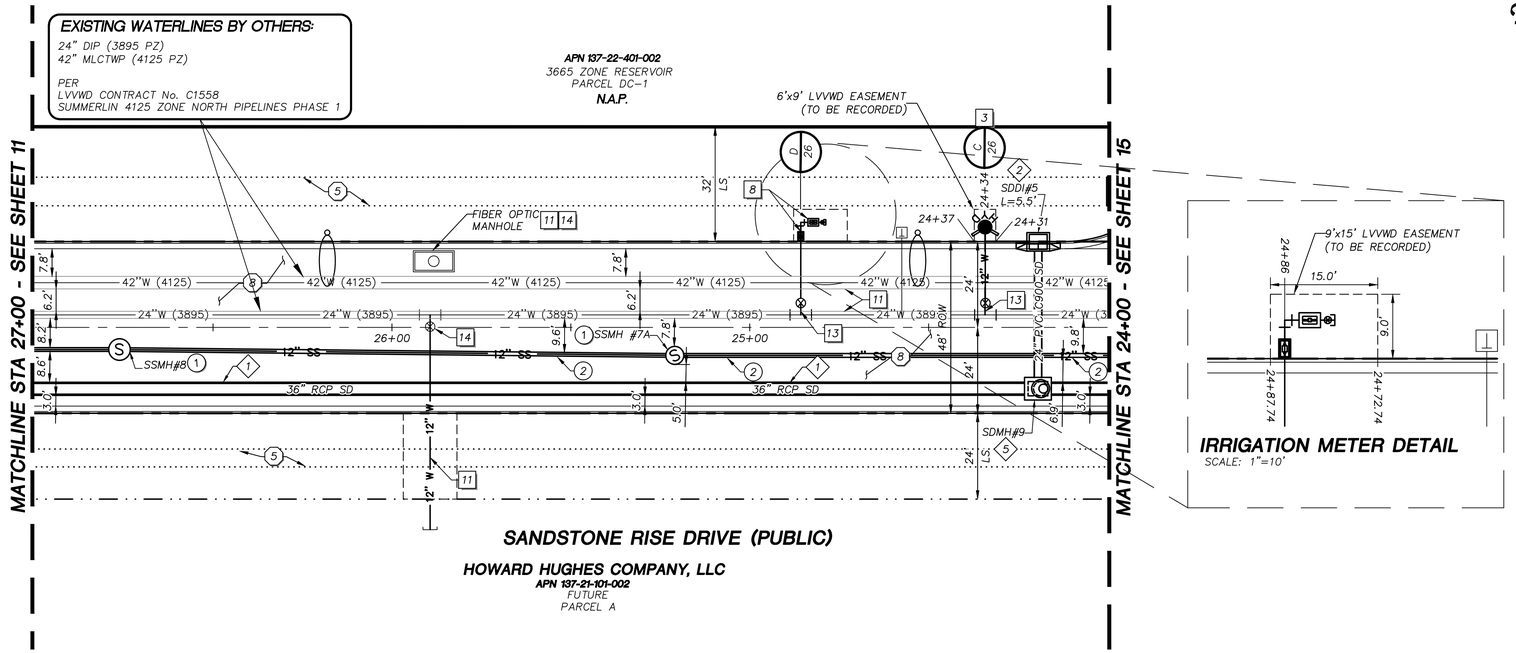
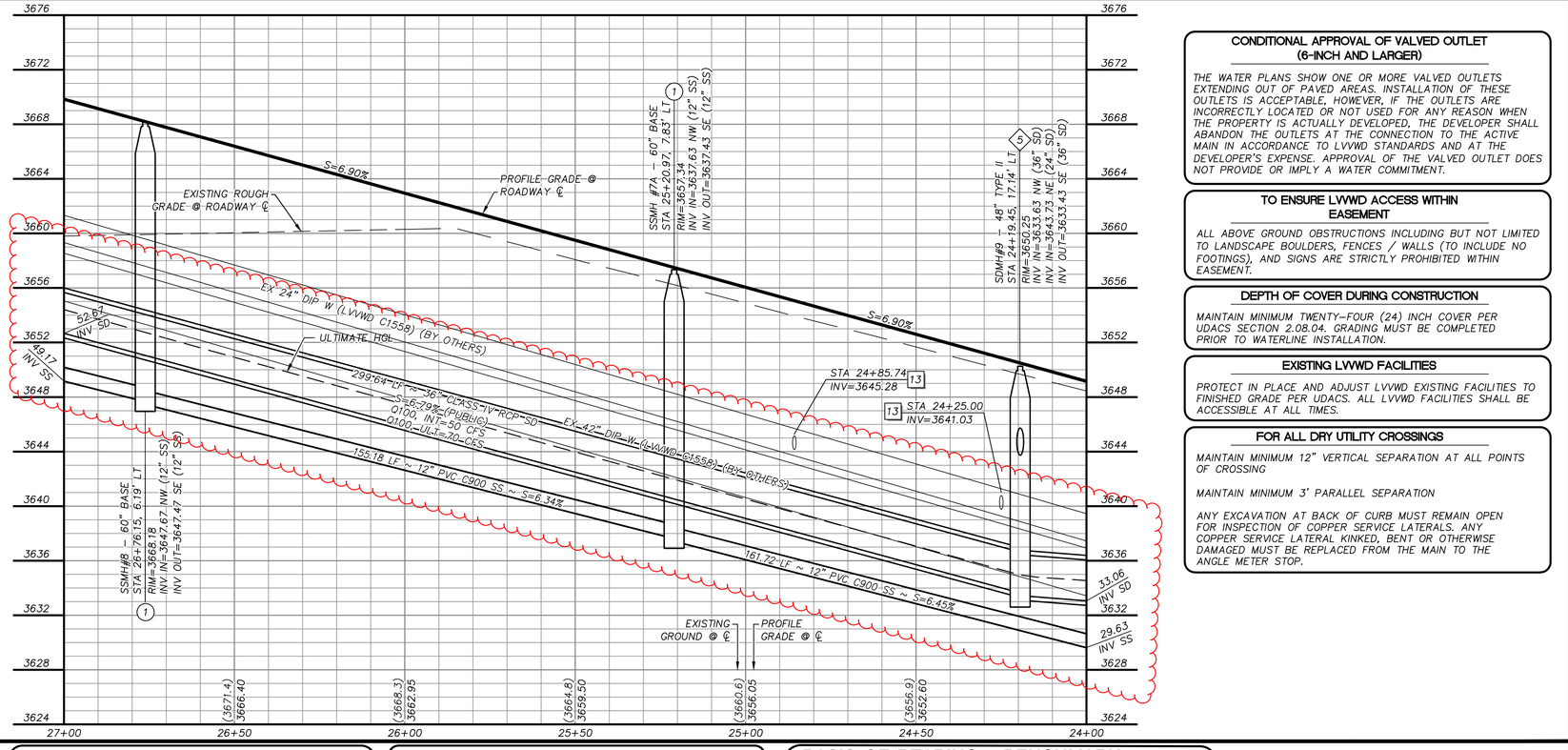


IRRIGATION METER DETAIL
SCALE: 1"=10'



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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 137065 FIRST APPROVED DATE: _____
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GRADING PLAN CERTIFICATION

ANTHONY ORTIZ PE# 18849 04/16/2020
DATE

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CONDITIONAL APPROVAL OF VALVED OUTLET (6-INCH AND LARGER)

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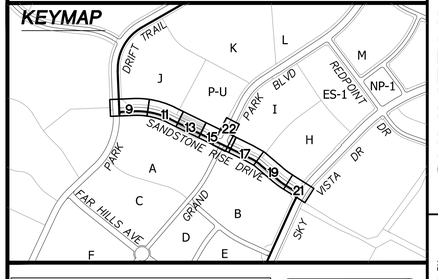
KEYMAP



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NEVADA PROFESSIONAL ENGINEER-STATE OF NEVADA ANTHONY J. ORTIZ Exp. 6-30-21 CIVIL NO. 18849
4/16/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 25
SANDSTONE RISE DRIVE (STREET M)
SKY VISTA DRIVE TO PARK DRIFT TRAIL (STREET K)

SANDSTONE RISE DRIVE PLAN AND PROFILE
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107\5132 L20-00453	DESIGNED BY: G. BLAKE
DATE: APRIL 2020	DRAWN BY: G. BLAKE
DRAWING NO. 13/32	CHECKED BY: T. ORTIZ
	HORIZ.: 1"=20' VERT.: 1"=5'
JOB NO. 100063656	

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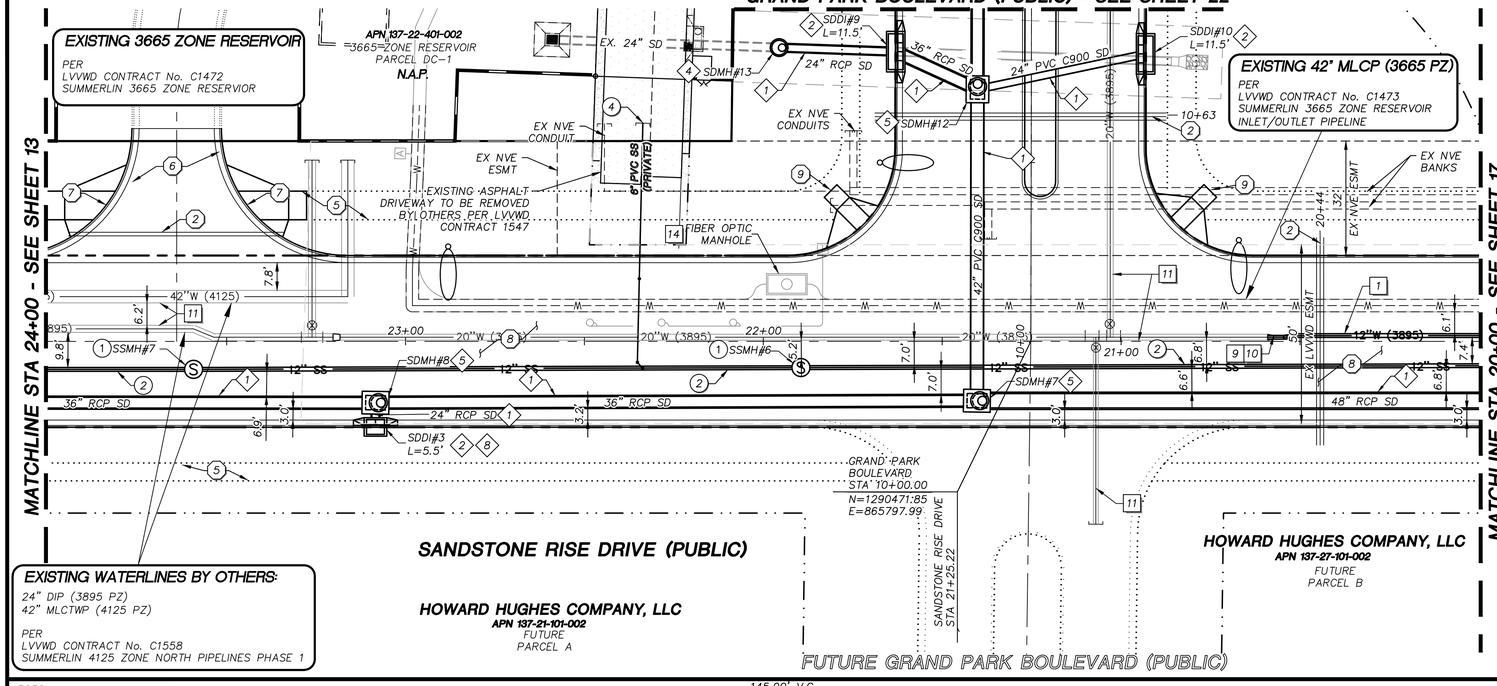

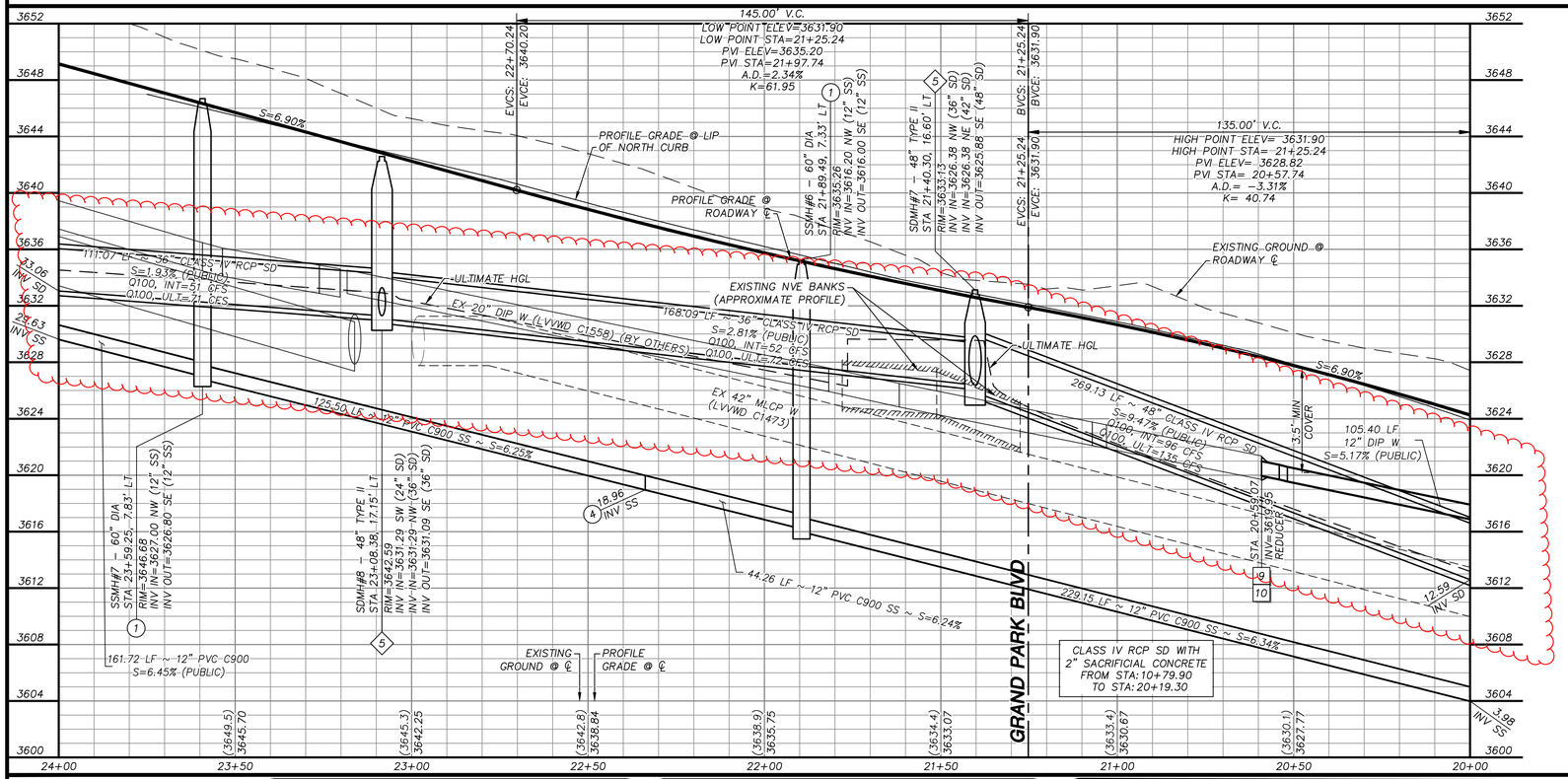

GRAPHIC SCALE
20 0 10 20 40
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LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 137065 FIRST APPROVED DATE: _____

LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL

GRADING PLAN CERTIFICATION

ANTHONY ORTIZ PE# 18849 04/16/2020 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

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FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 FREMONT AND ARTERIAL SYSTEMS OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

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2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1, #422 & #421. LENGTH PER PLAN
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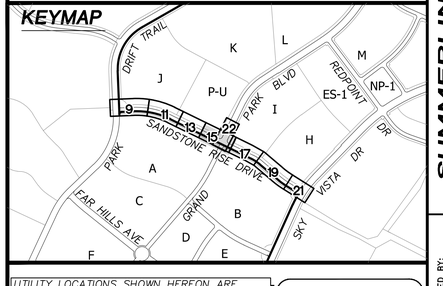

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PROFESSIONAL ENGINEER-STATE OF NEVADA ANTHONY ORTIZ Exp. 6-30-21 CIVIL No. 18849

4/16/2020

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REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

