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RESPONSE TO COMMENTS ON THE TECHNICAL DRAINAGE STUDY FOR VILLAGE 25 SUMMERLIN COUNCIL PARK AT GRAND PARK

62025-660-1

November 2022

Prepared for:
Howard Hughes Company, LLC
10845 W. Griffith Peak Dr., Suite 160
Las Vegas, NV 89135

Prepared by GCW, Inc.

1555 South Rainbow Blvd
Las Vegas, NV 89146

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HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: VILLAGE 25 SUMMERLIN COUNCIL PARK AT GRAND PARK Date: November 2022

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

East/West: Sky Vista Drive

b) Section: 22 Township: 20 Range: 59

c) APN : 137-22-711-001

Name of Owner: The Howard Hughes Company, LLC

Telephone No.: 702-791-4300 Fax No.: E-Mail Address: april.chapman@howardhughes.com

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

Contact Person-Name: Nelson Baggs, P.E. **Telephone No.:** 702-804-2000

* **E-Mail Address:** NBaggs@gcwengineering.com **Fax No.:** 702-804-2299

Firm: GCW, Inc.

Address: 1555 South Rainbow Boulevard Las Vegas, Nevada 89146

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 93.3 acres Being Developed/Disturbed: +/- 22.4 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.): Park Improvements
5. Approximate upstream land area which drains to the subject site: 0
6. Has the site drainage been evaluated in the past? ☐ **YES** ☒ **NO** If yes, please identify documentation:
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: 42" stub in Sky Vista
8. Briefly describe your proposed schedule for the subject project: The client intends to start construction as soon as pracitical. Any expediting of this process is appreciated.



Engineer's Seal

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

*New Required Field

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

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

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62025-660-1

November 17, 2022

Albert Y. Sung, P.E.
City of Las Vegas Public Works
495 S. Main St.
Las Vegas, Nevada 89101

Re: Technical Drainage Study for Village 25 Summerlin Council Park at Grand Park

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,

Nelson Baggs, P.E.
Flood Control Division



11/17/2022

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Las Vegas, Nevada 89146

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62025-660-1

November 17, 2022

Mr. Albert Sung, P.E.
City of Las Vegas
495 Main Street
Las Vegas, NV

Re: Response to Comments on the Technical Drainage Study for Council Park at Grand Park (DS5579A)

Dear Mr. Sung:

This letter addresses the City of Las Vegas (CLV) review comments dated June 23, 2022. Changes to the design that have occurred since the first submittal are discussed below followed by individual responses to the review comments. A copy of the comment letter is included in Appendix B.

Reference Material
Since the previous submittal, it was discovered that reference material for referenced hydrology and street hydraulic calculations from adjacent studies was not included with the previous submittal. This information has been included in Appendix B with this submittal.

Onsite Hydrology
The previous submittal included new proposed onsite hydrology that resulted in a lower flow rate than anticipated by the referenced adjacent studies. To be conservative and match the approved studies in the area, the onsite hydrology is now referenced and then prorated to determine the flow rate at design locations. Pertinent reference material is included in Appendix B.

Onsite Hydraulics
Minor swales have been provided to direct areas of minimal runoff around park facilities. Swales designed to convey the 100-year storm event have been provided to catch the runoff in strategic locations and direct it to proposed onsite drop inlets. Note that the location and size of the onsite inlets and storm drain has been revised since the previous submittal. The onsite grading has also been revised for the newly proposed swales. Hydraulic calculations for the swales, inlets, and storm drain are provided in Appendix A.

In addition, a location where ponding would occur was discovered near the northeast corner of the Project. A ditch has been provided to direct the flow south towards a newly proposed inlet that conveys the flow to the stub in Sky Vista where this flow was anticipated by previous studies. A ditch and inlet have also been added to the open area at the southwest corner of the Site to convey this runoff to the Sky Vista stub.

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Comment: 1. Provide a copy of the zoning/planning conditions associated with this site with the next submittal to verify compliance with conditions. Flood Control will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the City Council). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.

Response: The zoning/planning conditions have been included in Appendix B within this submission.

Comment: 2. Sites with a grade difference of 2 feet above or below existing are required to have approval from the City Planning and Development Department. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the City Planning Department (229- 6301). The engineer must provide Planning approval with the next submittal.

Response: Plans, Details, and Letter have been submitted and approved. The Planning approval is included in Appendix B.

Comment: 3. The site is adjacent to or crosses 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 2

Response: It is acknowledged that CCRFCD concurrence is required prior to the final approval of the drainage study.

Comment: 4. Sheet GD1 & Sheet GD2: The Grand Park Detention Basin is under construction or has been built already, ie, the detention basin must be shown as existing and developed on all pertinent grading plans. Clearly identify the detention basin right-of-way limit and features such as maintenance ramp and inlet/outlet pipes etc. adjacent to the proposed park in the next submittal.

Response: The Grand Park Detention Basin and features have been shown on the grading sheets.

Comment: 5. Provide typical cross-sections to reflect the interface between the detention basin and the proposed Summerlin park.

Response: Cross-sections have been added to the plans to reflect the interface.

Comment: 6. Sheets GD2, GD4, GD6 & GD7: The label of an existing storm drain in Sunset Run Drive and Kettle Ridge Drive to be RCB is wrong. Revise to show “RCP” with diameter and label with City of Las Vegas recorded drawing number in the next submittal.

Response: Labels have been included to show “RCP” with diameter as well as the City of Las Vegas recorded drawing number.

Comment: 7. Sheet GD5: The north side of the driveway in Fox Hill Drive does not meet a minimum hump of six inches above the 100-year water surface in the main street. Review and revise accordingly.

Response: Humps 6 inches above the water surface elevation in adjacent street have been provided.

Comment: 8. Sheet GD5 & Sheet GD7: Show the size of the RCB in Sky Vista Drive and label with City of Las Vegas recorded drawing number on the plans.

Response: Size has and City of Las Vegas recorded drawing number have been provided on the plans.

Comment: 9. The overall parking lot improvement area is larger than 1 acre. Per Section 1500 of the Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual, the subject improvements must provide for Low Impact Development (LID) measures. Review and address the issue in the next submittal.

Response: Stormceptors have been provided to treat a minimum of 75% of the parking lot area. A BMP exhibit and calculations have been provided in Appendix B.

Comment: 10. Provide a note on all grading plans: "The onsite storm drains and the associated facilities are privately owned and to be privately maintained by the Summerlin Master HOA".

Response: The note has been provided on the grading plans.

Comment: 11. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (Stormwater Quality Management Stamp and Sign Detail).

Response: The note has been provided on all pertinent sheets.

Comment: 12. Provide a note on all grading plans (Standard Note No. 6): Post-Construction BMPs (PCBMPs) / Control Measures noted on the Grading Plans are mandatory permanent regulatory stormwater pollution controls. These PCBMPs must be installed per the approved plans and must be permanently maintained

Response: The note has been provided on the grading plans.

We hope that the foregoing satisfactorily addresses your concerns. Should you have questions or require additional information, please call.

Cordially,

GCW, INC.