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JOB NO. 100063656

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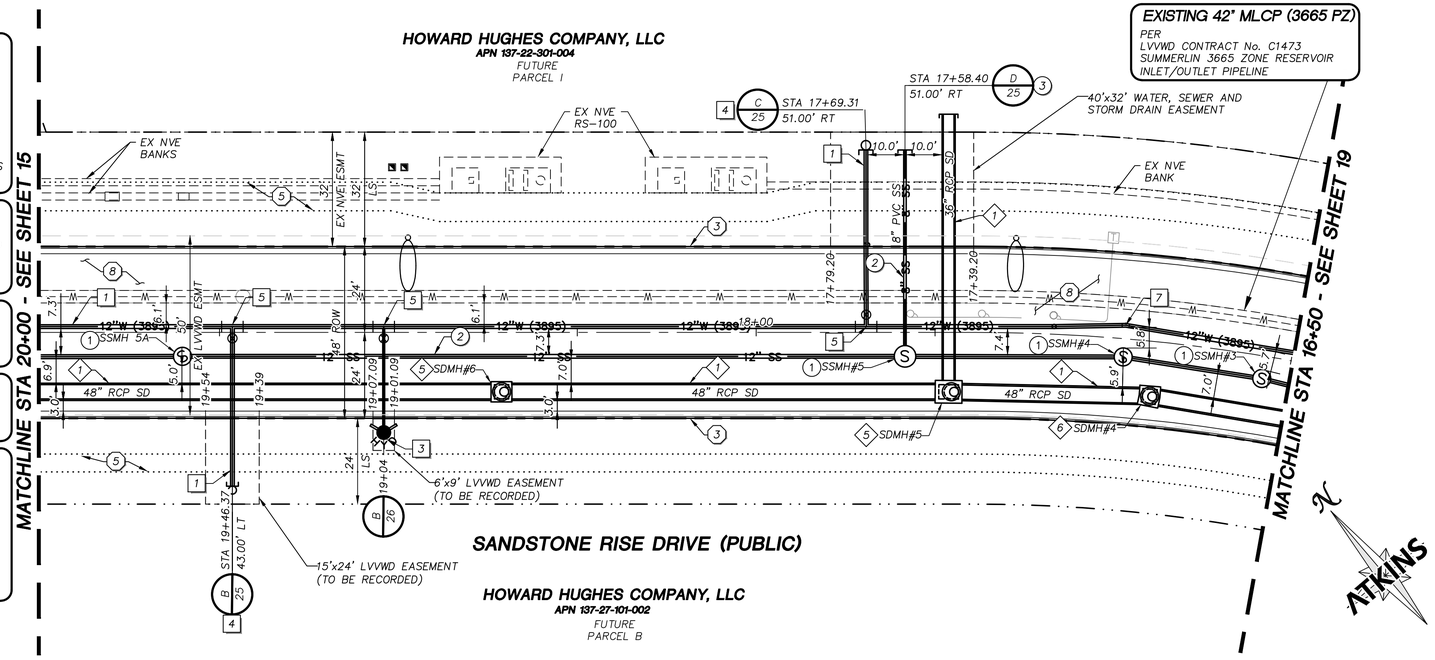

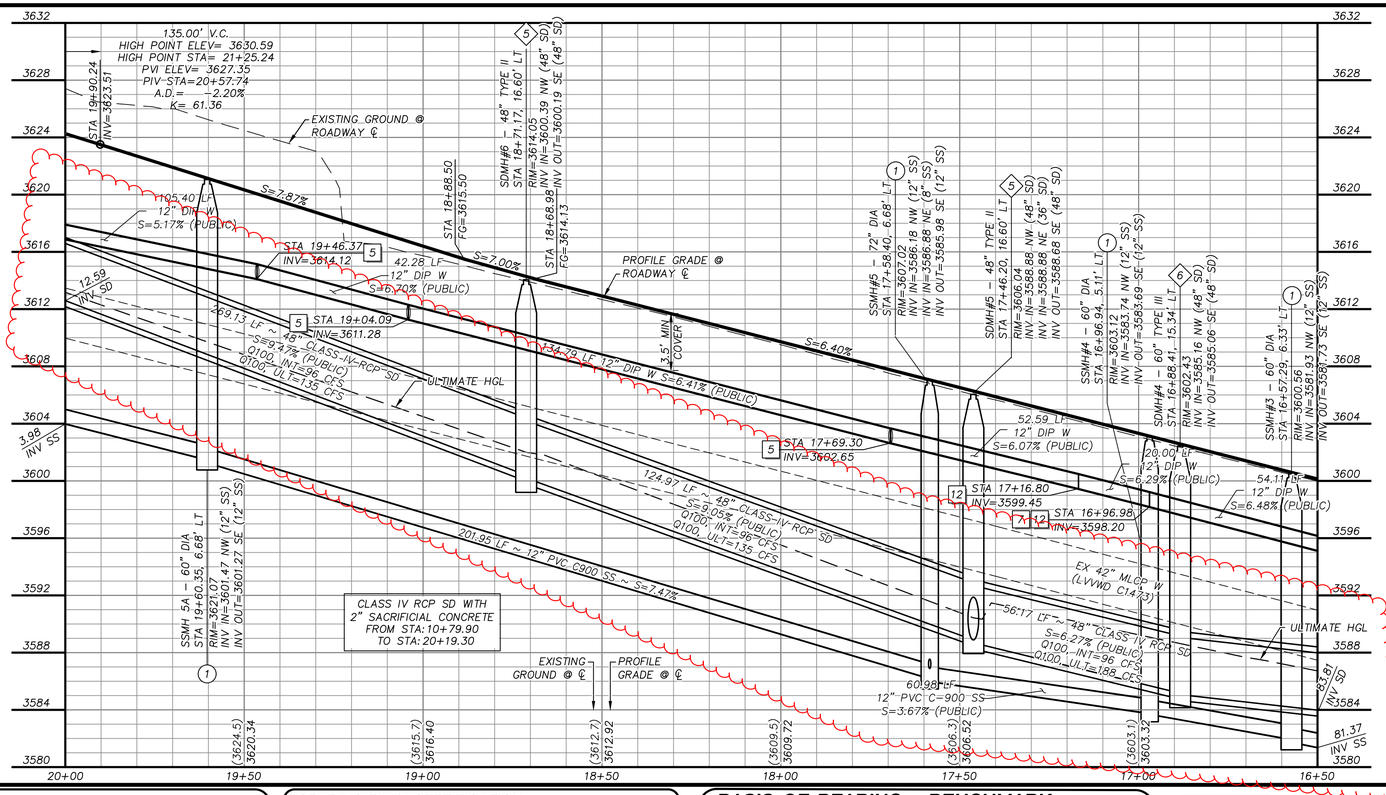

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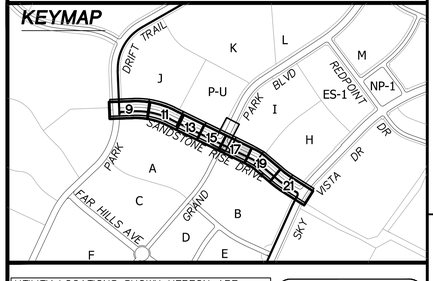

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107\51.32
L20-00453
DATE: APRIL, 2020
DRAWING NO. 17/32
JOB NO. 100036356

GRAPHIC SCALE
20 0 10 20 40
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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 137065 FIRST APPROVED DATE: _____
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL

GRADING PLAN CERTIFICATION

ANTHONY ORTIZ PE# 18849 04/16/2020 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.
DRAINAGE STUDY NO.: 5221

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PROFESSIONAL ENGINEER - STATE OF NEVADA - ANTHONY ORTIZ - No. 18949 - CIVIL - 4/16/2020

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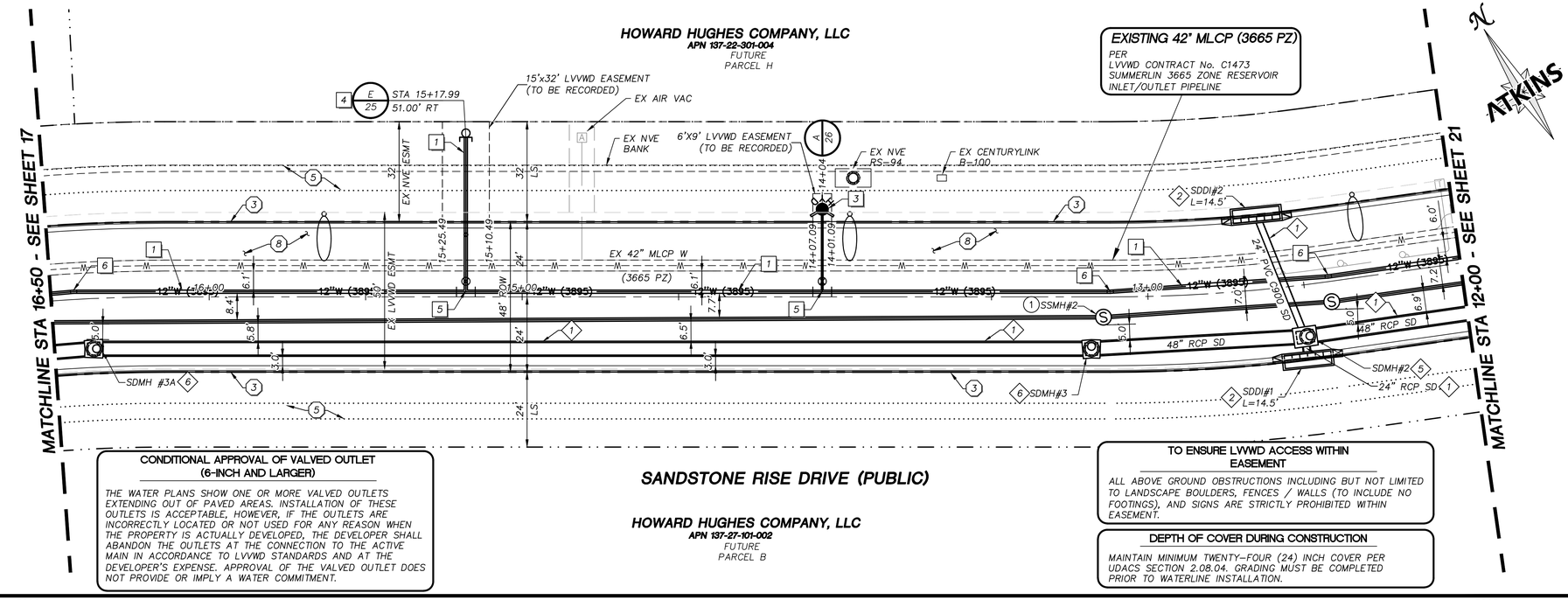

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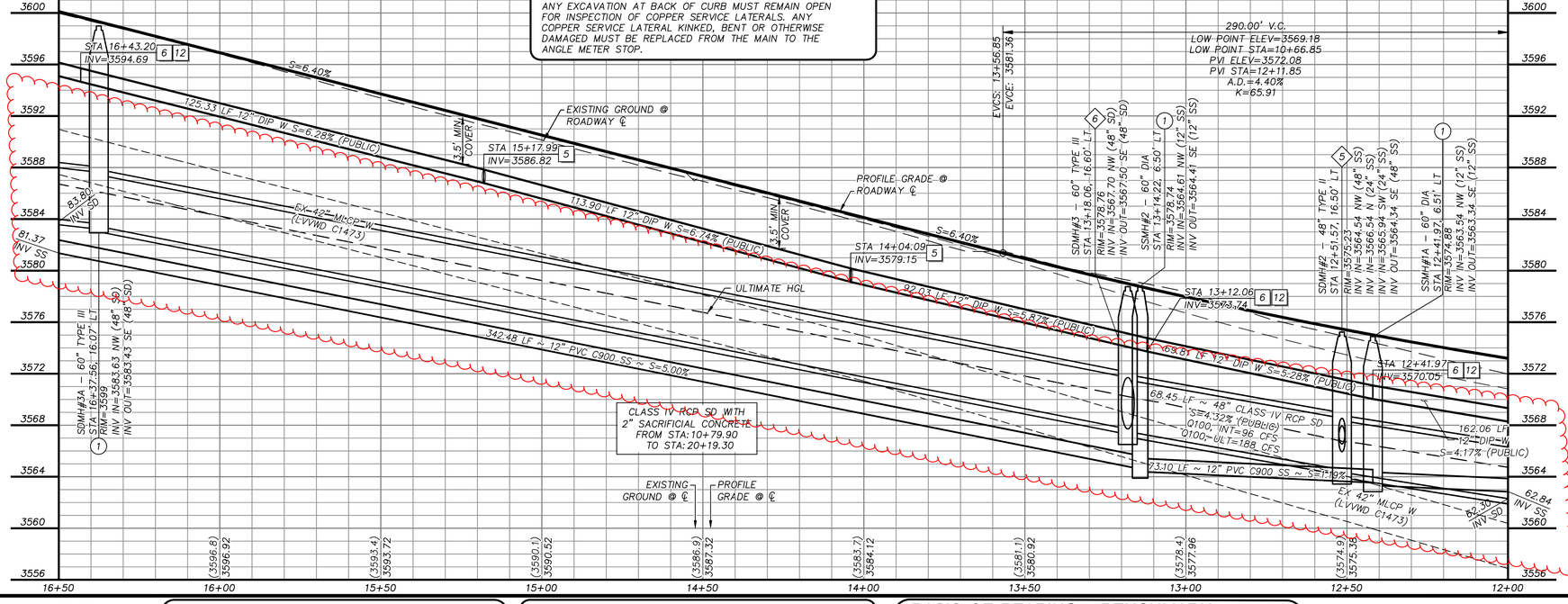

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LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 137065 FIRST APPROVED DATE: _____

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BENCHMARK

CITY OF LAS VEGAS BENCHMARK:
D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET 5 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1, #422 & #421. LENGTH PER PLAN
3. INSTALL NEENAH R-2560-G BEEHIVE DROP INLET
4. INSTALL 60" TYPE I SD MANHOLE PER CCAUSD #403
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7. STUB & PLUG STORM DRAIN FOR FUTURE CONNECTION PER MANUFACTURER'S PLUG, OR APPROVED EQUAL
8. DEEP DROP INLET PER DETAIL "C" SHEET 29.

SEWER CONSTRUCTION NOTES

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WATERLINE CONSTRUCTION NOTES

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2. INSTALL GATE VALVE PER UDACS PLATES #30 AND #39
3. INSTALL FIRE HYDRANT PER UDACS PLATE #40 AND DETAIL "C" ON SHEET 28
4. INSTALL CAP AND 2" MANUAL BLOWOFF ASSEMBLY PER UDACS PLATE #36
5. INSTALL TEE W/ VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31 AND #39
6. INSTALL 5° BEND PER UDACS PLATE #31
7. INSTALL 11.25° BEND PER UDACS PLATE #31
8. INSTALL 1.5" WATER METER AND RPPA PER UDACS PLATES #4 AND #8 AND DETAIL ON SHEET 30
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10. REMOVE CAP AND 2" BLOWOFF AND CONNECT TO EXISTING WATERLINE
11. EXISTING WATER LINE BY OTHERS
12. WATER MAIN JOINT DEFLECTION PER UDACS 2.07.01 AND 2.07.03
13. CONNECT TO EXISTING BLIND FLANGE
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1. SAWCUT AND MATCH EXISTING
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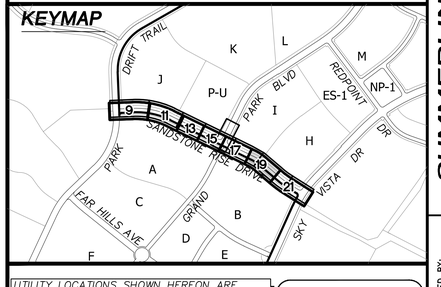
9. CONSTRUCT SIDEWALK RAMP CASE II PER CCAUSD #235 AND DETAIL "B", SHEET 28



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PROFESSIONAL ENGINEER-STATE OF NEVADA ANTHONY J. ORTIZ Exp. 6-30-21 CIVIL No. 18849

4/16/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 25
SANDSTONE RISE DRIVE (STREET M)
SKY VISTA DRIVE TO PARK DRIFT TRAIL (STREET K)

SANDSTONE RISE DRIVE PLAN AND PROFILE
STA 12+00 TO STA 16+50

107\5132 L20-00453	DESIGNED BY: G. BLAKE
DATE: APRIL 2020	DRAWN BY: G. BLAKE
DRAWING NO. 19/32	CHECKED BY: T. ORTIZ
	HORIZ.: 1"=20' VERT.: 1"=5'

JOB NO. 100063656

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TO ENSURE LVVWD ACCESS WITHIN EASEMENT

ALL ABOVE GROUND OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO LANDSCAPE BOULDERS, FENCES / WALLS (TO INCLUDE NO FOOTINGS), AND SIGNS ARE STRICTLY PROHIBITED WITHIN EASEMENT.

DEPTH OF COVER DURING CONSTRUCTION

MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04. GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION.

EXISTING LVVWD FACILITIES

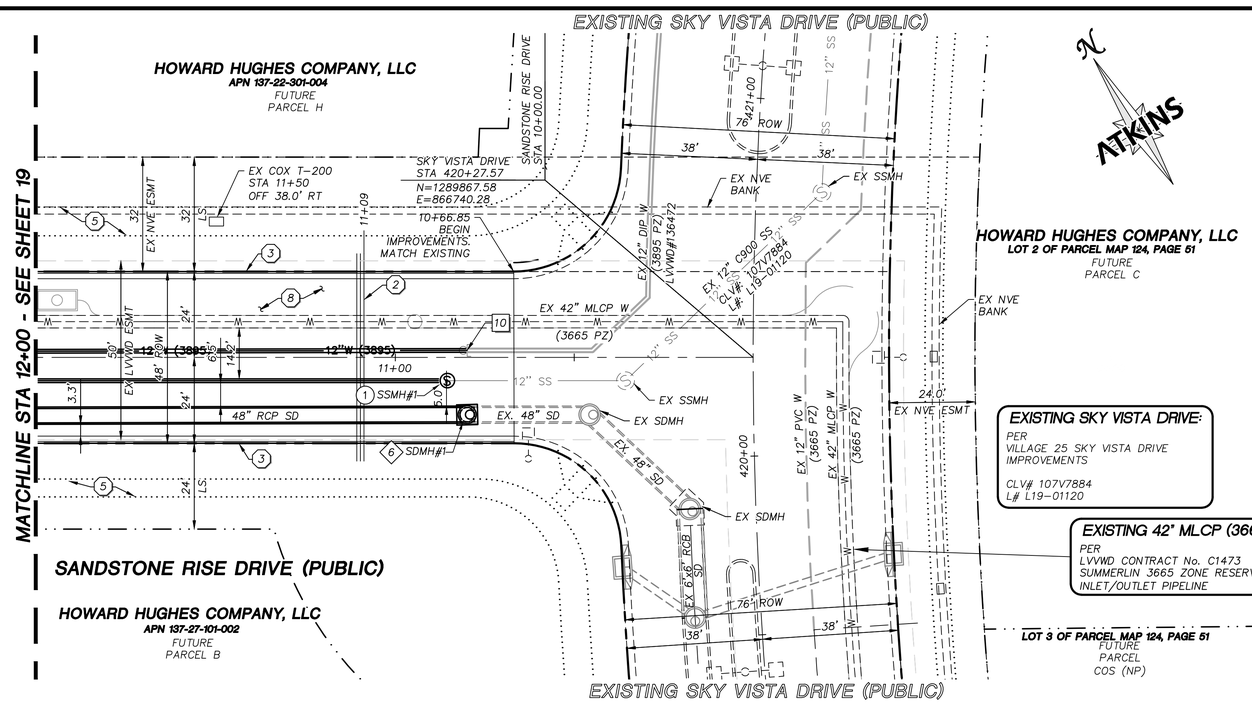
PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES.