Nelson Baggs, PE
Flood Control Division

APPENDIX A

Hydraulic Calculations and Information

Worksheet for Drive Aisle - Max Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.42 %
Discharge	13.00 cfs

MAX FLOW RATE AND SLOPE FOR DRIVE AISLES

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.64
0+00.00	1.14
0+24.00	0.00
0+24.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.64)	(0+24.00, 0.50)	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	0.37 ft
Roughness Coefficient	0.016
Elevation	0.37 ft
Elevation Range	0.00 to 1.64 ft
Flow Area	1.4 ft²
Wetted Perimeter	8.18 ft
Hydraulic Radius	0.18 ft
Top Width	7.80 ft
Normal Depth	0.37 ft
Critical Depth	0.62 ft
Critical Slope	0.59 %
Velocity	8.99 ft/s
Velocity Head	1.26 ft
Specific Energy	1.63 ft
Froude Number	3.680
Flow Type	Supercritical

Worksheet for Drive Aisle - Max Slope

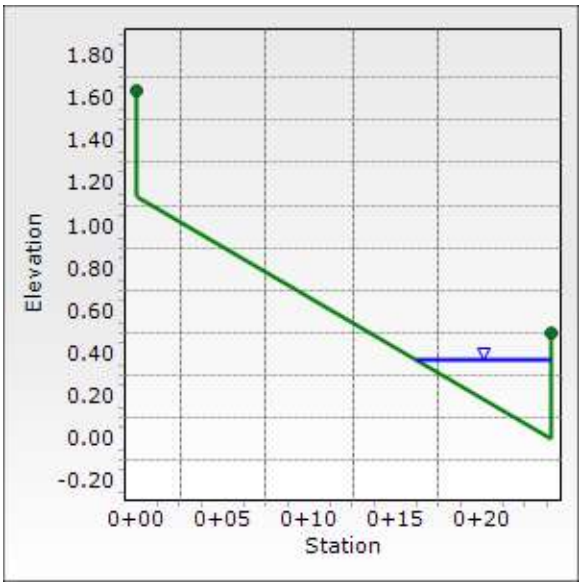
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Length	0.00 ft
Number Of Steps	0

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Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.37 ft
Critical Depth	0.62 ft
Channel Slope	9.42 %
Critical Slope	0.59 %

Cross Section for Drive Aisle - Max Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.42 %
Normal Depth	0.37 ft
Discharge	13.00 cfs



Worksheet for Drive Aisle - 1.97% Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

MAX FLOW RATE AT 1.97% SLOPE

Input Data	
Channel Slope	1.97 %
Discharge	13.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.64
0+00.00	1.14
0+24.00	0.00
0+24.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.64)	(0+24.00, 0.50)	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	0.50 ft
Roughness Coefficient	0.016
Elevation	0.50 ft
Elevation Range	0.00 to 1.64 ft
Flow Area	2.6 ft²
Wetted Perimeter	10.98 ft
Hydraulic Radius	0.24 ft
Top Width	10.47 ft
Normal Depth	0.50 ft
Critical Depth	0.62 ft
Critical Slope	0.59 %
Velocity	4.99 ft/s
Velocity Head	0.39 ft
Specific Energy	0.88 ft
Froude Number	1.764
Flow Type	Supercritical

Worksheet for Drive Aisle - 1.97% Slope

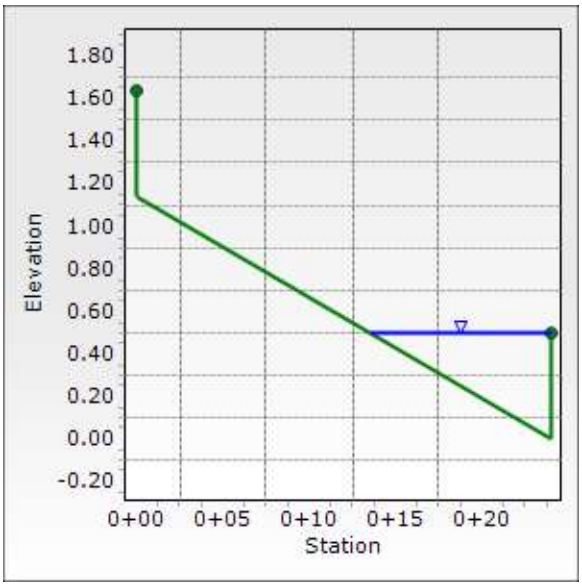
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Number Of Steps	0

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Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.50 ft
Critical Depth	0.62 ft
Channel Slope	1.97 %
Critical Slope	0.59 %

Cross Section for Drive Aisle - 1.97% Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.97 %
Normal Depth	0.50 ft
Discharge	13.00 cfs



Worksheet for Drive Aisle - Min Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

SMALLEST SLOPE WITH HIGHEST ANTICIPATED FLOW IN AREAS UNDER 1.97%

Input Data	
Channel Slope	1.11 %
Discharge	6.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.64
0+00.00	1.14
0+24.00	0.00
0+24.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.64)	(0+24.00, 0.50)	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
Roughness Coefficient	0.016
Elevation	0.41 ft
Elevation Range	0.00 to 1.64 ft
Flow Area	1.8 ft²
Wetted Perimeter	9.15 ft
Hydraulic Radius	0.20 ft
Top Width	8.73 ft
Normal Depth	0.41 ft
Critical Depth	0.46 ft
Critical Slope	0.65 %
Velocity	3.32 ft/s
Velocity Head	0.17 ft
Specific Energy	0.59 ft
Froude Number	1.284
Flow Type	Supercritical

Worksheet for Drive Aisle - Min Slope

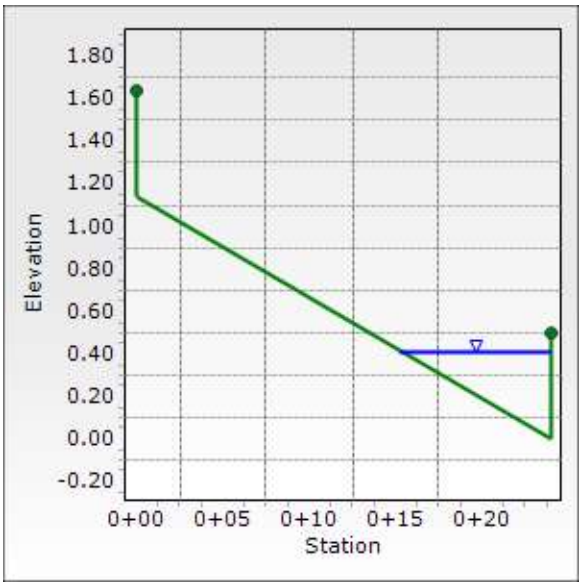
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Length	0.00 ft
Number Of Steps	0

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Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.41 ft
Critical Depth	0.46 ft
Channel Slope	1.11 %
Critical Slope	0.65 %

Cross Section for Drive Aisle - Min Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.11 %
Normal Depth	0.41 ft
Discharge	6.00 cfs



Worksheet for SECTION A (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.62 %
Discharge	4.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.025

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	0.57 ft
Roughness Coefficient	0.025
Elevation	0.57 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	1.0 ft²
Wetted Perimeter	3.63 ft
Hydraulic Radius	0.27 ft
Top Width	3.45 ft
Normal Depth	0.57 ft
Critical Depth	0.64 ft
Critical Slope	1.43 %
Velocity	4.04 ft/s
Velocity Head	0.25 ft
Specific Energy	0.83 ft
Froude Number	1.329
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION A (MAX SLOPE)

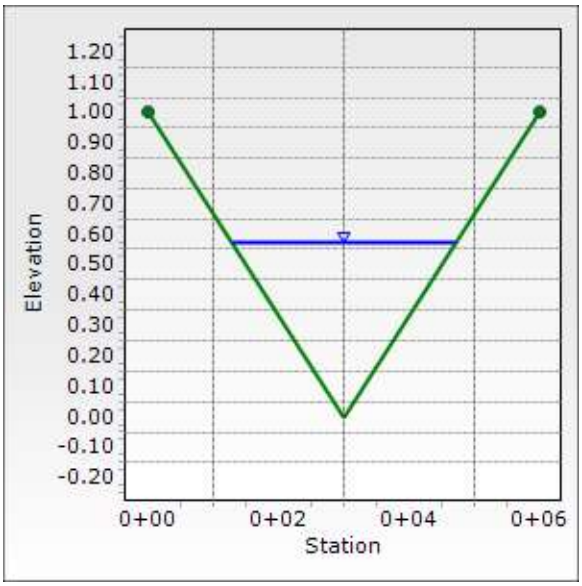
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Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.57 ft
Critical Depth	0.64 ft
Channel Slope	2.62 %
Critical Slope	1.43 %

Cross Section for SECTION A (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.62 %
Normal Depth	0.57 ft
Discharge	4.00 cfs



Worksheet for SECTION A (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.50 %
Discharge	4.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.025

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	0.78 ft
Roughness Coefficient	0.025
Elevation	0.78 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	1.8 ft²
Wetted Perimeter	4.95 ft
Hydraulic Radius	0.37 ft
Top Width	4.70 ft
Normal Depth	0.78 ft
Critical Depth	0.64 ft
Critical Slope	1.43 %
Velocity	2.17 ft/s
Velocity Head	0.07 ft
Specific Energy	0.86 ft
Froude Number	0.612
Flow Type	Subcritical

GVF Input Data

Worksheet for SECTION A (MIN SLOPE)

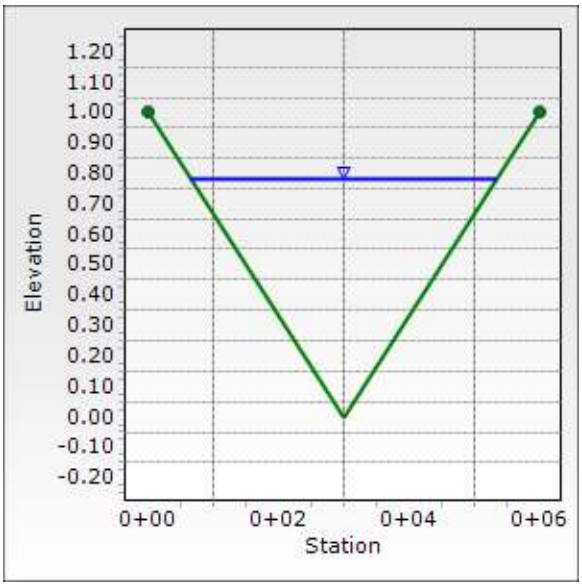
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Length	0.00 ft
Number Of Steps	0

GVF Output Data	
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Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.78 ft
Critical Depth	0.64 ft
Channel Slope	0.50 %
Critical Slope	1.43 %

Cross Section for SECTION A (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.50 %
Normal Depth	0.78 ft
Discharge	4.00 cfs



Worksheet for SECTION B1 (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.44 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.025

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	0.30 ft
Roughness Coefficient	0.025
Elevation	0.30 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	0.3 ft²
Wetted Perimeter	1.88 ft
Hydraulic Radius	0.14 ft
Top Width	1.79 ft
Normal Depth	0.30 ft
Critical Depth	0.37 ft
Critical Slope	1.71 %
Velocity	3.76 ft/s
Velocity Head	0.22 ft
Specific Energy	0.52 ft
Froude Number	1.720
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION B1 (MAX SLOPE)

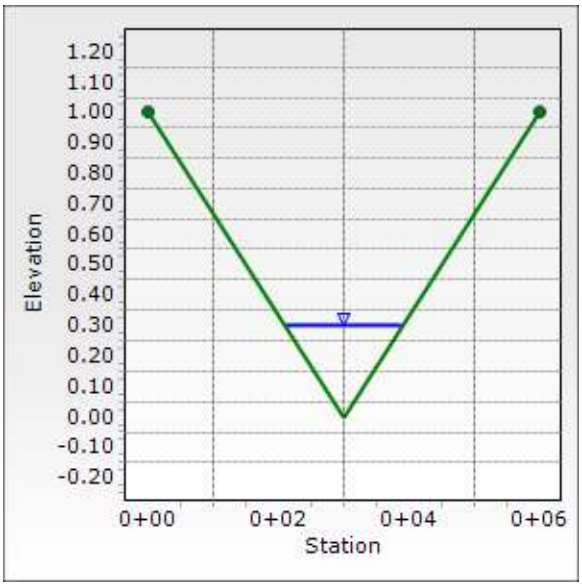
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Number Of Steps	0

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Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.30 ft
Critical Depth	0.37 ft
Channel Slope	5.44 %
Critical Slope	1.71 %

Cross Section for SECTION B1 (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.44 %
Normal Depth	0.30 ft
Discharge	1.00 cfs



Worksheet for SECTION B1 (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.40 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.025

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	0.33 ft
Roughness Coefficient	0.025
Elevation	0.33 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	0.3 ft²
Wetted Perimeter	2.06 ft
Hydraulic Radius	0.15 ft
Top Width	1.95 ft
Normal Depth	0.33 ft
Critical Depth	0.37 ft
Critical Slope	1.71 %
Velocity	3.16 ft/s
Velocity Head	0.15 ft
Specific Energy	0.48 ft
Froude Number	1.380
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION B1 (MIN SLOPE)

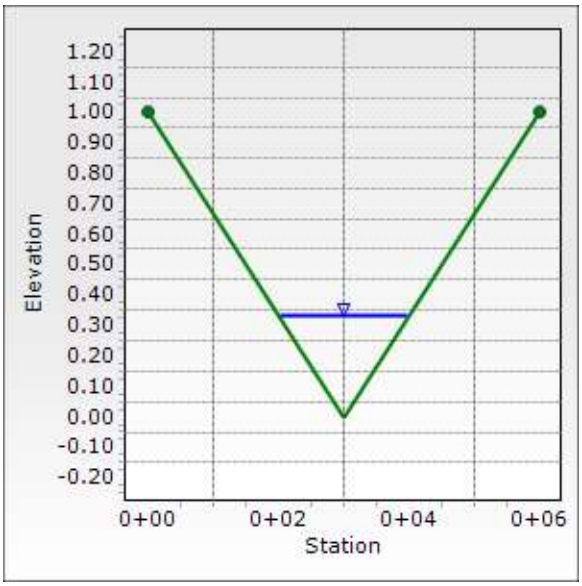
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Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.33 ft
Critical Depth	0.37 ft
Channel Slope	3.40 %
Critical Slope	1.71 %

Cross Section for SECTION B1 (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.40 %
Normal Depth	0.33 ft
Discharge	1.00 cfs



Worksheet for SECTION B3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.20 %
Discharge	5.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.037

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	0.57 ft
Roughness Coefficient	0.037
Elevation	0.57 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	1.0 ft²
Wetted Perimeter	3.62 ft
Hydraulic Radius	0.27 ft
Top Width	3.43 ft
Normal Depth	0.57 ft
Critical Depth	0.70 ft
Critical Slope	3.03 %
Velocity	5.10 ft/s
Velocity Head	0.40 ft
Specific Energy	0.98 ft
Froude Number	1.682
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION B3

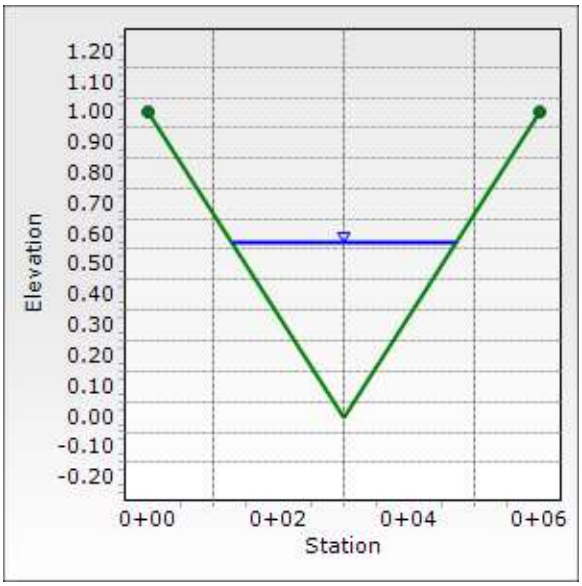
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Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.57 ft
Critical Depth	0.70 ft
Channel Slope	9.20 %
Critical Slope	3.03 %