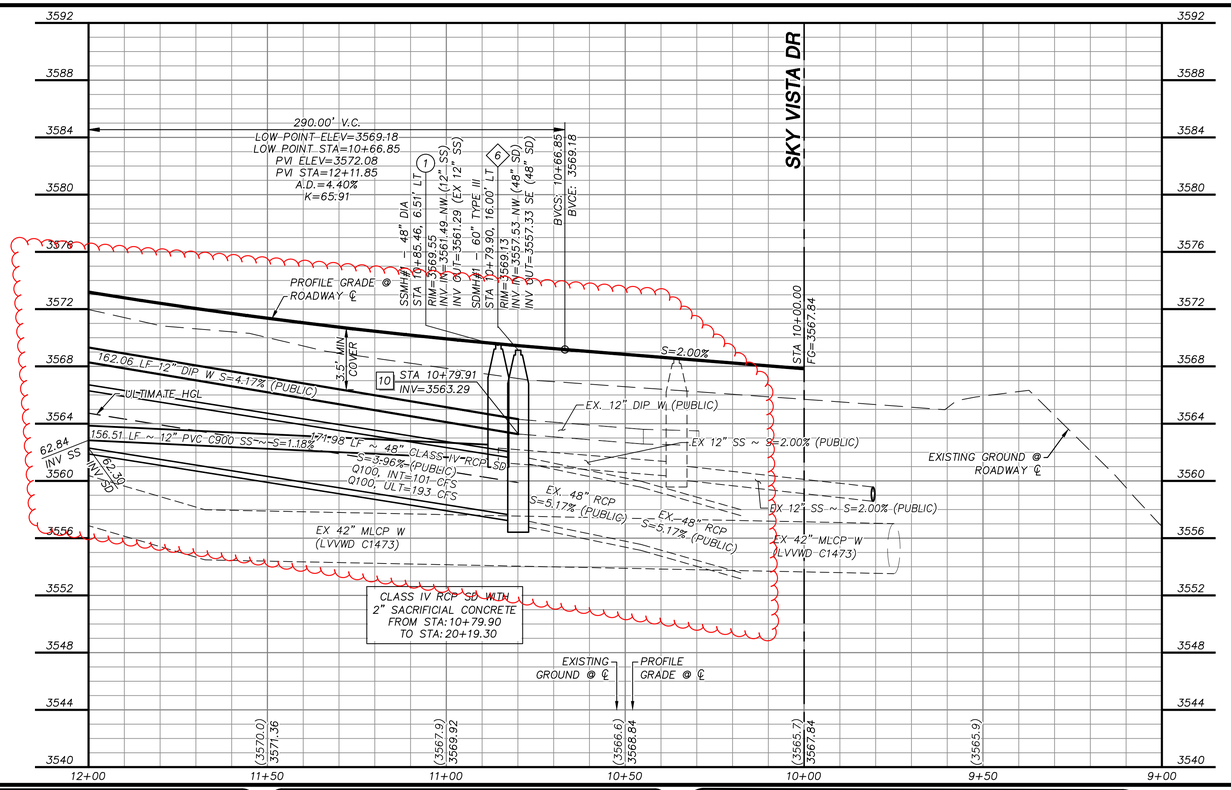
FOR ALL DRY UTILITY CROSSINGS

MAINTAIN MINIMUM 12" VERTICAL SEPARATION AT ALL POINTS OF CROSSING

MAINTAIN MINIMUM 3' PARALLEL SEPARATION

ANY EXCAVATION AT BACK OF CURB MUST REMAIN OPEN FOR INSPECTION OF COPPER SERVICE LATERALS. ANY COPPER SERVICE LATERAL KINKED, BENT OR OTHERWISE DAMAGED MUST BE REPLACED FROM THE MAIN TO THE ANGLE METER STOP.





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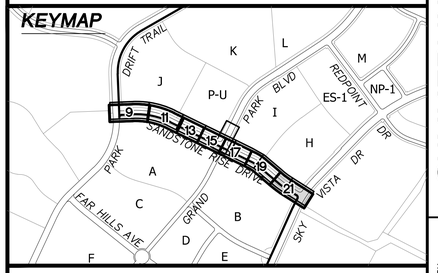

GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"= 20'
5 0 2.5 5 10
VERTICAL: 1"= 5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 137065 FIRST APPROVED DATE: _____

LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL

GRADING PLAN CERTIFICATION

ANTHONY ORTIZ PE# 18849 04/16/2020 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DRAINAGE STUDY NO.: 5221

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK:
D368 (REVISED 2008)
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PROFESSIONAL ENGINEER-STATE OF NEVADA ANTHONY J ORTIZ EXP. 6-30-21 CIVIL No. 18849

4/16/2020

REV.	DESCRIPTION	BY	DATE	APPROVAL
	REVISIONS			

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 25
SANDSTONE RISE DRIVE (STREET M)
SKY VISTA DRIVE TO PARK DRIFT TRAIL (STREET K)

SANDSTONE RISE DRIVE PLAN AND PROFILE
BEGIN TO STA 12+00

DESIGNED BY:	G. BLAKE
DRAWN BY:	G. BLAKE
CHECKED BY:	T. ORTIZ
HORIZ.:	1"=20'
VERT.:	1"=5'
107751.32 L20-00453	
DATE:	APRIL 2020
DRAWING NO.	21/32
JOB NO.	100063656

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GCW

ENGINEERS \ SURVEYORS

RESPONSE TO COMMENTS FOR THE TECHNICAL DRAINAGE STUDY FOR

SUMMERLIN WEST DETENTION BASIN 5 TEMPORARY DIVERSION BERM

62052-3084

November 2020

Prepared for:
The Howard Hughes Company, LLC
10845 Griffith Peak Drive, Suite 160
Las Vegas, Nevada 89135
Phone: (702) 791-4300

Prepared by GCW, Inc.

1555 South Rainbow Blvd
Las Vegas, NV 89146

P: 702.804.2000
F: 702.804.2298

info@gcwengineering.com
www.gcwengineering.com

CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**				**DATE:** **December 10, 2020**
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: **Summerlin West Detention Basin 5** **Temporary Diversion Berm**			**COPIES TO:** GCW, Inc.
Cross Streets:	Sky Vista and Alta			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5357B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-28-601-001 & 137-28-101-005			
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	**X**	
Proposed Storm Drain	YES	NO	**X**	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	9/10/2020	10/01/2020	See Comments Below	$400	$400
2nd Submittal	11/19/2020	12/10/2020	See Comments Below	$400	$400
			TOTAL FEES (LDDRS):	**$800**	**----**

REMARKS: Study to address interim wash protection. All interim facilities are to be Privately Owned and Maintained by Howard Hughes Company, LLC.

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

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

1. This study provides for the separate improvements necessary to convey flows to the Summerlin Detention Basin #5. The report addresses the concerns outlined in the Summerlin Detention Basin #5 Modifications (DS 5225); Comments #2 and #3, from the Memorandum dated July 6, 2020.
2. The addition of these proposed berms provide for the Ultimate Flow conveyance of 4,779 cfs in the interim condition. Future Development of the adjacent Summerlin Village Parcels shall require a Technical Drainage Study that addresses the Ultimate Facility Improvements. The proposed interim facilities shall be owned and maintained by the Master Developer, Howard Hughes Corporation, LLC.
3. The drainage easement shown on the Grading Plans must be a "*Public Drainage Easements to be Privately Maintained"* and labeled as such on the grading plans. Public drainage easements must be recorded by separate document prior to the final acceptance of the improvement plans unless they are to be recorded by parcel or final map.
4. The engineer has provided a table on the grading plans that shows a quantity estimate of all drainage improvements within Public Drainage Easements. All drainage improvements within Public Drainage Easements must be bonded and inspected.
5. As noted on the Grading Plans "*All offsite interim flood control facilities such as but not limited to berms/ditches are privately owned and to be privately maintained by the Howard Hughes Company"*.

6. The project proposed to construct interim drainage facilities including drainage berms/ditches along an existing diversion berm and wash that conveys flows into the Summerlin Detention Basin #5. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

7. Provide the standard drainage compliance note on the grading plan: "*I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT (DS5357)".*

8. This interim facility is within a proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility alignment. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

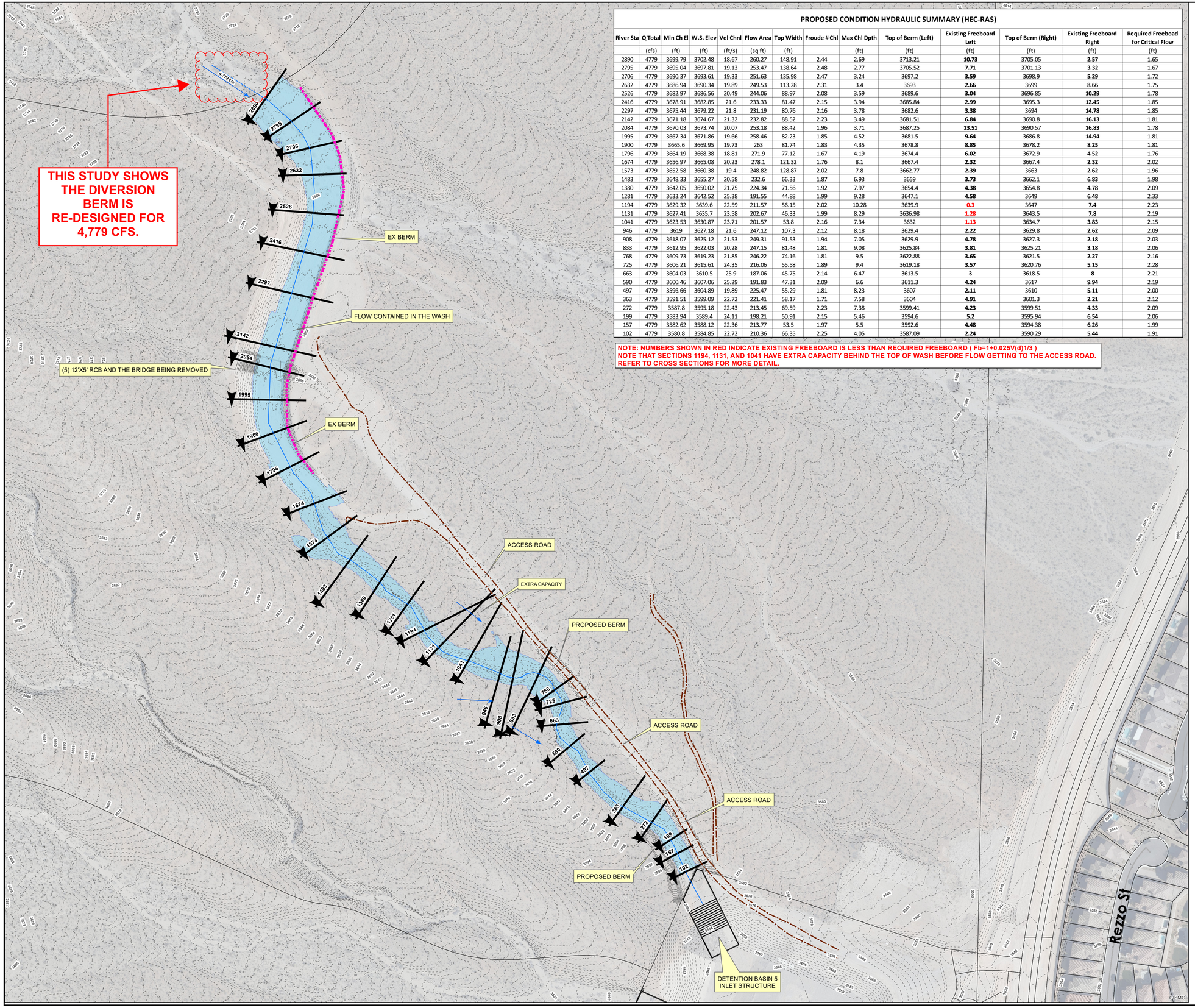
   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

   Please note that effective April 6, 2020, only electronic submittals to the CCRFCD will be accepted for regional concurrence. Contact cwang@regionalflood.org for direction.

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
HDR/PBJ/AYS

T/R/S: T20S/R59E/S28
AREA K-28



PROPOSED CONDITION HYDRAULIC SUMMARY (HEC-RAS)

River Sta	Q Total	Min Ch El	W.S. Elev	Vel Chnl	Flow Area	Top Width	Froude # Chl	Max Chl Dpth	Top of Berm (Left)	Existing Freeboard Left	Top of Berm (Right)	Existing Freeboard Right	Required Freeboad for Critical Flow
	(cfs)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
2890	4779	3699.79	3702.48	18.67	260.27	148.91	2.44	2.69	3713.21	**10.73**	3705.05	**2.57**	1.65
2795	4779	3695.04	3697.81	19.13	253.47	138.64	2.48	2.77	3705.52	**7.71**	3701.13	**3.32**	1.67
2706	4779	3690.37	3693.61	19.33	251.63	135.98	2.47	3.24	3697.2	**3.59**	3698.9	**5.29**	1.72
2632	4779	3686.94	3690.34	19.89	249.53	113.28	2.31	3.4	3693	**2.66**	3699	**8.66**	1.75
2526	4779	3682.97	3686.56	20.49	244.06	88.97	2.08	3.59	3689.6	**3.04**	3696.85	**10.29**	1.78
2416	4779	3678.91	3682.85	21.6	233.33	81.47	2.15	3.94	3685.84	**2.99**	3695.3	**12.45**	1.85
2297	4779	3675.44	3679.22	21.8	231.19	80.76	2.16	3.78	3682.6	**3.38**	3694	**14.78**	1.85
2142	4779	3671.18	3674.67	21.32	232.82	88.52	2.23	3.49	3681.51	**6.84**	3690.8	**16.13**	1.81
2084	4779	3670.03	3673.74	20.07	253.18	88.42	1.96	3.71	3687.25	**13.51**	3690.57	**16.83**	1.78
1995	4779	3667.34	3671.86	19.66	258.46	82.23	1.85	4.52	3681.5	**9.64**	3686.8	**14.94**	1.81
1900	4779	3665.6	3669.95	19.73	263	81.74	1.83	4.35	3678.8	**8.85**	3678.2	**8.25**	1.81
1796	4779	3664.19	3668.38	18.81	271.9	77.12	1.67	4.19	3674.4	**6.02**	3672.9	**4.52**	1.76
1674	4779	3656.97	3665.08	20.23	278.1	121.32	1.76	8.1	3667.4	**2.32**	3667.4	**2.32**	2.02
1573	4779	3652.58	3660.38	19.4	248.82	128.87	2.02	7.8	3662.77	**2.39**	3663	**2.62**	1.96
1483	4779	3648.33	3655.27	20.58	232.6	66.33	1.87	6.93	3659	**3.73**	3662.1	**6.83**	1.98
1380	4779	3642.05	3650.02	21.75	224.34	71.56	1.92	7.97	3654.4	**4.38**	3654.8	**4.78**	2.09
1281	4779	3633.24	3642.52	25.38	191.55	44.88	1.99	9.28	3647.1	**4.58**	3649	**6.48**	2.33
1194	4779	3629.32	3639.6	22.59	211.57	56.15	2.02	10.28	3639.9	**0.3**	3647	**7.4**	2.23
1131	4779	3627.41	3635.7	23.58	202.67	46.33	1.99	8.29	3636.98	**1.28**	3643.5	**7.8**	2.19
1041	4779	3623.53	3630.87	23.71	201.57	53.8	2.16	7.34	3632	**1.13**	3634.7	**3.83**	2.15
946	4779	3619	3627.18	21.6	247.12	107.3	2.12	8.18	3629.4	**2.22**	3629.8	**2.62**	2.09
908	4779	3618.07	3625.12	21.53	249.31	91.53	1.94	7.05	3629.9	**4.78**	3627.3	**2.18**	2.03
833	4779	3612.95	3622.03	20.28	247.15	81.48	1.81	9.08	3625.84	**3.81**	3625.21	**3.18**	2.06
768	4779	3609.73	3619.23	21.85	246.22	74.16	1.81	9.5	3622.88	**3.65**	3621.5	**2.27**	2.16
725	4779	3606.21	3615.61	24.35	216.06	55.58	1.89	9.4	3619.18	**3.57**	3620.76	**5.15**	2.28
663	4779	3604.03	3610.5	25.9	187.06	45.75	2.14	6.47	3613.5	**3**	3618.5	**8**	2.21
590	4779	3600.46	3607.06	25.29	191.83	47.31	2.09	6.6	3611.3	**4.24**	3617	**9.94**	2.19
497	4779	3596.66	3604.89	19.89	225.47	55.29	1.81	8.23	3607	**2.11**	3610	**5.11**	2.00
363	4779	3591.51	3599.09	22.72	221.41	58.17	1.71	7.58	3604	**4.91**	3601.3	**2.21**	2.12
272	4779	3587.8	3595.18	22.43	213.45	69.59	2.23	7.38	3599.41	**4.23**	3599.51	**4.33**	2.09
199	4779	3583.94	3589.4	24.11	198.21	50.91	2.15	5.46	3594.6	**5.2**	3595.94	**6.54**	2.06
157	4779	3582.62	3588.12	22.36	213.77	53.5	1.97	5.5	3592.6	**4.48**	3594.38	**6.26**	1.99
102	4779	3580.8	3584.85	22.72	210.36	66.35	2.25	4.05	3587.09	**2.24**	3590.29	**5.44**	1.91

NOTE: NUMBERS SHOWN IN RED INDICATE EXISTING FREEBOARD IS LESS THAN REQUIRED FREEBOARD (Fb=1+0.025V(d)1/3)
NOTE THAT SECTIONS 1194, 1131, AND 1041 HAVE EXTRA CAPACITY BEHIND THE TOP OF WASH BEFORE FLOW GETTING TO THE ACCESS ROAD. REFER TO CROSS SECTIONS FOR MORE DETAIL.

NORTH

120 0 120 240 Feet

1 in = 120 ft

Legend

- HEC-RAS River Alignment
- Access Road
- EX Berm and Road
- Flow Direction
- HEC-RAS Cross Sections
- Proposed Grading(1 ft Contours)
- Parcels
- Existing 2 ft Contours
- Inundation Boundary (Proposed)

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP	DATE

PROJECT NO. 62052-3084

DESIGN:
DRAWN:
CHECK:

PLOT DATE: 11/10/2020
PLOT TIME: 11:26:27 AM

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\6000\62052-3084\Division\Fcd\Figures\GIS\RTC\FIG6_RTC.mxd
MEdalat

THE HOWARD HUGHES COMPANY, LLC

SUMMERLIN WEST DETENTION BASIN 5
TEMPORARY DIVERSION BERM

PROPOSED CONDITION DRAINAGE MAP

DRAWING
FIG6
1 OF 1 SHTS

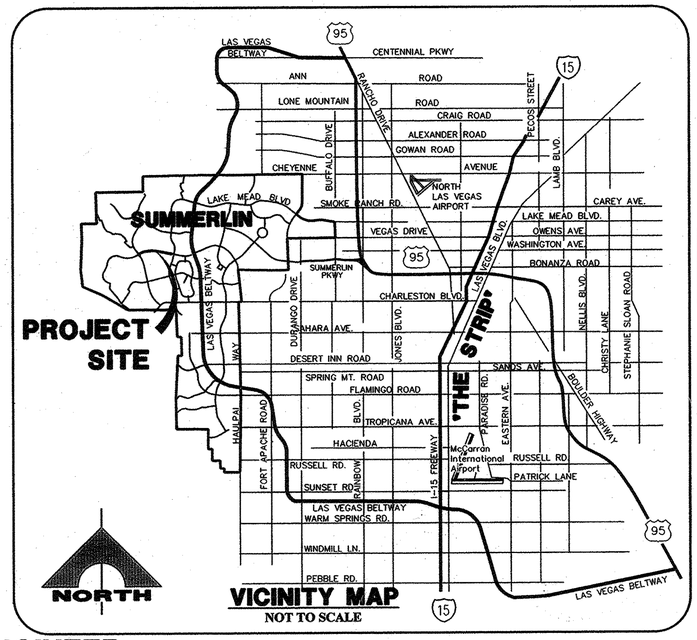
SUMMERLIN

SM

VILLAGE 23B
FAR HILLS AVENUE RCB IMPROVEMENTS
SKY VISTA DRIVE TO DESERT FOOTHILLS DRIVE
2013

A.P.N. 137-22-000-015 (PORTION)

SID NO. 808 PROJECT 33



VICINITY MAP
NOT TO SCALE

OWNER/DEVELOPER

THE HOWARD HUGHES COMPANY, LLC
10801 W. CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89146
OFFICE PHONE NO. (702) 791-4300
OFFICE FAX NO. (702) 791-4450

ENGINEER

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BLVD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2299 · GCWALLACE.COM

THE HOWARD HUGHES COMPANY, LLC

KEVIN ORRICK
TITLE: VICE PRESIDENT — 8/6/13 DATE

DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

JOSHUA L. JOHNSON P.E. 15789 — 7/16/13 DATE

DAVID BOWERS, PE, PTOE, PE# 16736 — 7/28/13 DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS". THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

CLV BUILDING AND SAFETY DEPARTMENT

THIS PLAN CONFORMS TO THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT

N/A — 8/27/13 DATE
CHRIS KNIGHT, DIRECTOR, BUILDING AND SAFETY

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
PROJECT NO. 121198 DATE: 7/30/13
DRAWINGS C1, C3, P1-P11, L1-L2, C2, MU1, R1-R3

UTILITY/AGENCY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. — 7/17/13 DATE

CENTRAL TELEPHONE CO. DBA CENTURYLINK — 7-17-13 DATE

THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY — 7-19-2013 DATE

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

Sharon McShea — 7.29.2013 DATE
NV ENERGY – TRANSMISSION ENGINEERING

SOUTHWEST GAS CORP. — 7/18/13 DATE

H #50002
CLV # 1071/5996

REV	DATE	DESCRIPTION	DES APP	DATE	CCW APP
2	7/30/13	REVISED SHEETS 11-22a (TYP.) (ASBUILT) ADDED "PENTHOUSE"		7/30/13	H.J.F.
1	2/5/14	REVISED SHEET 22		2/5/14	H.J.F.

PROJECT NO. 820238-227
DESIGN: DFK
DRAWN: DFK
CHECK: JLJ
PLOT DATE: 07-16-13
PLOT TIME: 14:44:13

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LAS VEGAS

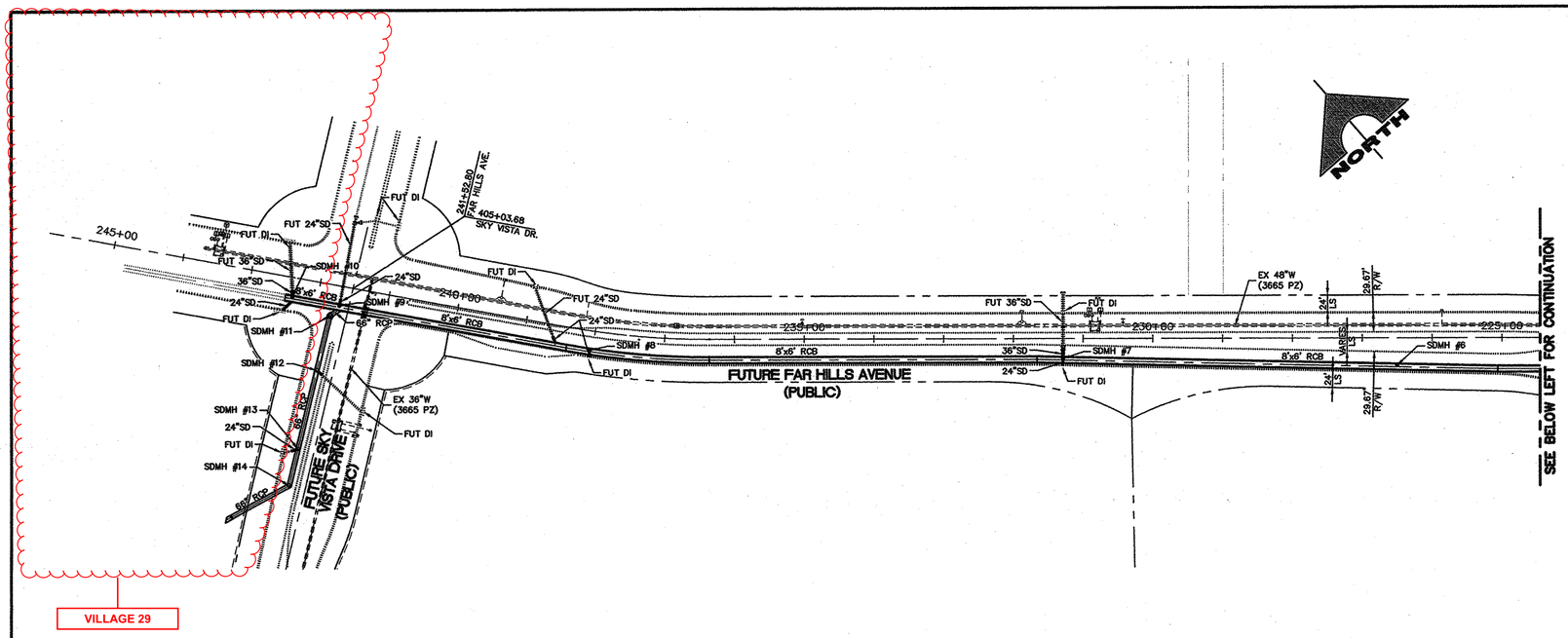
F:\Projects\820\820238-227\UWG\Production\1-227-C01.dwg
Daniel Kelley

THE HOWARD HUGHES COMPANY, LLC

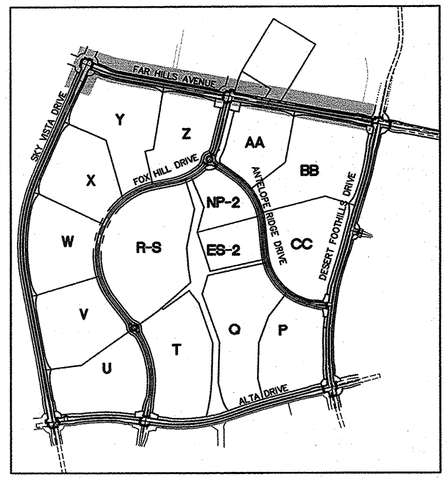
VILLAGE 23B FAR HILLS AVE RCB IMPROVEMENTS
SKY VISTA DRIVE TO DESERT FOOTHILLS DRIVE

COVER SHEET

DRAWING
C1
1 OF 25 SHTS



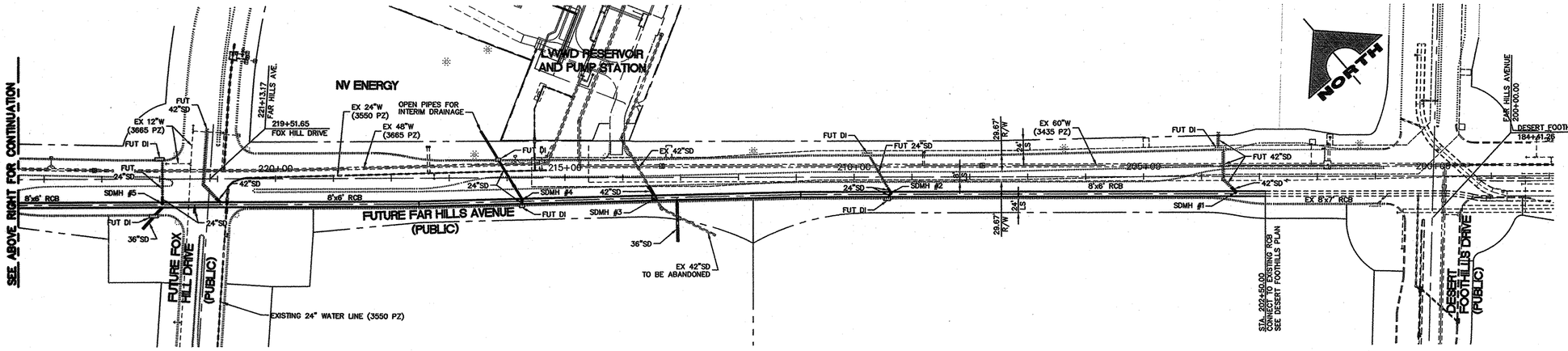
VILLAGE 29



KEY MAP

NOT TO SCALE

SCALE: 1"=100'



STORM DRAIN QUANTITIES (PUBLIC)

8'x6' RCB	3910	LF
8'X7' RCB	52	LF
66" RCP	360	LF
42" RCP	38	LF
36" RCP	120	LF
24" RCP	137	LF
TYPE I MANHOLE	10	EA
NDOT TYPE 4 MANHOLE	4	EA
RIP RAP	1100	CY

APPROVED FOR CONSTRUCTION

Y. DISHARI FOR DOA MEADE

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

PROJECT NO. 121998 DATE: 7/30/13

FAST

Call before you UnderGround. 1-702-432-5300

FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

BASIS OF BEARINGS

NORTH 89°45'05" EAST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 28 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
RIVET AND PLATE IN TOP OF CURB @ SOUTHEAST CORNER OF FAR HILLS AVENUE AND DESERT FOOTHILLS DRIVE	3335.36 (FEET)	1016.620 (METERS)
CLV BM No. 7LV09 27E4		

H #50002

CLV # 167V5996

STATE OF NEVADA — PROFESSIONAL ENGINEER — DANIEL J. KELLEY — No. 15757 — 7/30/13

REV	DATE	DESCRIPTION	DATE	HDEN APP	DATE	CCNV APP

PROJECT NO. 62023B-227

DESIGN: DFK
DRAWN: DFK
CHECK: JLJ
PLOT DATE: 07-29-13
PLOT TIME: 13:04:38

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Daniel Kelley

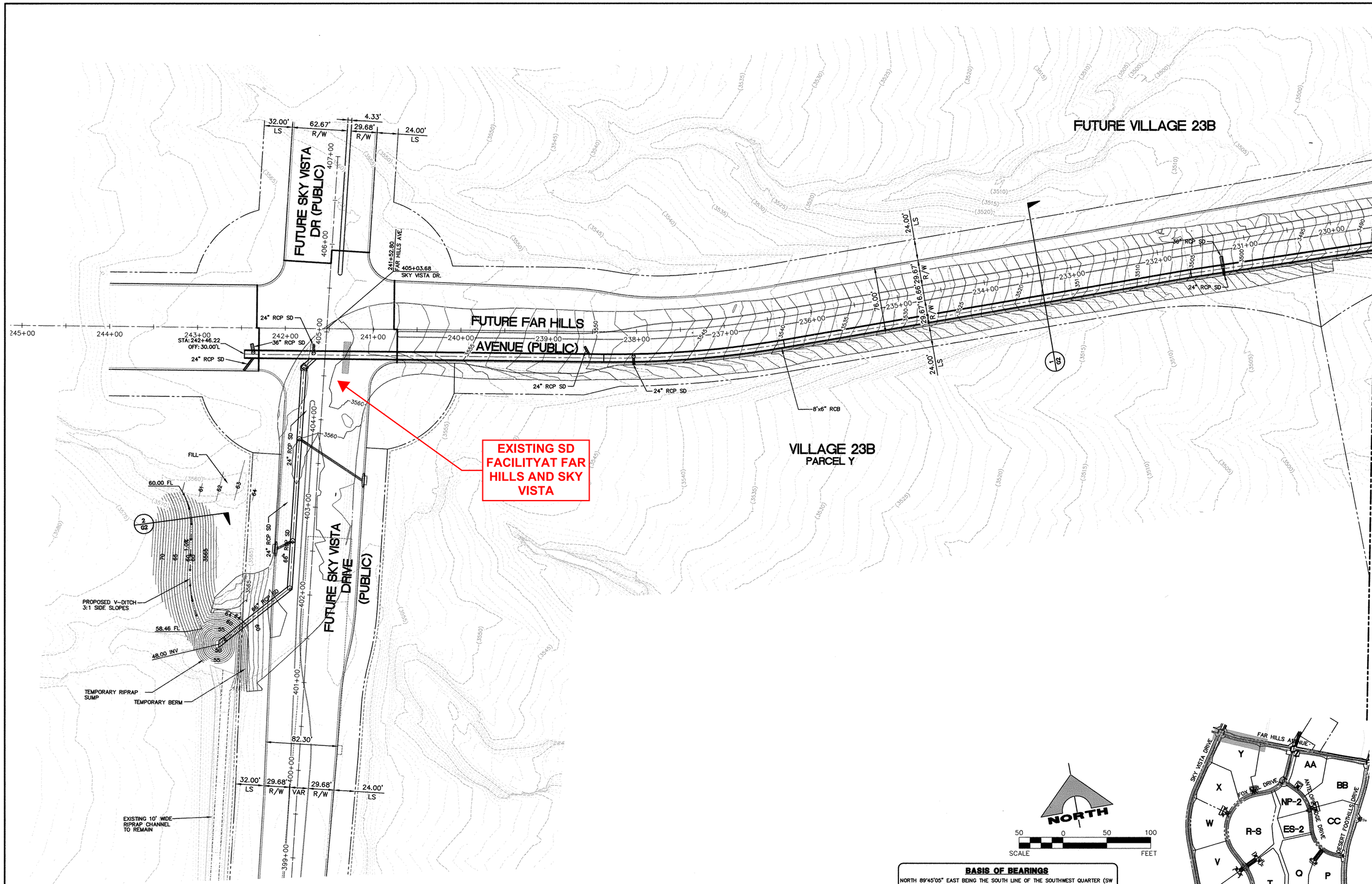
THE HOWARD HUGHES COMPANY, LLC

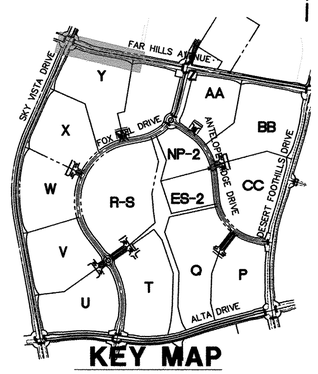
VILLAGE 28B FAR HILLS AVE RCB IMPROVEMENTS
SKY VISTA DRIVE TO DESERT FOOTHILLS DRIVE

MASTER STORM DRAIN PLAN

DRAWING MU1

4 OF 25 SHTS





KEY MAP

NOT TO SCALE

BASIS OF BEARINGS

NORTH 89°45'05" EAST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 28 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
RIVET AND PLATE IN TOP OF CURB @ SOUTHEAST CORNER OF FAR HILLS AVENUE AND DESERT FOOTHILLS DRIVE CLV BM No. 7LV09 27E4	3335.36 (FEET)	1016.620 (METERS)

FAST Call before you UnderGround. 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig Avoid cutting underground utility lines. It's costly. Call 811 OR 1-800-227-2600 AND CLARK COUNTY TRAFFIC OPERATIONS 1-702-455-7544