Cross Section for SECTION B3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.20 %
Normal Depth	0.57 ft
Discharge	5.00 cfs



Channel Protection Sizing Using Equation 718

Known:

d50=	Riprap size (in)	8
Sg=	Specific Gravity of Rock (typ=2.5)	2.5
s=	Longitudinal Channel Slope (ft/ft)	0.092

$Vel=3*(d_{50}^{0.5})*(Sg-1)/(S^{0.17})$

Solve For:

Max Allowable Velocity= 5.51 fps

Worksheet for SECTION C

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.31 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.025

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
Roughness Coefficient	0.025
Elevation	0.47 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	0.7 ft²
Wetted Perimeter	2.97 ft
Hydraulic Radius	0.22 ft
Top Width	2.82 ft
Normal Depth	0.47 ft
Critical Depth	0.57 ft
Critical Slope	1.48 %
Velocity	4.54 ft/s
Velocity Head	0.32 ft
Specific Energy	0.79 ft
Froude Number	1.651
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION C

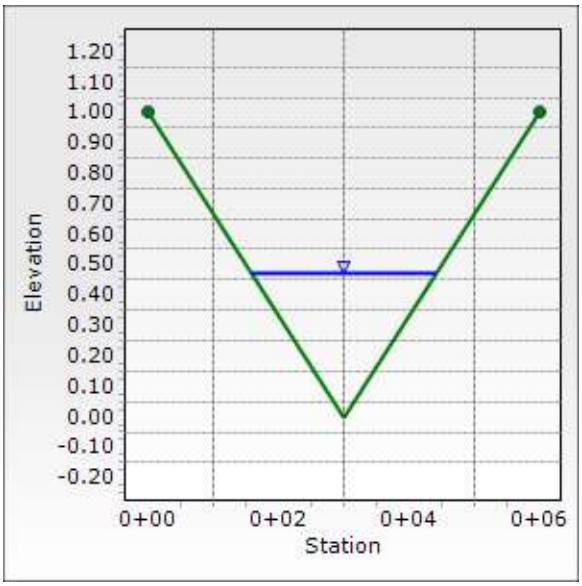
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
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	4.31 %
Critical Slope	1.48 %

Cross Section for SECTION C

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.31 %
Normal Depth	0.47 ft
Discharge	3.00 cfs



Worksheet for SECTION D

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.97 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.025

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	0.48 ft
Roughness Coefficient	0.025
Elevation	0.48 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	0.7 ft²
Wetted Perimeter	3.02 ft
Hydraulic Radius	0.23 ft
Top Width	2.86 ft
Normal Depth	0.48 ft
Critical Depth	0.57 ft
Critical Slope	1.48 %
Velocity	4.40 ft/s
Velocity Head	0.30 ft
Specific Energy	0.78 ft
Froude Number	1.588
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION D

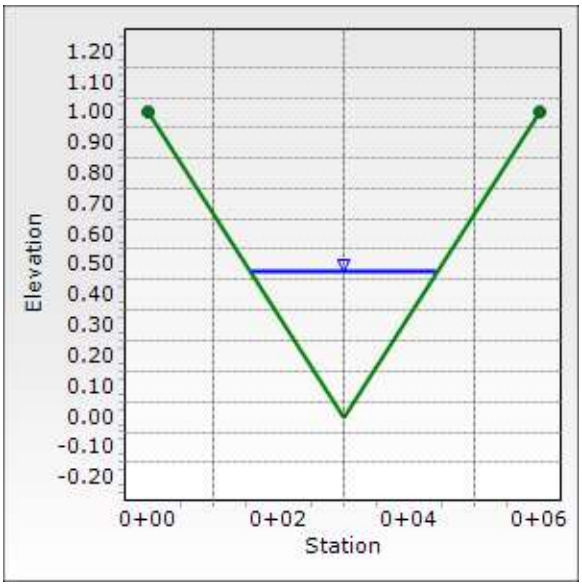
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.48 ft
Critical Depth	0.57 ft
Channel Slope	3.97 %
Critical Slope	1.48 %

Cross Section for SECTION D

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.97 %
Normal Depth	0.48 ft
Discharge	3.00 cfs



Worksheet for SECTION E

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	6.70 %
Discharge	7.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.037

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	0.69 ft
Roughness Coefficient	0.037
Elevation	0.69 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	1.4 ft²
Wetted Perimeter	4.35 ft
Hydraulic Radius	0.33 ft
Top Width	4.13 ft
Normal Depth	0.69 ft
Critical Depth	0.81 ft
Critical Slope	2.90 %
Velocity	4.93 ft/s
Velocity Head	0.38 ft
Specific Energy	1.07 ft
Froude Number	1.481
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION E

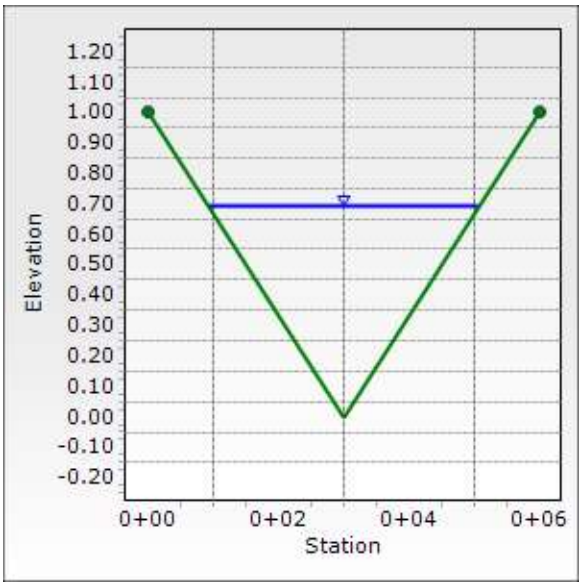
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.69 ft
Critical Depth	0.81 ft
Channel Slope	6.70 %
Critical Slope	2.90 %

Cross Section for SECTION E

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	6.70 %
Normal Depth	0.69 ft
Discharge	7.00 cfs



Channel Protection Sizing Using Equation 718

Known:

d50=	Riprap size (in)	8
Sg=	Specific Gravity of Rock (typ=2.5)	2.5
s=	Longitudinal Channel Slope (ft/ft)	0.067

$Vel=3*(d_{50}^{0.5})*(Sg-1)/(S^{0.17})$

Solve For:

Max Allowable Velocity= 5.82 fps

Worksheet for SECTION F

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.40 %
Discharge	4.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.025

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	0.55 ft
Roughness Coefficient	0.025
Elevation	0.55 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	0.9 ft²
Wetted Perimeter	3.46 ft
Hydraulic Radius	0.26 ft
Top Width	3.28 ft
Normal Depth	0.55 ft
Critical Depth	0.64 ft
Critical Slope	1.43 %
Velocity	4.46 ft/s
Velocity Head	0.31 ft
Specific Energy	0.86 ft
Froude Number	1.502
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION F