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

H #- 50002
CLV # 10745996

PROFESSIONAL ENGINEER - STATE OF NEVADA JOSHUA L. JOHNSON Exp. 06/30/2015 CIVIL No. 15789 DATE: 7/29/13

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP

PROJECT NO. 62023B-227
DESIGN: DFK
DRAWN: DFK
CHECK: JLJ
PLOT DATE: 07-29-13
PLOT TIME: 11:19:35

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LAS VEGAS

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Daniel Kelley

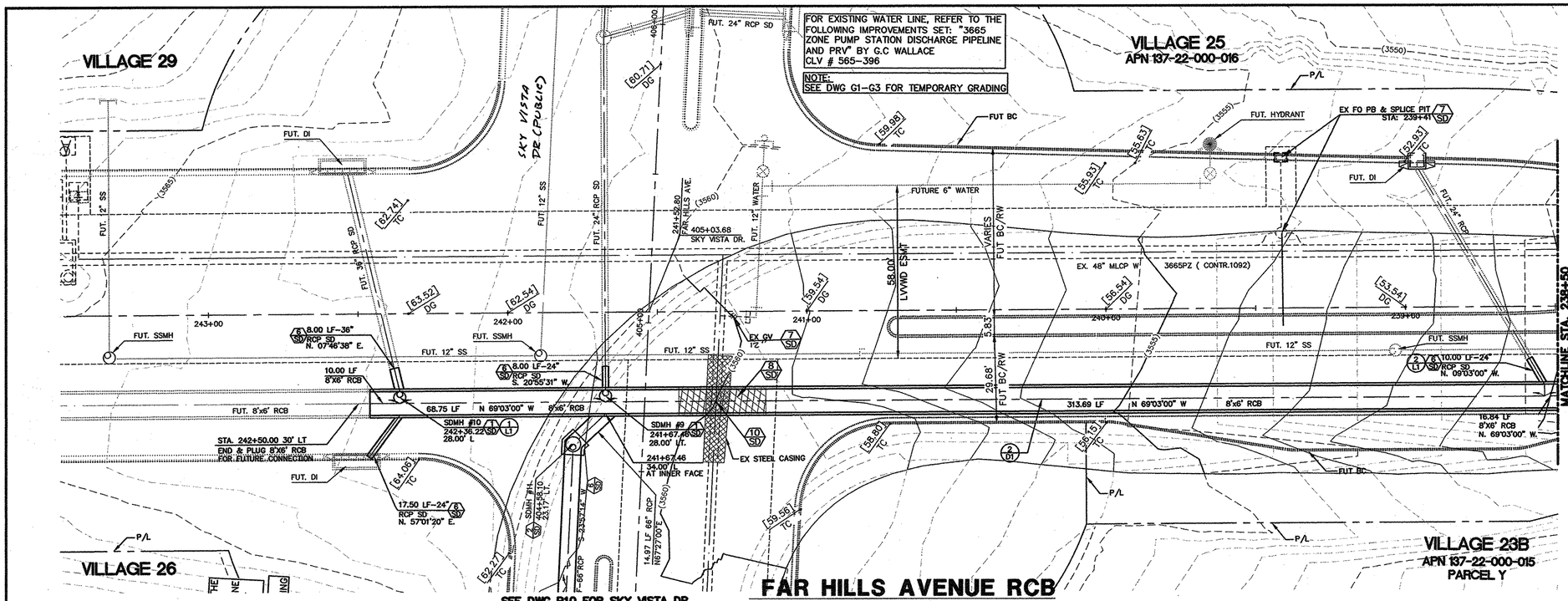
THE HOWARD HUGHES COMPANY, LLC

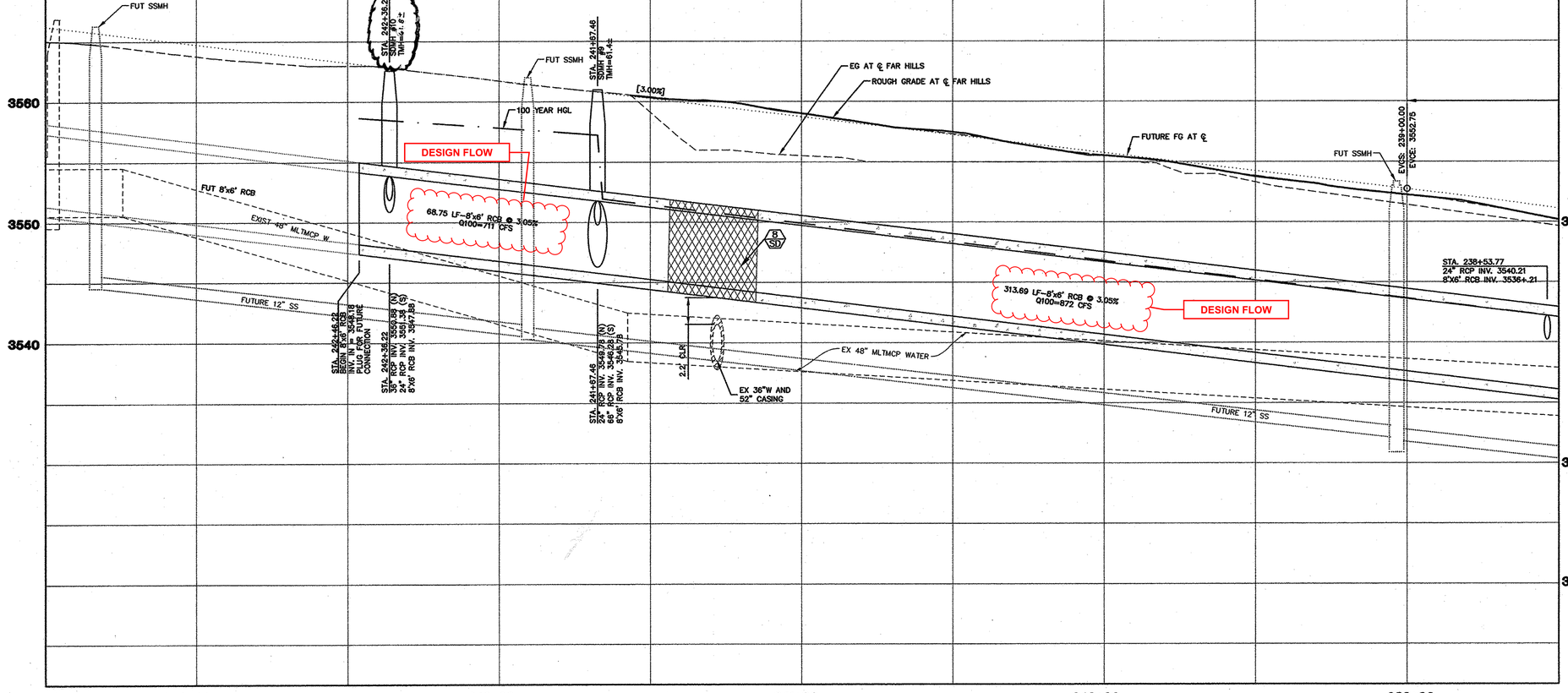
VILLAGE 23B FAR HILLS AVE RCB IMPROVEMENTS
SKY VISTA DRIVE TO DESERT FOOTHILLS DRIVE

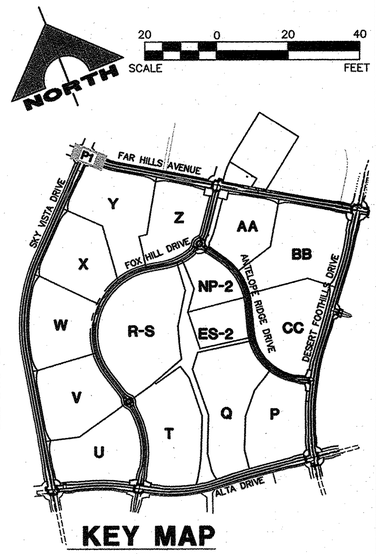
GRADING PLAN 1

DRAWING G1

8 OF 25 SHTS







KEY MAP

NOT TO SCALE

STORM DRAIN CONSTRUCTION NOTES:

1. INSTALL 48" TYPE IA STORM DRAIN MANHOLE PER DTL 1, DWG D1
2. INSTALL NDOT TYPE 4 MANHOLE PER "NDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION" (LATEST EDITION) R-4.3.2
3. ABANDON EXISTING STORM DRAIN
4. INSTALL PRECAST CONCRETE JUNCTION BOX
5. CONNECT TO EXISTING STORM DRAIN (CONTRACTOR TO VERIFY SIZE, INVERT AND LOCATION OF EXISTING STORM DRAIN)
6. INSTALL TEMPORARY PLUG AND CAP
7. PROTECT EXISTING FACILITY AND ADJUST TO GRADE AND BACK OF CURB (AS REQUIRED). WATER VALVES TO REMAIN ACCESSIBLE AT ALL TIMES
8. INSTALL STORM DRAIN WITH WATERTIGHT JOINTS USING LVVWD APPROVED INTERNAL ELASTOMERIC JOINT SEALANT PER UDACS SECTION 2.22.02 D.2, LVVWD TO SUPERVISE APPLICATION OF SEALANT.
9. ENCASE STORM DRAIN IN A MINIMUM OF (4) INCHES OF CEMENT SLURRY (CLSM II) PER UDACS SEC 2.22.02
10. PROTECT WATERLINE IN PLACE. WHEREVER A WATERLINE IS ABOVE A STORM DRAIN OR SEWER WHERE COMPACTION REQUIREMENTS UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CLASS I/CLASS II CONTROLLED LOW STRENGTH MATERIAL (CLSM I) TO THE SPRINGLINE OF THE WATERLINE.

BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
SLV09--34NE6	RIVET AND PLATE IN TOP OF CURB @ NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA DRIVE	3304.45 (FEET)	1007.197 (METERS)

BASIS OF BEARINGS

NORTH 89°45'05" EAST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 28 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA

CONTRACTOR NOTE:

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APPROVED FOR CONSTRUCTION

J. DISHAR FOR DOA MEADE

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
PROJECT NO. 121998 DATE: 7/30/13

NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM. PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS.

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1-702-227-2929

FAST
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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

H #50002
CLV # 107V5996

STATE OF NEVADA — ENGINEER — No. 15686 — PROFESSIONAL — DANIEL J. KELLEY — DATE: 7/31/13

REV	DATE	DESCRIPTION	DRAWN	CHECKED
1	2/13/14	REVISED TMH CAHOOT	J.L.F	GCW APP
2	5/21/14	ADDED APP		

PROJECT NO. 62023B-227
DESIGN: DFK
DRAWN: DFK
CHECK: JLJ
PLOT DATE: 07-29-13
PLOT TIME: 13:08:04

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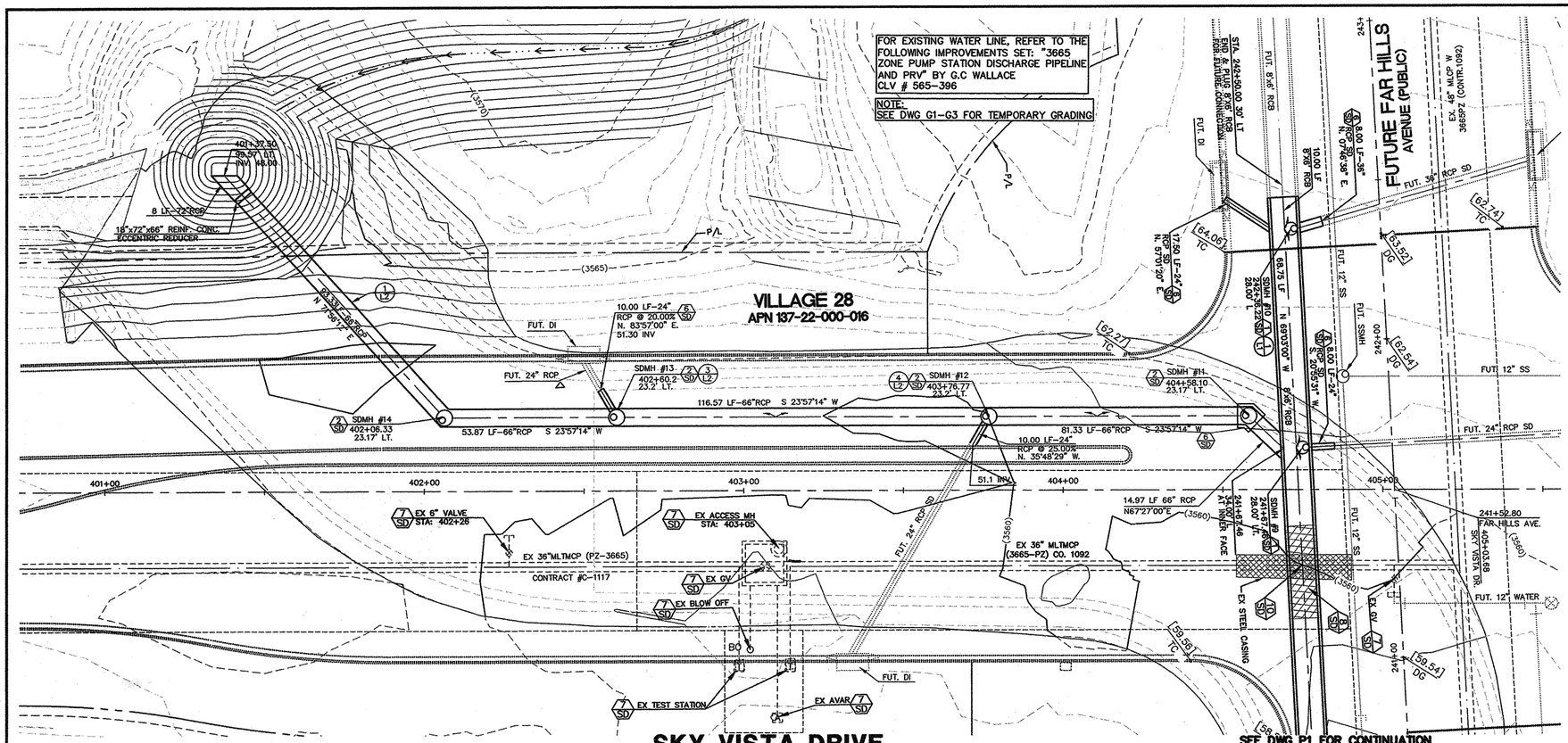
F:\Projects\600\62023B-227\DWG Production\6-227-PP.dwg
Daniel Kelley

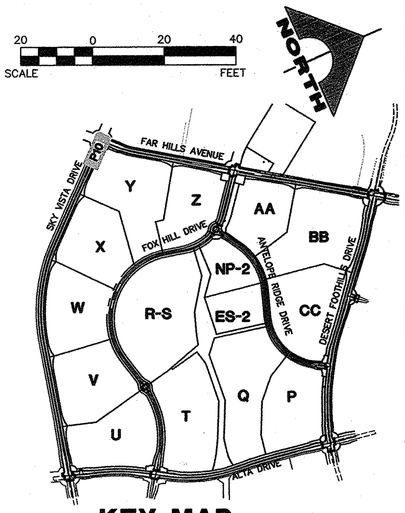
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 23B FAR HILLS AVE RCB IMPROVEMENTS
SKY VISTA DRIVE TO DESERT FOOTHILLS DRIVE

PLAN AND PROFILE 1

DRAWING
P1
11 OF 25 SHTS





KEY MAP

NOT TO SCALE

STORM DRAIN CONSTRUCTION NOTES:

1. INSTALL 48" TYPE IA STORM DRAIN MANHOLE PER DTL 1, DWG D1
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BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM (FEET)	NAVD 88 DATUM (METERS)
5LV09-34NE6	RIVET AND PLATE IN TOP OF CURB @ NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA DRIVE	3304.45	1007.197

BASIS OF BEARINGS

NORTH 89°45'05" EAST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 28 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA

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APPROVED FOR CONSTRUCTION

J. DISHAR, FOR DOA MEADE

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

PROJECT NO. 121998 DATE: 7/30/13

NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM. PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS.

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or
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AND
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1-702-455-7544

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CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround.
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

H #50002

CLV # 10745996

PROFESSIONAL ENGINEER - STATE OF NEVADA - JOSEPH A. VOSSEN - No. 9890 - 7/31/13

REV	DATE	REVISED BY/INITIALS	DESCRIPTION
A	7/31/13		

PROJECT NO. 82023B-227

DESIGN: DFK
DRAWN: DFK
CHECK: JLJ
PLOT DATE: 07-29-13
PLOT TIME: 11:23:06

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LAS VEGAS - MESQUITE

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Daniel Kelley

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 23B FAR HILLS AVE ROB IMPROVEMENTS
SKY VISTA DRIVE TO DESERT FOOTHILLS DRIVE

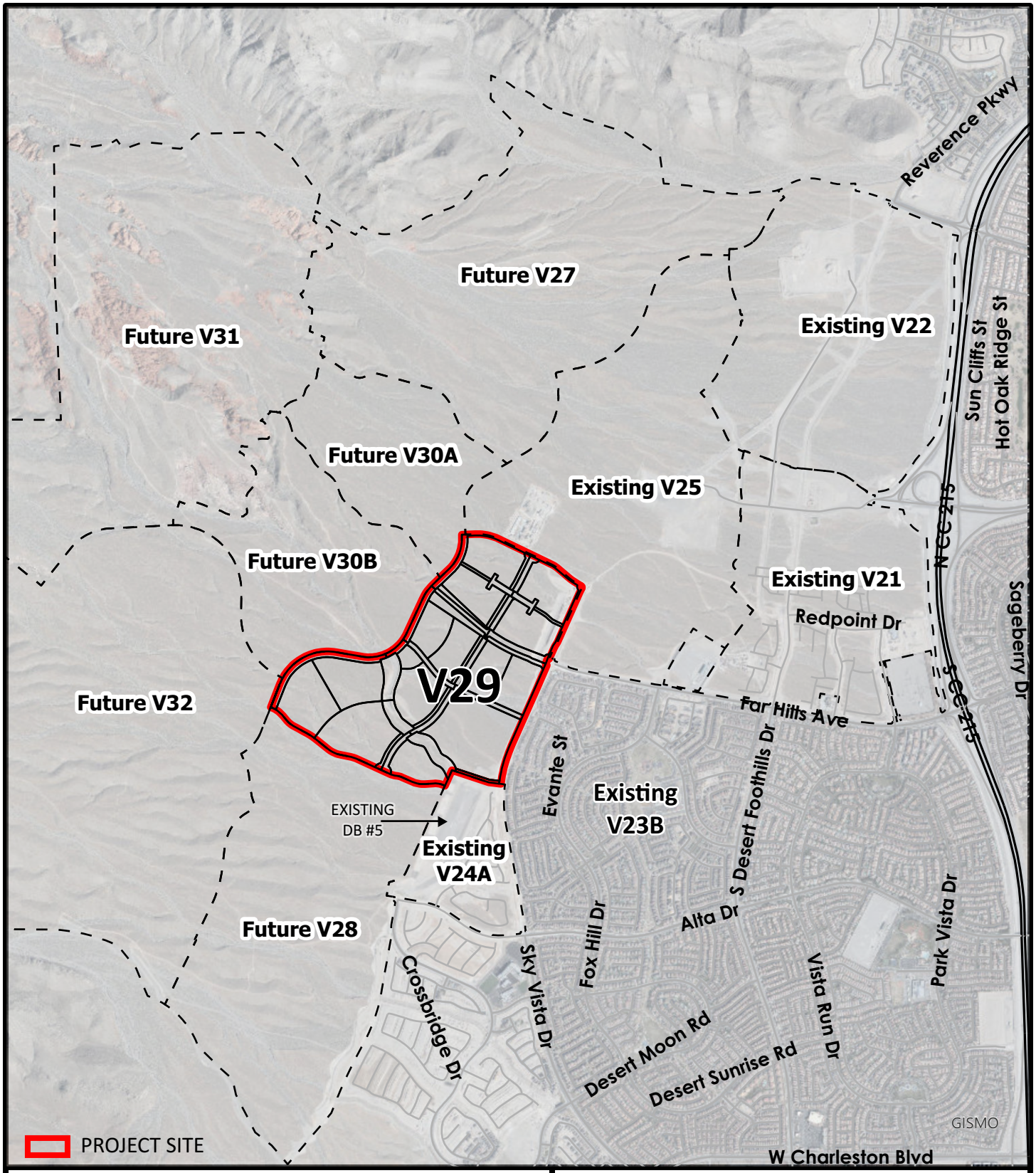
PLAN AND PROFILE 10

DRAWING P10

20 OF 25 SHTS

APPENDIX D

Drainage Figures



0 3,000 6,000 Feet

NORTH

FIG 1
VICINITY MAP

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
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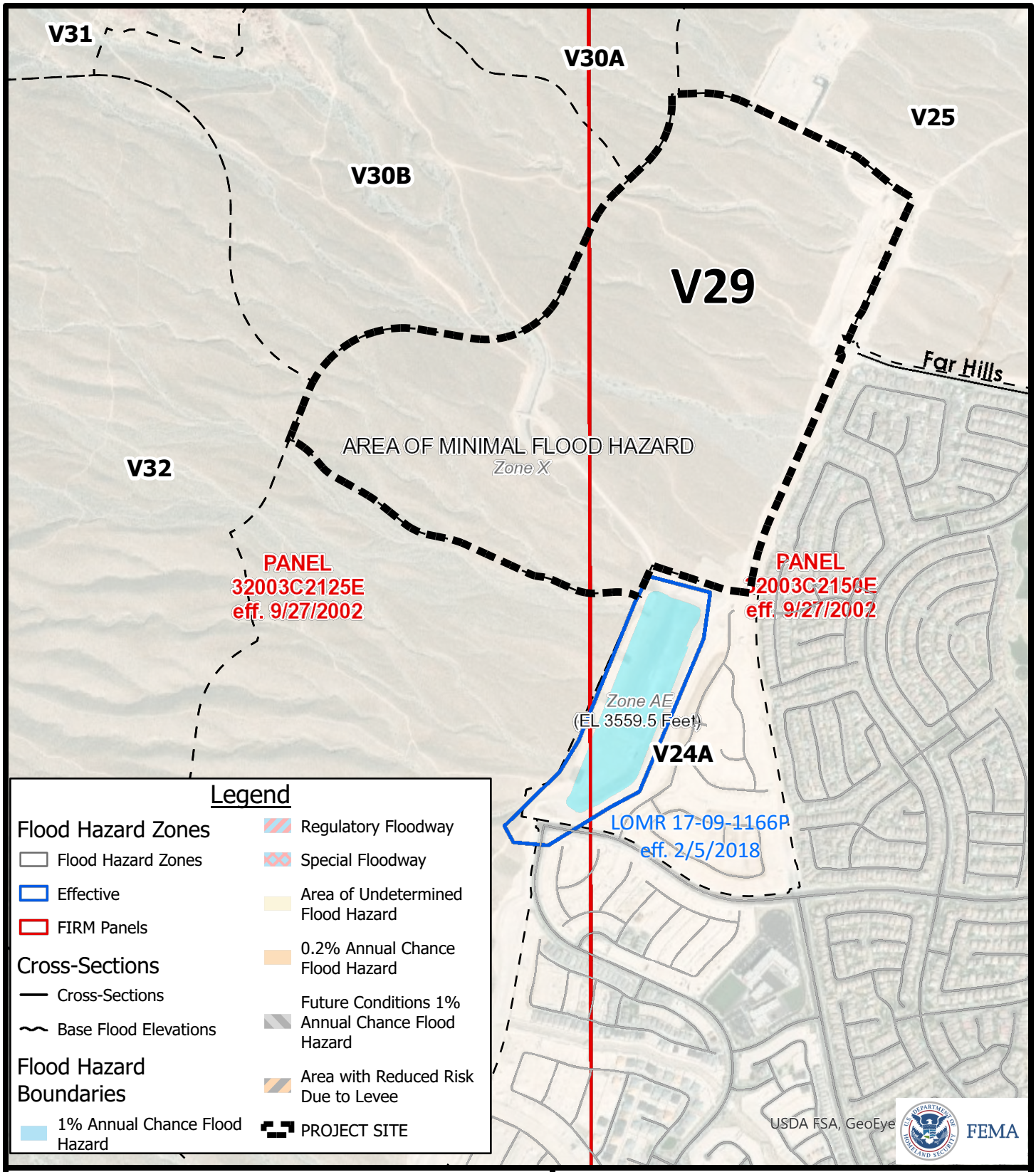

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Scale: 1:15,000

NORTH

FIG 2
FEMA FIRM

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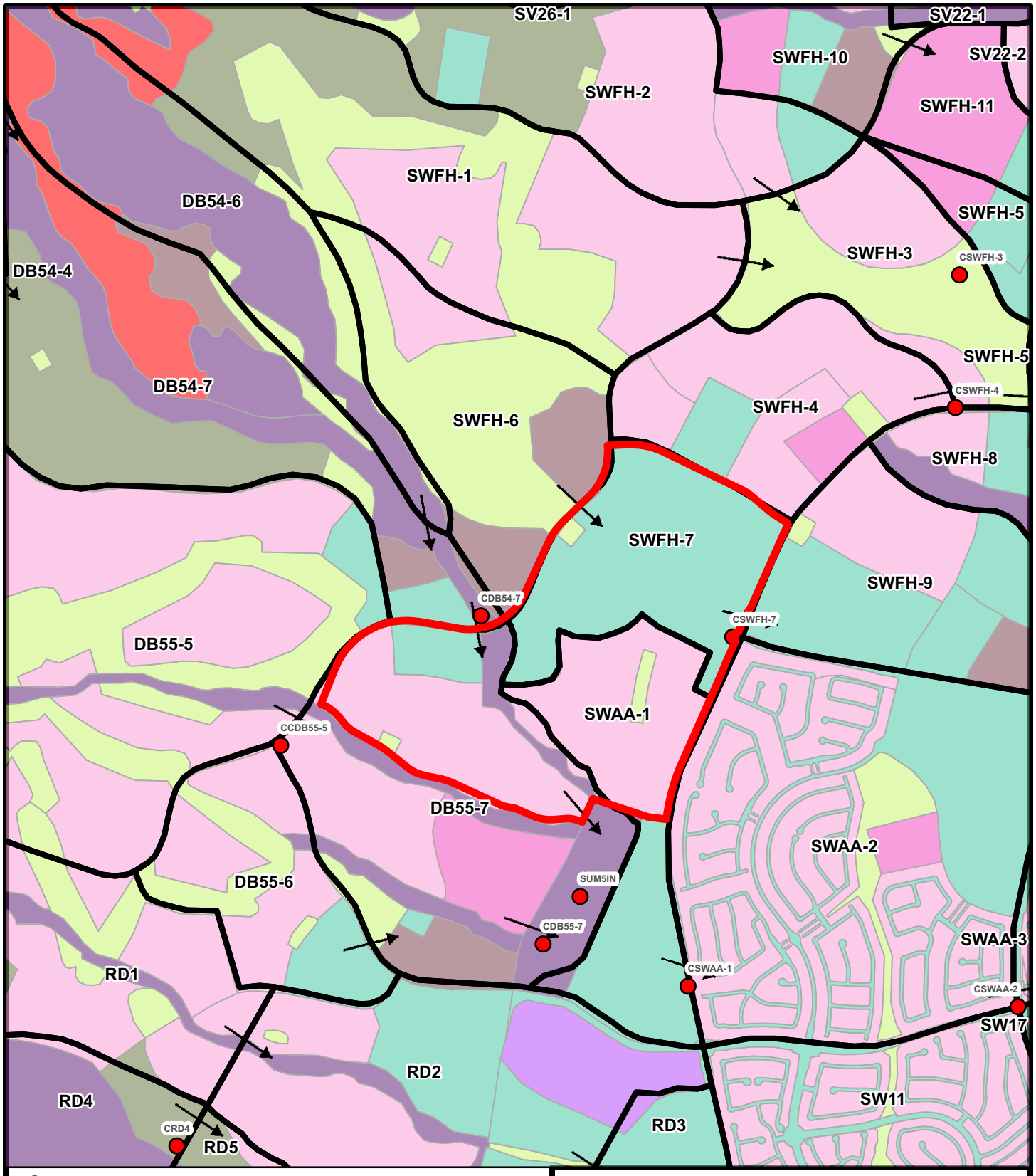

FIG 3

2018 MPU SUBBASIN MAP

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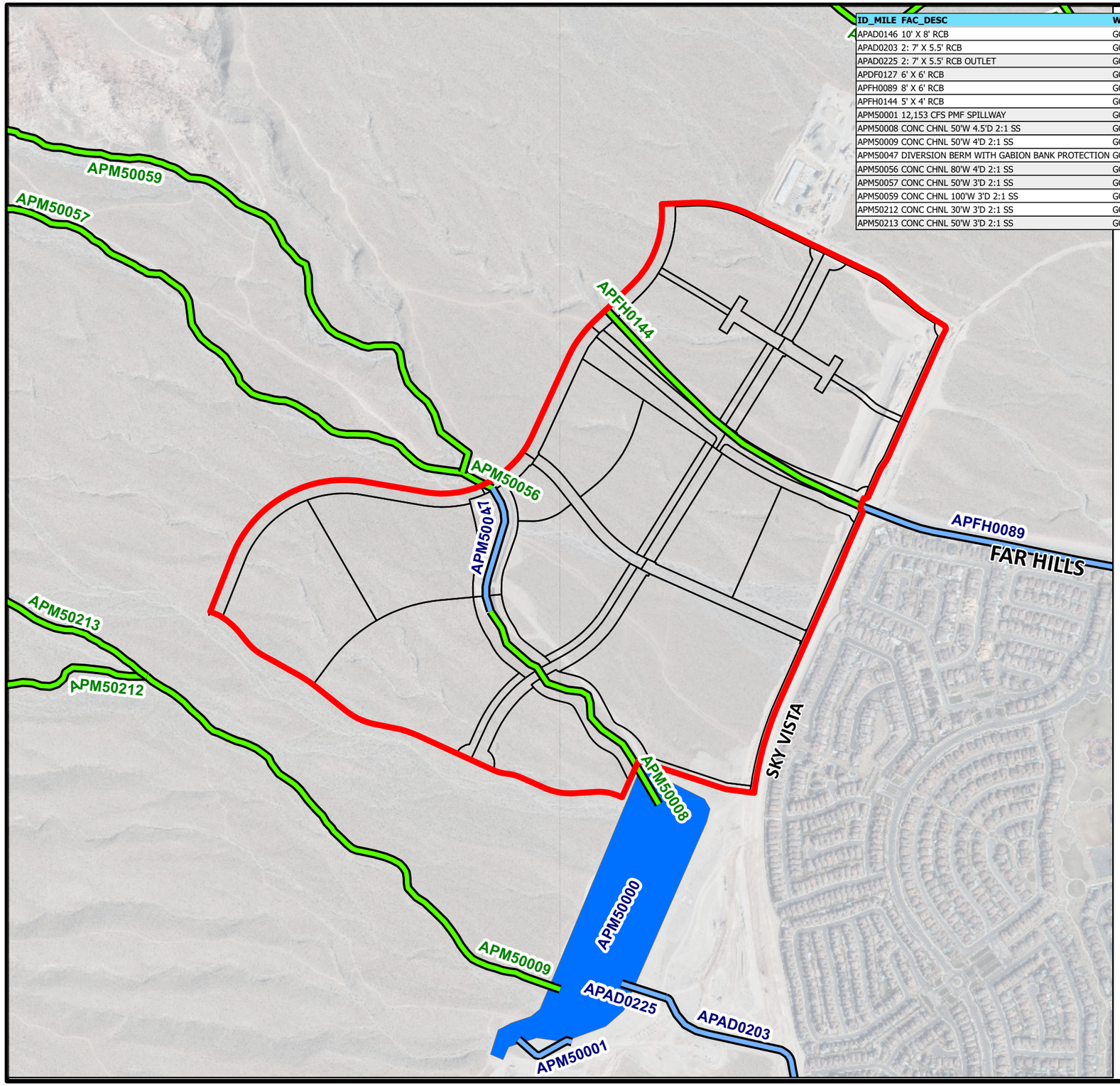

ID_MILE	FAC_DESC	WATERSHED	LENGTH_FT	W_FT	SLOPE_FTFT	HEC1_MODEL	HEC1_NODE	HEC1_FLOW	TRIB_AREA	FACNAME
APAD0146	10' X 8' RCB	GOWAN	3057	10	0.044	GOW3A	CSWAA-1	2200	6.95	ANGEL PARK - ALTA DRIVE BRANCH
APAD0203	2: 7' X 5.5' RCB	GOWAN	1104	7	0.0528	GOW3A	CSWAA-1	2200	6.95	ANGEL PARK - ALTA DRIVE BRANCH
APAD0225	2: 7' X 5.5' RCB OUTLET	GOWAN	360	7	0.034	GOW3A	SUM5DB	2137	6.73	ANGEL PARK - ALTA DRIVE BRANCH
APDF0127	6' X 6' RCB	GOWAN	2977	6	0.038	GOW3A	SWFH-1	853	0.69	ANGEL PARK - DESERT FOOTHILLS BRANCH
APFH0089	8' X 6' RCB	GOWAN	2946	8	0.02	GOW3A	CSWFH-7	839	0.5	ANGEL PARK - FAR HILLS BRANCH
APFH0144	5' X 4' RCB	GOWAN	2497	5	0.055	GOW3A	SWFH-6	456	0.28	ANGEL PARK - FAR HILLS BRANCH
APM50001	12,153 CFS PMF SPILLWAY	GOWAN	0	0	0	GOW3A	SUM5IN	12153	6.73	ANGEL PARK - MIDDLE 5 BRANCH
APM50008	CONC CHNL 50'W 4.5'D 2:1 SS	GOWAN	2102	50	0.052	GOW3A	CCDB54-7	3634	4.13	ANGEL PARK - MIDDLE 5 BRANCH
APM50009	CONC CHNL 50'W 4'D 2:1 SS	GOWAN	4180	50	0.058	GOW3A	CDB55-7	3495	2.6	ANGEL PARK - MIDDLE 5 BRANCH
APM50047	DIVERSION BERM WITH GABION BANK PROTECTION	GOWAN	1000	0	0.013	GOW3A	CCDB54-7	3634	4.13	ANGEL PARK - MIDDLE 5 BRANCH
APM50056	CONC CHNL 80'W 4'D 2:1 SS	GOWAN	264	80	0.013	GOW3A	CCDB54-7	3634	4.13	ANGEL PARK - MIDDLE 5 BRANCH
APM50057	CONC CHNL 50'W 3'D 2:1 SS	GOWAN	9922	50	0.068	GOW3A	CDB54-4	1664	0.81	ANGEL PARK - MIDDLE 5 BRANCH
APM50059	CONC CHNL 100'W 3'D 2:1 SS	GOWAN	9075	100	0.07	GOW3A	CDB54-7	2606	3.31	ANGEL PARK - MIDDLE 5 BRANCH
APM50212	CONC CHNL 30'W 3'D 2:1 SS	GOWAN	6695	30	0.075	GOW3A	DB55-1	1092	0.64	ANGEL PARK - MIDDLE 5 BRANCH
APM50213	CONC CHNL 50'W 3'D 2:1 SS	GOWAN	6522	50	0.073	GOW3A	CDB55-5	1729	1.3	ANGEL PARK - MIDDLE 5 BRANCH

ID_MILE	FAC_DESC	WATERSHED	ACRE_FT	HEC1_MODEL	HEC1_NODE	HEC1_FLOW	TRIB_AREA
APDF0125	130 AC-FT GRAND PARK DETENTION BASIN	GOWAN	130	GOW3A	CSWFH-3	1543	1.29
APM50000	384 AC-FT DETENTION BASIN #5	GOWAN	384.1	GOW3A	SUM5IN	6856	6.73