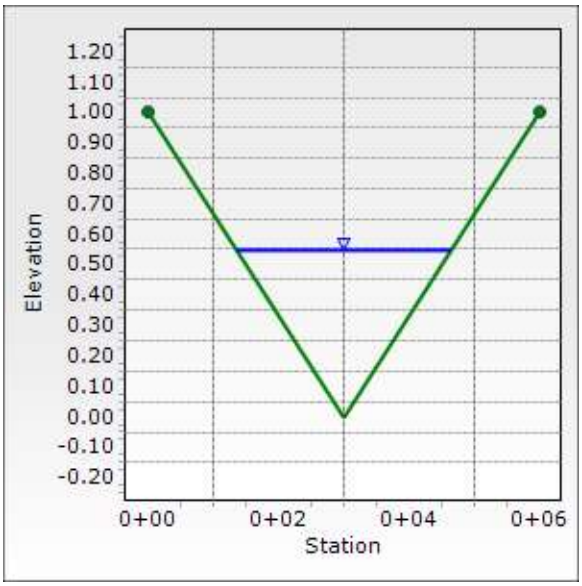
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.55 ft
Critical Depth	0.64 ft
Channel Slope	3.40 %
Critical Slope	1.43 %

Cross Section for SECTION F

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.40 %
Normal Depth	0.55 ft
Discharge	4.00 cfs



Worksheet for SECTION G

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.44 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+01.50	0.00
0+03.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+03.00, 0.50)	0.025

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

Results	
Normal Depth	0.27 ft
Roughness Coefficient	0.025
Elevation	0.27 ft
Elevation Range	0.00 to 0.50 ft
Flow Area	0.2 ft²
Wetted Perimeter	1.70 ft
Hydraulic Radius	0.13 ft
Top Width	1.61 ft
Normal Depth	0.27 ft
Critical Depth	0.37 ft
Critical Slope	1.72 %
Velocity	4.63 ft/s
Velocity Head	0.33 ft
Specific Energy	0.60 ft
Froude Number	2.226
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION G

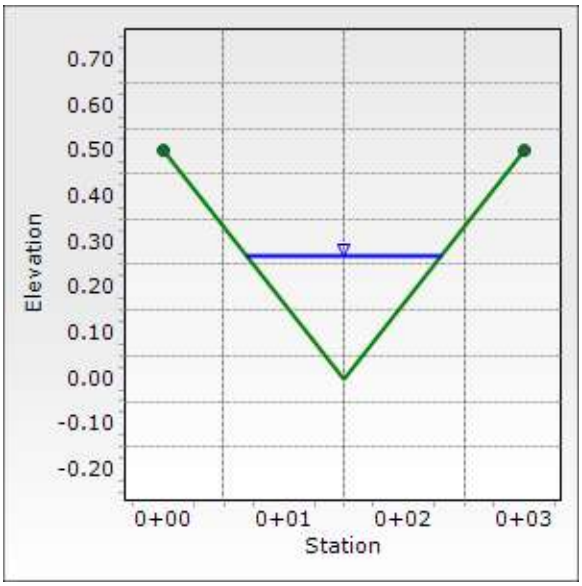
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.27 ft
Critical Depth	0.37 ft
Channel Slope	9.44 %
Critical Slope	1.72 %

Cross Section for SECTION G

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.44 %
Normal Depth	0.27 ft
Discharge	1.00 cfs



Worksheet for SECTION H

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.06 %
Discharge	1.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+01.50	0.00
0+03.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+03.00, 0.50)	0.025

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	0.35 ft
Roughness Coefficient	0.025
Elevation	0.35 ft
Elevation Range	0.00 to 0.50 ft
Flow Area	0.4 ft²
Wetted Perimeter	2.22 ft
Hydraulic Radius	0.17 ft
Top Width	2.11 ft
Normal Depth	0.35 ft
Critical Depth	0.43 ft
Critical Slope	1.62 %
Velocity	4.05 ft/s
Velocity Head	0.25 ft
Specific Energy	0.61 ft
Froude Number	1.704
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION H

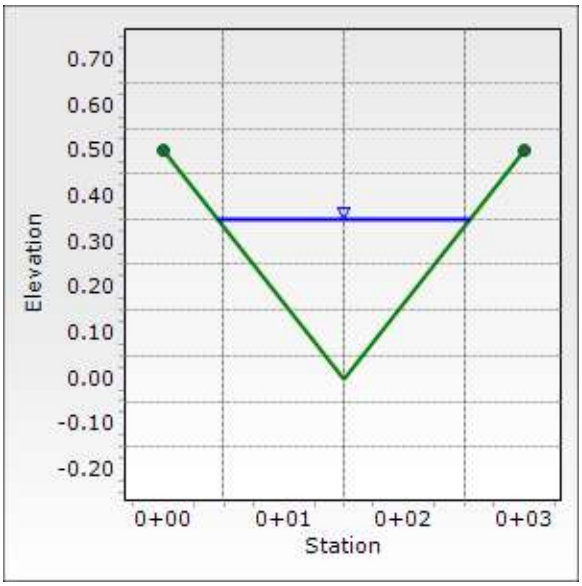
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.35 ft
Critical Depth	0.43 ft
Channel Slope	5.06 %
Critical Slope	1.62 %

Cross Section for SECTION H

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.06 %
Normal Depth	0.35 ft
Discharge	1.50 cfs



Worksheet for SECTION I (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	7.88 %
Discharge	6.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.037

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	0.63 ft
Roughness Coefficient	0.037
Elevation	0.63 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	1.2 ft²
Wetted Perimeter	3.99 ft
Hydraulic Radius	0.30 ft
Top Width	3.78 ft
Normal Depth	0.63 ft
Critical Depth	0.76 ft
Critical Slope	2.96 %
Velocity	5.04 ft/s
Velocity Head	0.39 ft
Specific Energy	1.02 ft
Froude Number	1.582
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION I (MAX SLOPE)

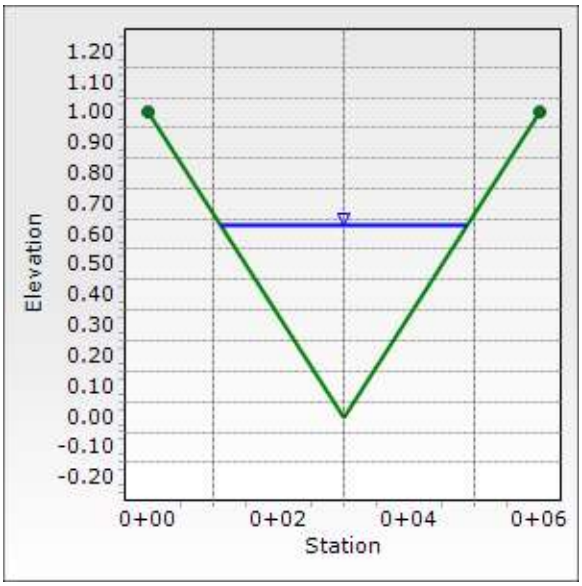
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.63 ft
Critical Depth	0.76 ft
Channel Slope	7.88 %
Critical Slope	2.96 %

Cross Section for SECTION I (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	7.88 %
Normal Depth	0.63 ft
Discharge	6.00 cfs



Channel Protection Sizing Using Equation 718

Known:

d50=	Riprap size (in)	8
Sg=	Specific Gravity of Rock (typ=2.5)	2.5
s=	Longitudinal Channel Slope (ft/ft)	0.079

$Vel=3*(d_{50}^{0.5})*(Sg-1)/(S^{0.17})$

Solve For:

Max Allowable Velocity= 5.66 fps

Worksheet for SECTION I (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.75 %
Discharge	6.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.037

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	0.67 ft
Roughness Coefficient	0.037
Elevation	0.67 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	1.3 ft²
Wetted Perimeter	4.23 ft
Hydraulic Radius	0.32 ft
Top Width	4.01 ft
Normal Depth	0.67 ft
Critical Depth	0.76 ft
Critical Slope	2.96 %
Velocity	4.47 ft/s
Velocity Head	0.31 ft
Specific Energy	0.98 ft
Froude Number	1.365
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION I (MIN SLOPE)