CCRFCD Facilities
STATUS
- COM
- CON
- PRO
- TN1
- TN2

CCRFCD Basins
STATUS
- COM
- CON
- PRO
- TN1
- TN2
- PROJECT SITE
- Subbasin

FIG 4
2018 MPU FACILITY MAP

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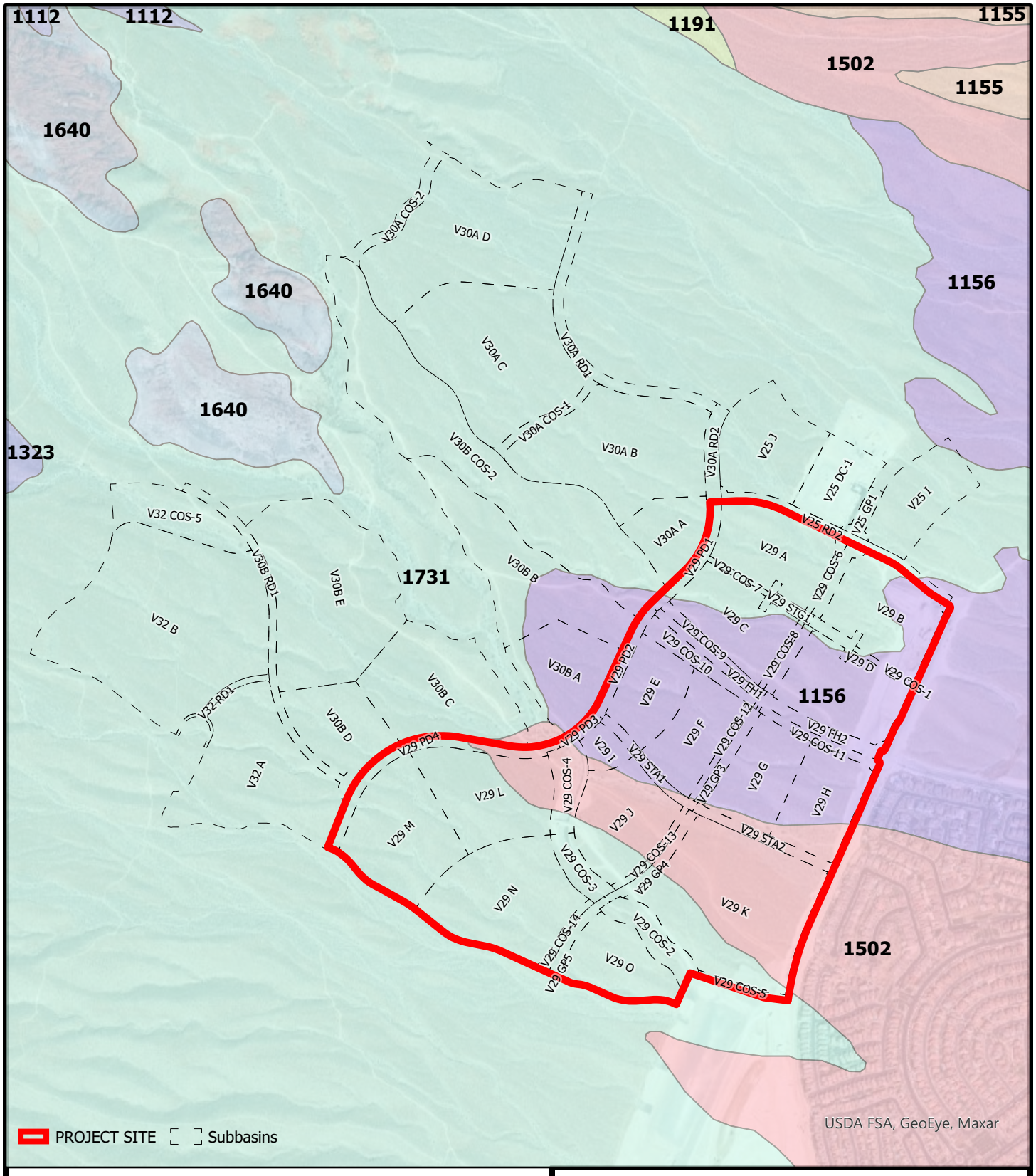

MPU MUSYM	A%	B%	C%	D%	ROCK%
1112	100	0	0	0	0
1155	0	0	0	100	0
1156	1	10	0	89	0
1191	100	0	0	0	0
1323	0	0	0	85	15
1502	60	0	0	40	0
1640	0	0	0	10	90
1731	10	2	0	88	0

FIG 5

MPU 2018 SOIL MAP

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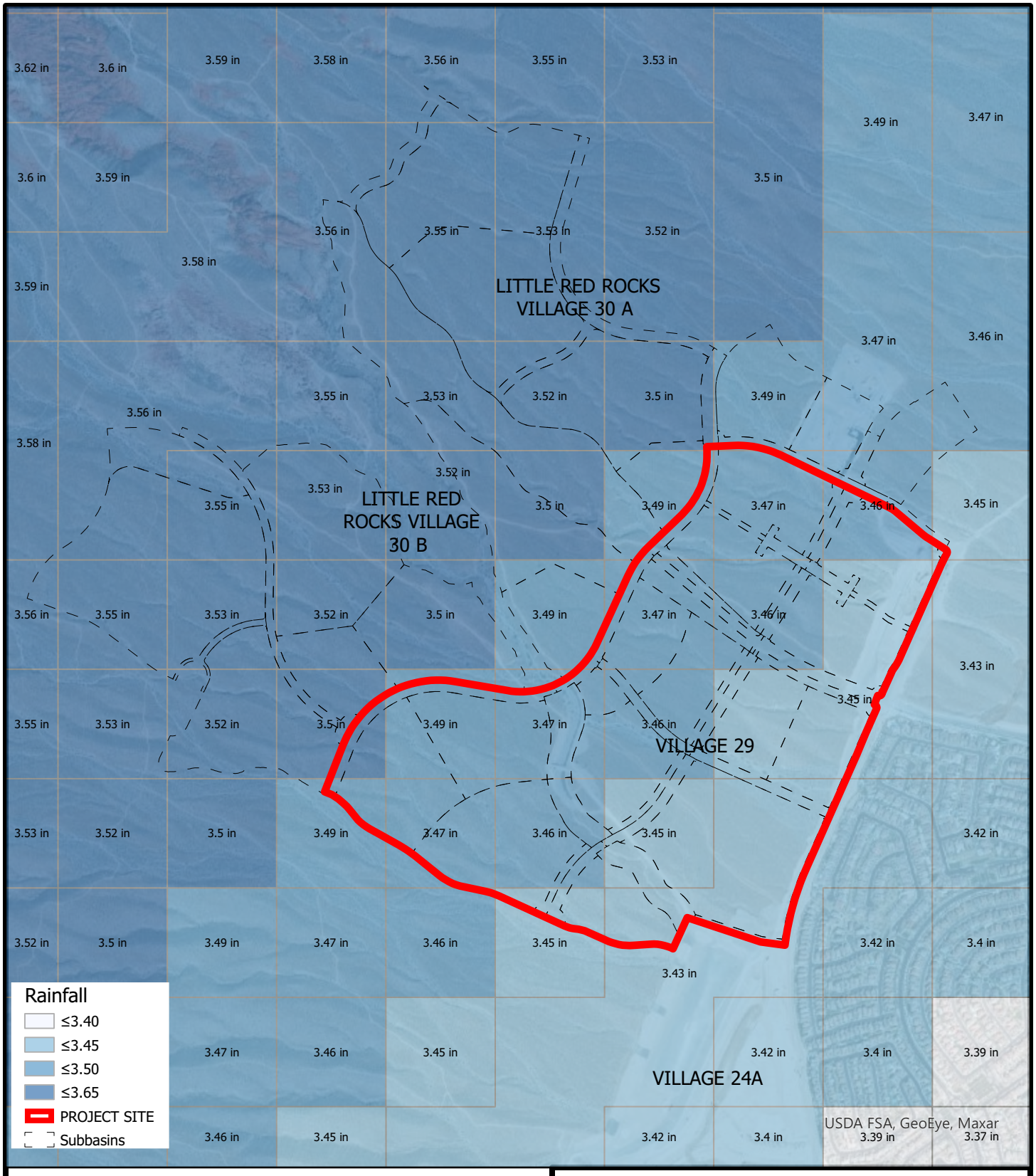

0 1,000 2,000 Feet

Scale: 1:15,000

NORTH

FIG 6

100-YEAR RAINFALL MAP

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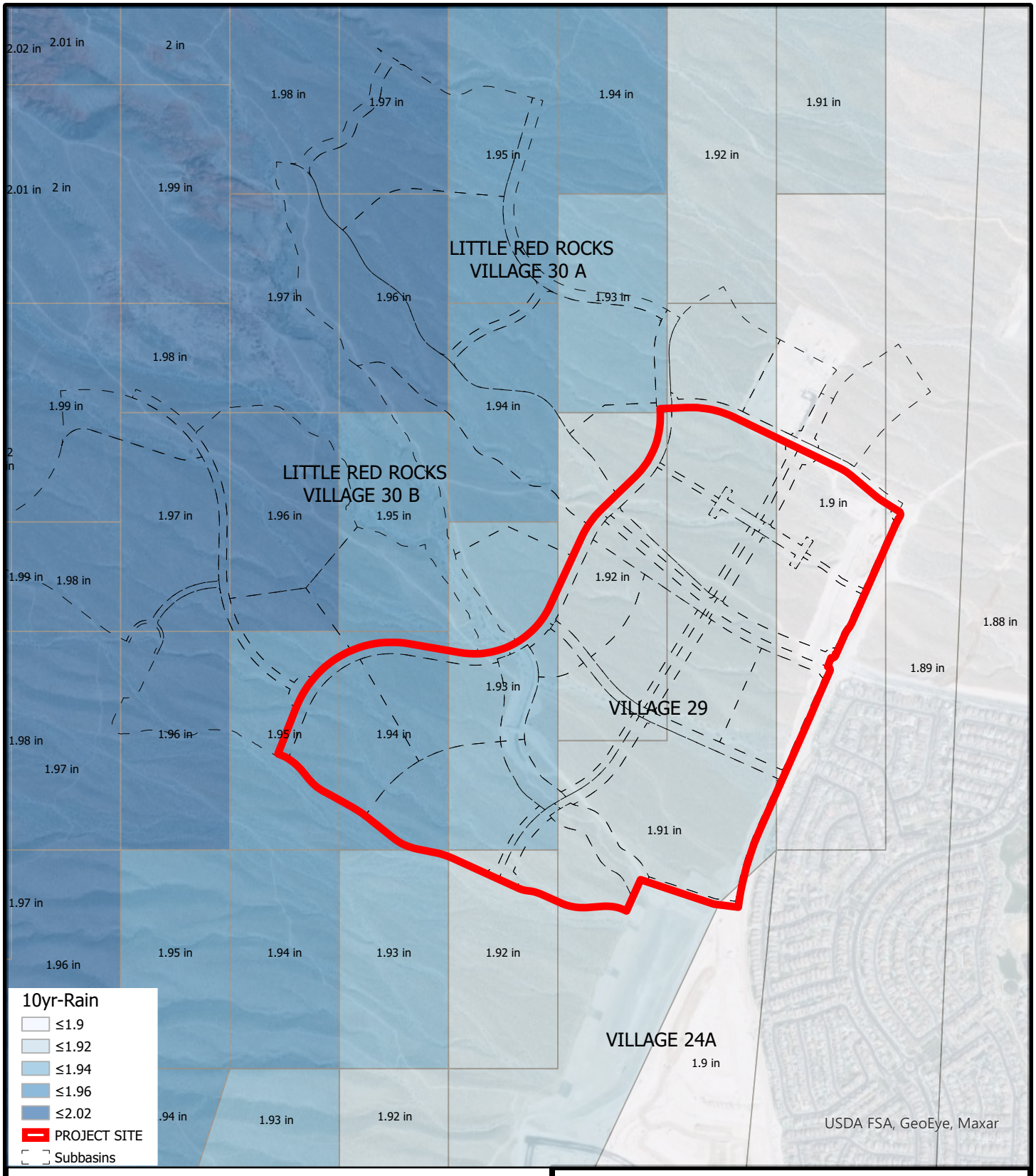

0 1,000 2,000 Feet

Scale: 1:15,000

NORTH

FIG 7

10-YEAR RAINFALL MAP

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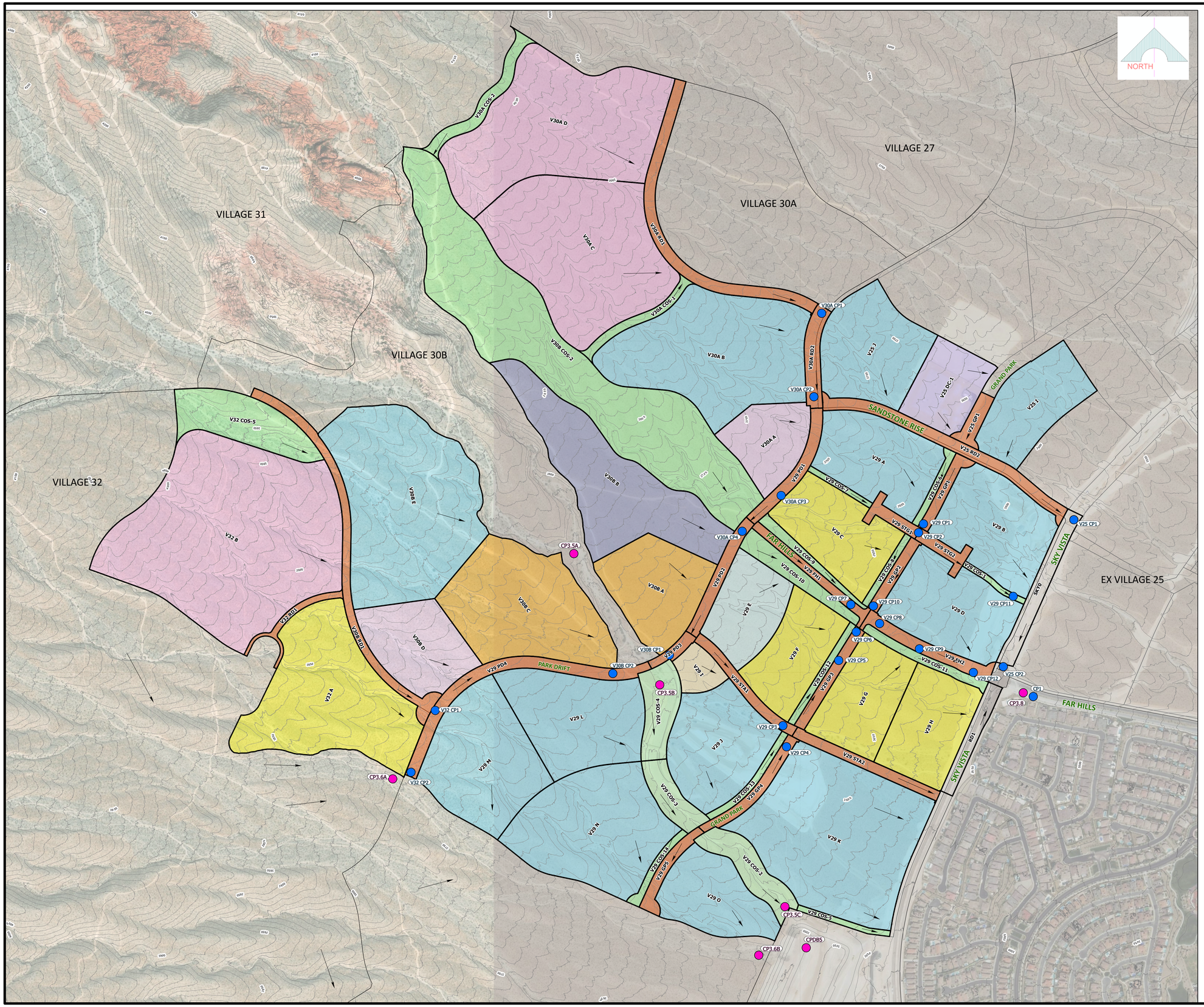

Legend

- Subbasin/V29 Parcels
- Summerlin Village 29 Boundary
- FLOW DIRECTION
- CP
- CP SWPA (for spatial reference only)
- 10ft Contours

LANDUSE
- COS
- COS (W)
- DC
- MF3
- NF
- SF1
- SF2
- SF3
- SFSD
- ST
- VC (R-C)
- VC (RR-MU)

SUMMERLIN WEST VILLAGE 29
SUBBASINS HYDROLOGICAL INFORMATION

Subbasin ID	Land Use Designation	AREA (ac)	Q100 (cfs)	WCN
V25 DC-1	DC	9.3	35	91.7
V25 GP1	ST	1.6	7	98.0
V25 I	SF2	13.2	49	94.3
V25 J	SF2	16.9	65	94.3
V25 RD2	ST	5.7	24	98.0
V29 A	SF2	15.8	61	94.3
V29 B	SF2	17.1	65	94.5
V29 C	SF3	14.6	56	94.5
V29 COS-1	COS	0.7	2	87.6
V29 COS-10	COS	3.8	13	87.8
V29 COS-11	COS	2.2	8	87.8
V29 COS-12	COS	1.4	5	87.7
V29 COS-13	COS	1.4	4	80.6
V29 COS-14	COS	1.2	4	86.7
V29 COS-2	COS (W)	5.3	16	86.7
V29 COS-3	COS (W)	3.6	12	86.7
V29 COS-4	COS (W)	5.2	11	78.8
V29 COS-5	COS	1.0	3	86.7
V29 COS-6	COS	1.1	4	86.7
V29 COS-7	COS	0.7	2	86.7
V29 COS-8	COS	1.0	3	87.7
V29 COS-9	COS	1.8	6	87.8
V29 D	SF2	16.8	64	94.6
V29 E	MF3	11.0	44	94.6
V29 F	SF3	12.1	49	94.6
V29 FH1	ST	2.3	10	98.0
V29 FH2	ST	3.2	14	98.0
V29 G	SF3	13.1	49	94.4
V29 GP1	ST	1.7	8	98.0
V29 GP2	ST	1.5	7	98.0
V29 GP3	ST	2.2	9	98.0
V29 GP4	ST	2.4	10	98.0
V29 GP5	ST	2.0	9	98.0
V29 H	SF3	13.6	50	93.8
V29 I	NF	3.0	13	94.2
V29 J	SF2	16.7	56	92.4
V29 K	SF2	39.0	128	92.3
V29 L	SF2	19.9	77	93.7
V29 M	SF2	21.9	83	94.3
V29 N	SF2	26.2	102	94.3
V29 O	SF2	12.4	47	94.3
V29 PD1	ST	2.8	12	98.0
V29 PD2	ST	2.6	11	98.0
V29 PD3	ST	1.0	4	98.0
V29 PD4	ST	6.1	28	98.0
V29 STA1	ST	2.4	11	98.0
V29 STA2	ST	2.8	13	98.0
V29 STG1	ST	1.4	6	98.0
V29 STG2	ST	1.4	6	98.0
V30A A	SFSD	9.6	39	94.3
V30A B	SF2	33.5	130	94.3
V30A C	SF1	37.6	115	88.1
V30A COS-1	COS	2.0	6	86.8
V30A COS-2	COS	3.3	10	86.7
V30A D	SF1	39.0	122	88.1
V30A RD1	ST	6.7	27	98.0
V30A RD2	ST	2.8	13	98.0
V30B A	VC (RR-MU)	14.9	57	94.6
V30B B	VC (R-C)	27.1	101	94.4
V30B C	VC (RR-MU)	26.4	103	94.3
V30B COS-2	COS	51.5	145	86.7
V30B D	SFSD	13.3	54	94.3
V30B E	SF2	40.3	152	94.3
V30B RD1	ST	6.3	25	98.0
V32 A	SF3	31.1	121	94.3
V32 B	SF1	59.7	183	88.1
V32 COS-5	COS	10.3	32	86.7
V32 RD1	ST	1.4	6	98.0