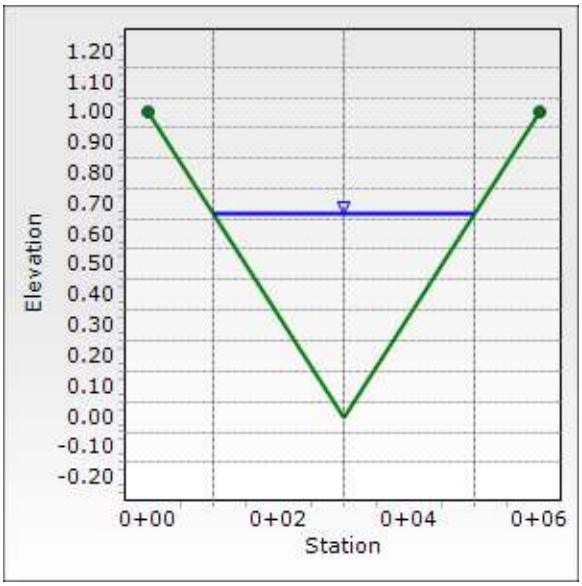
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.67 ft
Critical Depth	0.76 ft
Channel Slope	5.75 %
Critical Slope	2.96 %

Cross Section for SECTION I (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.75 %
Normal Depth	0.67 ft
Discharge	6.00 cfs



Worksheet for SECTION J

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	8.08 %
Discharge	2.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.035

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
Roughness Coefficient	0.035
Elevation	0.41 ft
Elevation Range	0.00 to 1.00 ft
Flow Area	0.5 ft²
Wetted Perimeter	2.57 ft
Hydraulic Radius	0.19 ft
Top Width	2.44 ft
Normal Depth	0.41 ft
Critical Depth	0.49 ft
Critical Slope	3.06 %
Velocity	4.03 ft/s
Velocity Head	0.25 ft
Specific Energy	0.66 ft
Froude Number	1.578
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION J

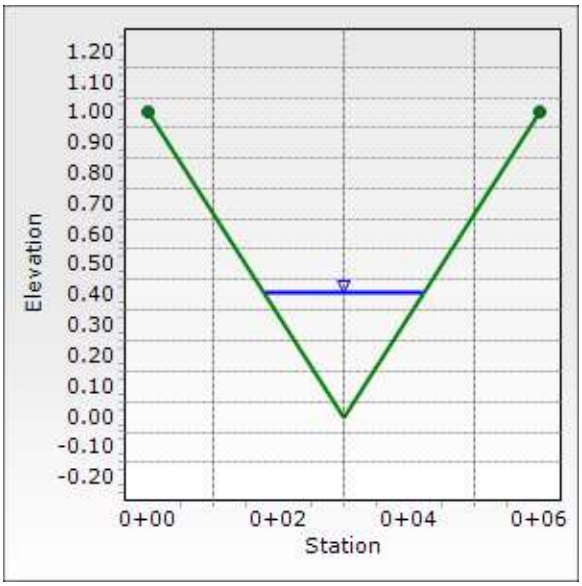
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
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	8.08 %
Critical Slope	3.06 %

Cross Section for SECTION J

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	8.08 %
Normal Depth	0.41 ft
Discharge	2.00 cfs



Channel Protection Sizing Using Equation 718

Known:

d50=	Riprap size (in)	6
Sg=	Specific Gravity of Rock (typ=2.5)	2.5
s=	Longitudinal Channel Slope (ft/ft)	0.081

$Vel=3*(d_{50}^{0.5})*(Sg-1)/(S^{0.17})$

Solve For:

Max Allowable Velocity= 4.88 fps

Worksheet for SECTION K (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.59 %
Discharge	16.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.50
0+04.50	0.00
0+09.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.50)	(0+09.00, 1.50)	0.025

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

Results	
Normal Depth	1.06 ft
Roughness Coefficient	0.025
Elevation	1.06 ft
Elevation Range	0.00 to 1.50 ft
Flow Area	3.4 ft²
Wetted Perimeter	6.71 ft
Hydraulic Radius	0.50 ft
Top Width	6.36 ft
Normal Depth	1.06 ft
Critical Depth	1.12 ft
Critical Slope	1.19 %
Velocity	4.74 ft/s
Velocity Head	0.35 ft
Specific Energy	1.41 ft
Froude Number	1.147
Flow Type	Supercritical

GVF Input Data

Worksheet for SECTION K (MAX SLOPE)

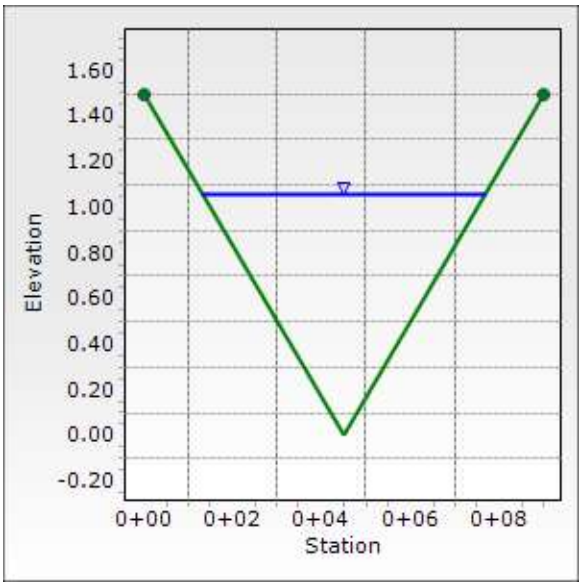
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.06 ft
Critical Depth	1.12 ft
Channel Slope	1.59 %
Critical Slope	1.19 %

Cross Section for SECTION K (MAX SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.59 %
Normal Depth	1.06 ft
Discharge	16.00 cfs



Worksheet for SECTION K (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.91 %
Discharge	16.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.50
0+04.50	0.00
0+09.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.50)	(0+09.00, 1.50)	0.025

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

Results	
Normal Depth	1.18 ft
Roughness Coefficient	0.025
Elevation	1.18 ft
Elevation Range	0.00 to 1.50 ft
Flow Area	4.2 ft²
Wetted Perimeter	7.45 ft
Hydraulic Radius	0.56 ft
Top Width	7.07 ft
Normal Depth	1.18 ft
Critical Depth	1.12 ft
Critical Slope	1.19 %
Velocity	3.84 ft/s
Velocity Head	0.23 ft
Specific Energy	1.41 ft
Froude Number	0.883
Flow Type	Subcritical

GVF Input Data

Worksheet for SECTION K (MIN SLOPE)

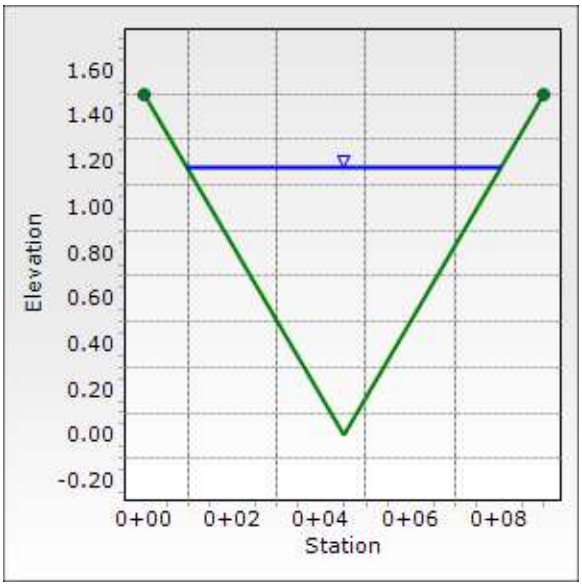
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.18 ft
Critical Depth	1.12 ft
Channel Slope	0.91 %
Critical Slope	1.19 %

Cross Section for SECTION K (MIN SLOPE)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.91 %
Normal Depth	1.18 ft
Discharge	16.00 cfs