SUMMERLIN WEST VILLAGE 29
CONCENTRATION POINTS INFORMATION

CP ID	Tributary	AREA (sq mi)	Q_{100} (cfs)
V25 CP1	V25 J, DC-1, V25 I, V25 GP1, V25 RD2	0.07	181
V25 CP2	V25 CP1, V29 B, V29 CP11, SKY0 (from V25 MDS)	0.14	350
V29 CP1	V29A, V29 GP1, V29 COS-6	0.03	73
V29 CP2	V29 CP1, V29 COS-7, V29 STG1	0.03	81
V29 CP3	V29 I, V29 STA1	0.01	24
V29 CP4	V29 GP4, V29 COS-13	0.01	13
V29 CP5	V29 CP3, V29 CP4, V29 GP3, V29 COS-12	0.02	51
V29 CP6	V29 CP5, V29 F	0.04	101
V29 CP7	V29 E, V29 COS-10, V29 FH1, V29 COS-9	0.03	74
V29 CP8	V29 CP10, V29 CP6, V29 CP7	0.10	240
V29 CP9	V29 CP8, V29 G, V29 FH2, V29 COS-11	0.12	311
V29 CP10	V29 C, V29 COS-8, V29 GP2	0.03	66
V29 CP11	V29 CP2, V29 STG2, V29 COS-1	0.04	90
V29 CP12	V29 CP9, V29D	0.15	375
CP1	V25 CP2, V29 CP12, V29 H, RD1 (from V23B Sky V)	0.31	785
V30A CP1	V30A D, V30A C, V30A RD1, V30A COS-1	0.13	268
V30A CP2	V30A CP1, V30A B, V30A RD2	0.19	411
V30A CP3	V30A CP2, V30A A, V29 PD1	0.21	462
V30A CP4	V30A CP3, V30B COS2, V30A COS-2	0.29	596
V30B CP1	V30A CP4, V29 PD2, V30B B, V30B A, V29 PD3	0.37	770
V30B CP2	V30B D, V29 PD4	0.03	81
V32 CP1	V32 B, V32 COS-5, V30B RD1, V32 RD1	0.12	244
V32 CP2	V32 CP1, V32 A	0.17	365

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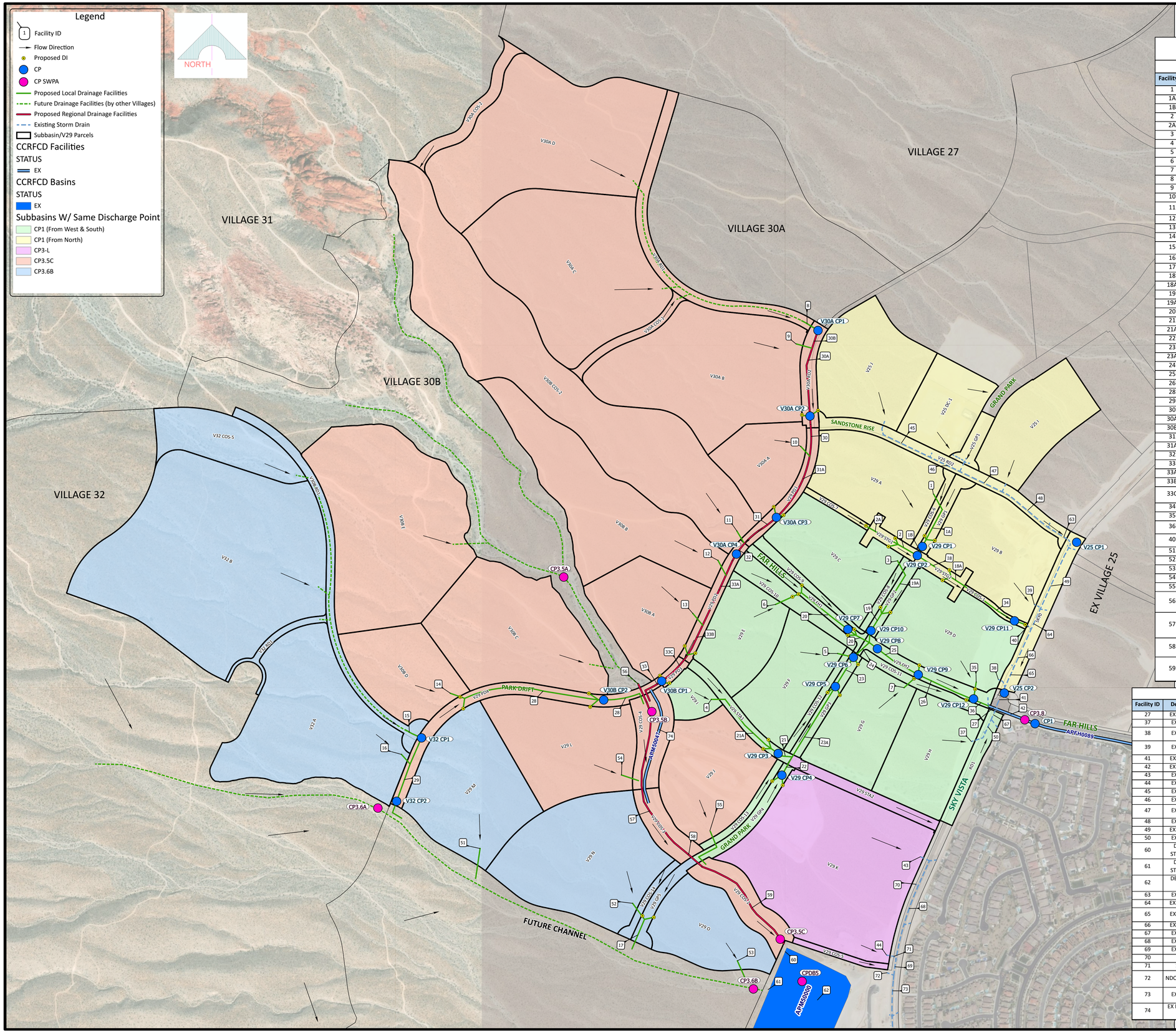
THE HOWARD HUGHES COMPANY, LLC

SUMMERLIN WEST VILLAGE 29 - MASTER DRAINAGE STUDY

ULTIMATE CONDITION BASIN MAP

FIG 8



SUMMERLIN WEST VILLAGE 29
STORM DRAIN INFORMATION

PROPOSED STORM DRAIN

Facility ID	Description	Tributary Basin/CP	Q_{100} (cfs)	Slope (%)	Note
1	42" RCP	V29A	61	1.0	
1A	42" RCP	V29A	61	0.5	
1B	42" RCP	V29 CP1	73	0.5	
2	24" RCP	V29 STG1, V29 COS-7	8	4.0	
2A	24" RCP	V29 COS-7	2	4.0	
3	42" RCP	V29C	56	1.0	
4	30" RCP	V29I	13	1.0	
5	42" RCP	V29F	49	1.0	
6	42" RCP	V29E, V29 COS-10, V29 FH1/2	62	1.0	
7	42" RCP	V29G, V29 COS-11, V29 F2/2	64	1.0	
8	54" RCP	V30A CP1	268	4.0	
9	54" RCP	V30A B	130	1.0	
10	36" RCP	V30A A	39	1.0	
11	(2) 48" RCP	V30B COS-2, V30A COS-2	155	1.0	
12	48" RCP	V30B B	101	1.0	
13	42" RCP	V30B A	57	1.0	
14	42" RCP	V30B D	54	1.0	
15	60" RCP	V32 CP1	244	3.7	
16	42" RCP	V32 A	121	1.0	
17	60" RCP	V29 N, V29 GP5, V20 COS-14	115	0.5	
18	42" RCP	V29 CP2	81	4.0	
18A	42" RCP	V29 CP2, V29 STG2	87	4.0	
19	48" RCP	V29 CP10	66	0.5	
19A	48" RCP	V29C	56	0.5	
20	42" RCP	V29 CP7	74	7.0	
21	30" RCP	V29 CP3	24	5.6	
21A	24" RCP	V29 I	13	5.6	
22	24" RCP	V29 CP4	13	1.0	
23	42" RCP	V29 CP5	51	1.0	
23A	36" RCP	V29 CP3, V29 CP4	37	1.0	
24	48" RCP	V29 CP6	101	1.0	
25	6'X6' RCB	V29 CP8	240	7.4	W/ 1" Sacificial Concrete
26	6'X6' RCB	V29 CP9	311	7.4	W/ 1" Sacificial Concrete
28	42" RCP	V30B CP2	81	3.0	
29	6'X6' RCB	V32 CP2	365	1.0	
30	7'X6' RCB	V30A CP2	411	0.6	
30A	7'X6' RCB	V30A CP1, V30A B	398	0.6	
30B	7'X6' RCB	V30A CP1	268	0.6	
31	8'X6' RCB	V30A CP3	462	0.6	
31A	8'X6' RCB	V30A CP2, V30A A	450	0.6	
32	10'X6' RCB	V30A CP4	596	0.6	
33	10'X7' RCB	V30B CP1	770	0.6	
33A	10'X7' RCB	V30A CP4, V30B B	697	0.6	
33B	10'X7' RCB	V30A CP4, V30B B, 30B A	754	0.6	
33C	10'X7' RCB	V30A CP4, V30B B, 30B A, V29 PD2	765	0.6	
34	42" RCP	V29 CP11	90	6.6	
35	42" RCP	V29 D	64	1.0	
36	6'X6' RCB	V29 CP12	375	3.0	W/ 1" Sacificial Concrete, Connect to Extisting 8'X6' RCB
40	42" RCP	V29 CP11	90	2.0	Existing 24" RCP to be replaced per revised hydraulic model
51	48" RCP	V29 M	83	1.0	
52	54" RCP	V29N, V29 COS-14, V29 GP5/2	111	1.0	
53	42" RCP	V29 O	47	1.0	
54	48" RCP	V29 L	77	1.0	
55	42" RCP	V29 J	56	1.0	
56	(5) 18'X9' RCBs	Revised CP3.5B	4615	5.0	SD Culvert Crossing Park Drift, Sized for normal depth and inlet cntrl (2 ft of Freeboard)
57	Channel with Natural Bottom, 120'W, 10'D, 2:1 SS W/ Riprap Banks (D50=16")	Revised CP3.5B	4615	5.0	Existing CCRFCD Facility to be replaced by a channel. Refer to the appendix for preliminary HEC-RAS analysis
58	(5) 18'X9' RCBs	Revised CP3.5B	4615	4.0	SD Culvert Crossing Grand Park, Sized for normal depth and inlet cntrl (2 ft of Freeboard)
59	Channel with Natural Bottom, 120'W, 10'D, 2:1 SS W/ Riprap Banks (D50=16")	Revised CP3.5C	4590	6.0	Refer to the appendix for preliminary HEC-RAS analysis

EXISTING STORM DRAIN

Facility ID	Description	Tributary Basin/CP	Q_{100} (cfs)	Slope (%)	Plan Set Name/Reference Study	Design Flow (cfs)
27	EX 8'X6' RCB	V29 CP12	375	3.0	Referenced from The Far Hills RCB Study	711
37	EX 66" RCP	V29 H	50	0.4	Referenced from The Far Hills RCB Study	320
38	EX 30" RCP	-	0	2.0	Referenced from The V25 Sky Vista Dr Study, Existing lateral SD to be abandoned	25
39	EX 36" RCP	V29 B	65	2.0	Referenced from The V25 Sky Vista Dr Study, acceptable per revised hydraulic model	49
41	EX 6'x6' RCB	V25 CP2	350	0.5	Referenced from The V25 Sky Vista Dr Study	416
42	EX 8'X6' RCB	CP1	785	2.0	Referenced from The Far Hills RCB Study	872
43	EX 54" RCP	A portion of V29K	-	6.0	Referenced from The V23B Sky Vista Dr Study	228
44	EX 42" RCP	A portion of V29K	-	3.5	Referenced from The V23B Sky Vista Dr Study	78
45	EX 36" RCP	V25 J	65	6.2	Referenced from The Sandstone Rise Study	70
46	EX 36" RCP	V25 J	65	2.8	Referenced from The Sandstone Rise Study	72
47	EX 48" RCP	V25 J, V25 DC-1, V25 GP1	107	9.5	Referenced from The Sandstone Rise Study	135
48	EX 48" RCP	V25 CP1	181	4.0	Referenced from The Sandstone Rise Study	188
49	EX 6'X6' RCB	V25 CP1	181	0.5	Referenced from The V25 Sky Vista Dr Study	308
50	EX 66" RCP	V29 H, RD1/2 (V23B SKY)	55	0.4	Referenced from The Far Hills RCB Study	320
60	DB INLET STRUCTURE	CP3.5C, V29L, V29J	4698	-	Referenced from The DB5 Study	4779
61	DB INLET STRUCTURE	CP3.6B	2762	-	Referenced from The DB5 Study	3617
62	DETENTION BASIN	CPDB5	7649	-	Referenced from The DB5 Study	8184
63	EX 48" RCP	V25 CP1	181	5.2	Referenced from The V25 Sky Vista Dr Study	308
64	EX 6'X6' RCB	V25 CP1, V29 B	246	0.5	Referenced from The V25 Sky Vista Dr Study	357
65	EX 6'x6' RCB	V25 CP1, V29 B, V29 CP11, SKY0/2	343	0.5	Referenced from The V25 Sky Vista Dr Study	384
66	EX 6'x6' RCB	V25 CP1, V29 B, V29 CP11	336	0.5	Referenced from The V25 Sky Vista Dr Study	377
67	EX 66" RCP	V29 H, RD1 (V23B SKY)	59	0.4	Referenced from The Far Hills RCB Study	320
68	EX 54" RCP	V29 K, Portion of V29 STA2	133	1.8	Referenced from The V23B Sky Vista Dr Study	228
69	EX 60" RCP	V29 K, V29 STA2	141	2.5	Referenced from The V23B Sky Vista Dr Study	307
70	5' DI	Portion of V29 STA2	5	-	Referenced from The V23B Sky Vista Dr Study	Nuisance Flow
71	12.5' DI	Portion of V29 STA2	8	-	Referenced from The V23B Sky Vista Dr Study	Nuisance Flow
72	NDOT TYPE II DI	V29 COS-5, Open area from V23B	11	-	Referenced from The V23B Sky Vista Dr Study	11
73	EX 60" RCP	V29 K, V29 STA2, V29 COS-5, Opne area frm V23B	152	1.9	Referenced from The V23B Sky Vista Dr Study	318
74	EX DIVERSION BERM	Revised CP3.5B	4615	-	Referenced from The Diversion Berm Study	4779

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THE HOWARD HUGHES COMPANY, LLC

SUMMERLIN WEST VILLAGE 29 - MASTER DRAINAGE STUDY

STORM DRAIN FACILITES MAP

FIG 9

NORTH

250 125 0 250 500 750 1,000 Feet

- SWPA Flow Direction
- CP SWPA
- SWPA Basin Boundary
- Summerlin Village 29 Boundary

V29 Subbasins W/ Same Discharge Point

- CP3.8 (From West & South)
- CP3.8 (From North)
- CP3-L
- CP3.5C
- CP3.6B

WOUS-5
WOUS-4
WOUS-3
WOUS-4B
3-A2
3-F
3-G1
3-G2
3-H1
3-L2
3-11
3-L
3-N1
3-N2
3-E
3-K1
3-K2
3-M
CP3.5A
CP3.5B
CP3.6A
CP3.5C
CP3.6B
CP3.8
CPDB5
V30A D
V30A C
V30A B
V30A A
V30A COS-2
V30A COS-1
V30A RD1
V30A RD2
V30B COS-2
V30B RD1
V30B B
V30B E
V30B A
V30B C
V30B D
V32 COS-5
V32 B
V32 RD1
V32 A
V25 J
V25 DC-1
V25 I
V25 GP1
V25 RD2
V29 A
V29 RD1
V29 COS-7
V29 COS-6
V29 GP1
V29 C
V29 STG1
V29 COS-1
V29 COS-3
V29 FH1
V29 COS-10
V29 COS-8
V29 GP2
V29 E
V29 D
V29 RD3
V29 F
V29 COS-12
V29 GP3
V29 FH2
V29 COS-11
V29 I
V29 STA1
V29 G
V29 H
V29 PD2
V29 PD4
V29 L
V29 COS-4
V29 J
V29 M
V29 COS-13
V29 GP4
V29 STA2
V29 N
V29 COS-14
V29 GP5
V29 COS-2
V29 O
V29 COS-5
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V29 COS-16
V29 P
V29 STA3
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