GCW ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 SUMMERLIN COUNCIL PARK
By: NB
Date: 11/15/2022

Drop Inlet Sizing in Sump

7.5' Drop Inlet
Facility 1

Known:

Q=	Design Flow	13.0	cfs
D_p=	Ponding Depth at Inlet	0.5	ft
W=	Grate Width	1.5	ft
L_g=	Length of Grate	5.0	ft
L_c=	Length of Curb Opening	7.5	ft
H_c=	Curb Opening Height	0.5	ft
C_{wc}=	Weir coefficient for curb opening	2.3	
C_{wg}=	Weir coefficient for grate	3.0	
C_o=	Orifice coefficient	0.67	
R_o=	Grate opening factor	0.60	
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

P_g=	Active grate weir length (agwl) = 2*W+Lg	8.00	ft
P_{agl}	Adjusted agwl = 2*(1-Cfg/100)*W+Lg	6.50	ft
A_g=	Grate area = W*L_g	7.50	ft^2
A_{aga}=	Adjusted open grate area = Ag*Ro*(1-Cfg/100)	2.25	ft^2
	check - If Dp<1.792*Aaga/Pagl; weir; else orifice	weir	
Q_{ig}=	Flow intercepted by grate If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$ If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$	6.9	cfs

Curb Opening Capacity Calculations

Pc =	Active curb opening weir length (acowl) = Lc+1.8*W	10.20	ft
Pacl	Adjusted acowl = Lc+1.8*(1-Cfc/100)*W	8.85	ft
Ac=	curb opening area (coa) = Lc*Hc	3.75	ft^2
A_{aca}=	Adjusted coa = Ac*(1-Cfc/100)	1.88	ft^2
	check - If Dp<Hc; weir; else orifice	orifice	
Qic=	Flow intercepted by curb opening If "weir" controls Qic=Cwc*Pacl*Dp1.5 If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5	7.1	cfs

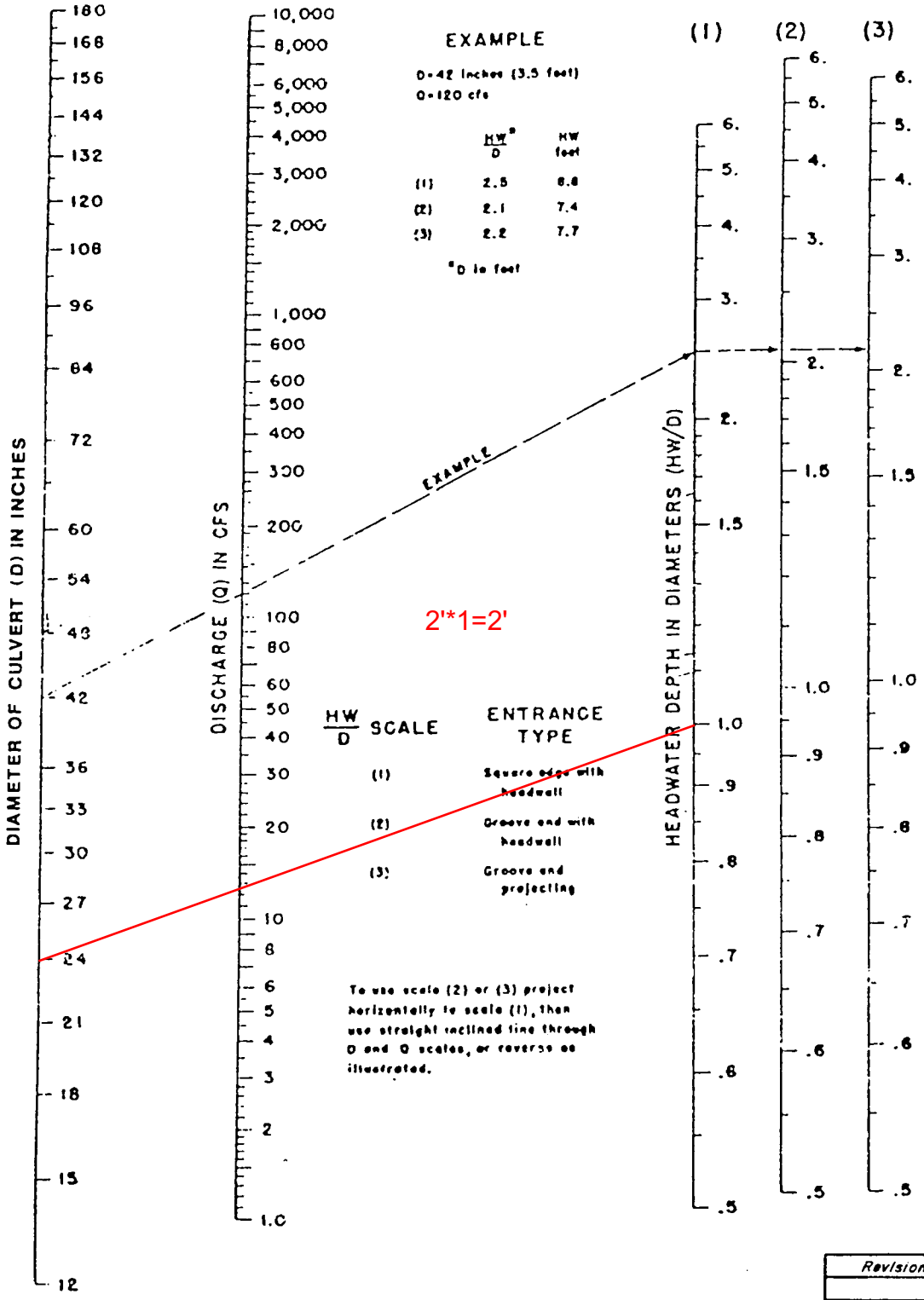
Total Inlet Calculations

Qti =	Flow Interception Capacity = Qig+Qic	14.0	cfs
q =	Interception per unit ratio = Q_{ti}/L_g	1.87	cfs/ft

Actual Flow Collected by Drop Inlet 13 cfs

NOMOGRAPH – INLET CONTROL RCP

FACILITY 1



Revision	Date

WRC ENGINEERING

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

FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

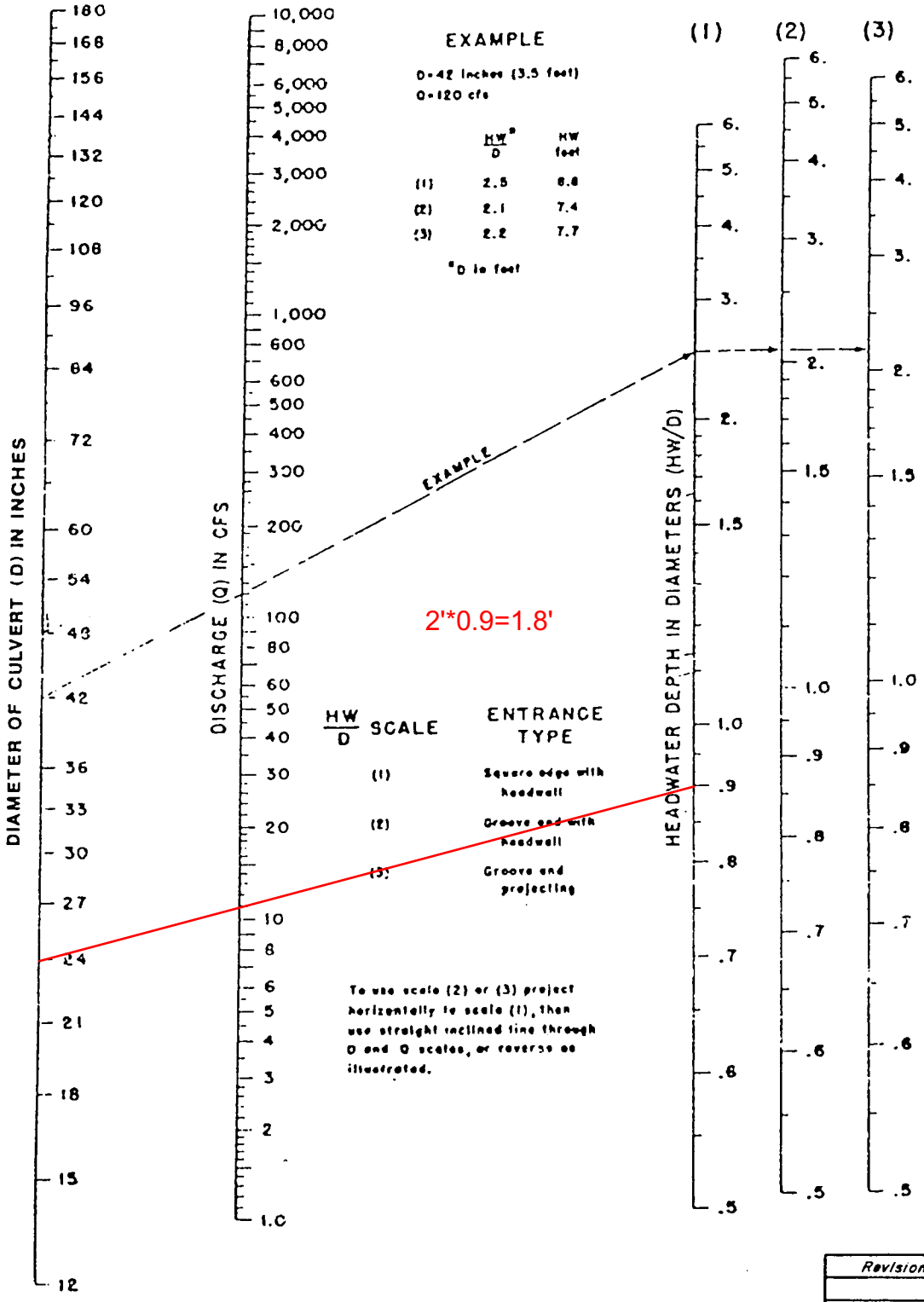
Grate Inlet Headwater Depth

2'X3' Grate Inlet
Facility 3

Known:		
Q=	Flow (cfs)	11
W=	Width of Grate (ft)	2.0
L=	Length of Grate (ft)	3.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	10.0
Pc=	Perimeter (w/clogging) (ft)	5.0
Hw=	Headwater depth (ft)	0.81
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	6.0
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	2.4
Hw=	Headwater depth (ft)	0.77
	Worst Case Scenario Occurs Under Weir Conditions	
	Headwater Depth (ft) =	**0.8**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 3



Revision	Date

WRC ENGINEERING

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

FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

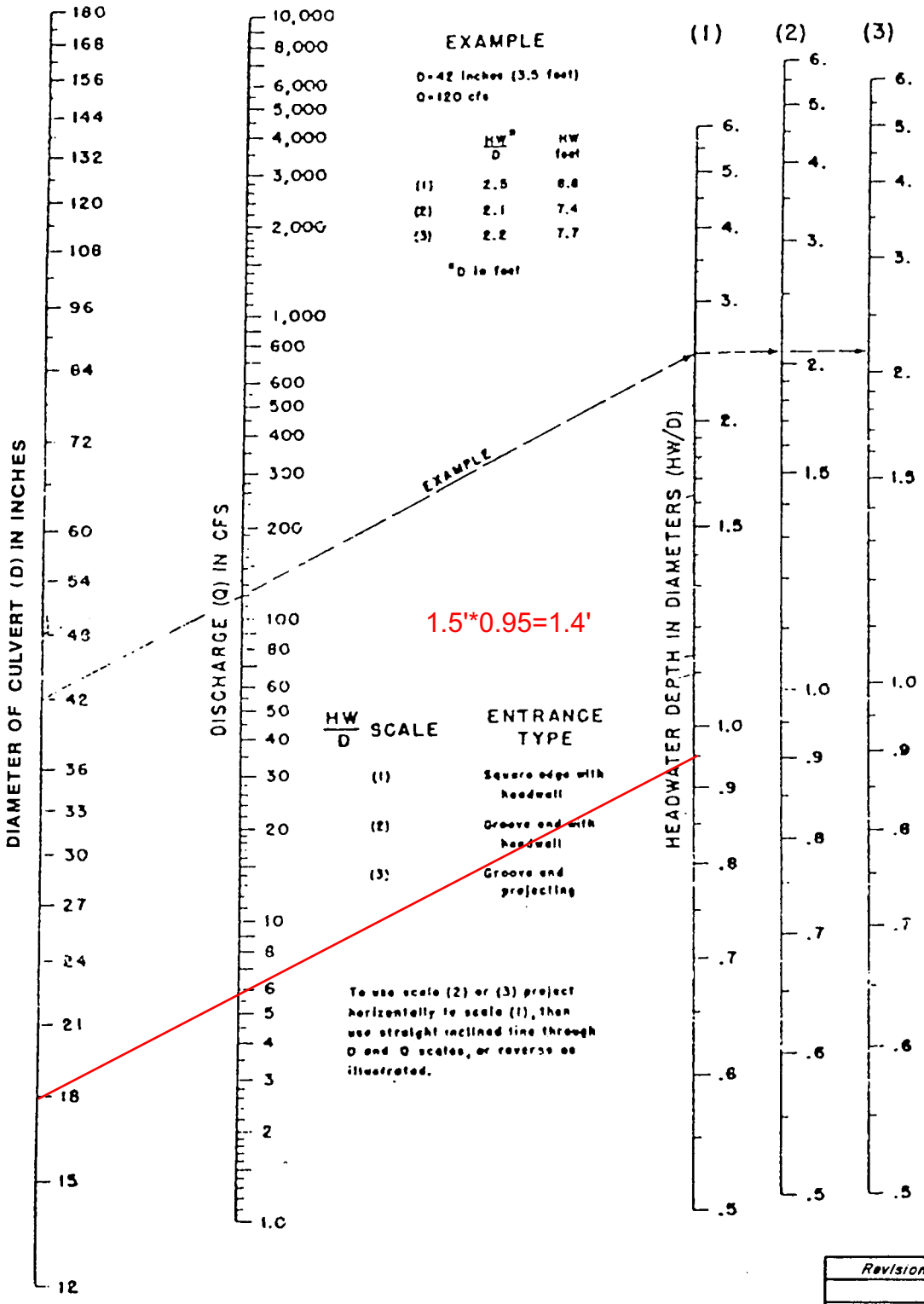
Grate Inlet Headwater Depth

2'X2' Grate Inlet
Facility 6

Known:		
Q=	Flow (cfs)	6
W=	Width of Grate (ft)	2.0
L=	Length of Grate (ft)	2.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	8.0
Pc=	Perimeter (w/clogging) (ft)	4.0
Hw=	Headwater depth (ft)	0.63
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	4.0
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	1.6
Hw=	Headwater depth (ft)	0.52
	Worst Case Scenario Occurs Under Weir Conditions	
	Headwater Depth (ft) =	**0.6**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 6



1.5'*0.95=1.4'

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

GCW ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 SUMMERLIN COUNCIL PARK
By: NB
Date: 11/15/2022

Drop Inlet Sizing in Sump

5' Drop Inlet
Facility 8

Known:

Q=	Design Flow	6.0	cfs
D_p=	Ponding Depth at Inlet	0.5	ft
W=	Grate Width	1.5	ft
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	5.0	ft
H_c=	Curb Opening Height	0.5	ft
C_{wc}=	Weir coefficient for curb opening	2.3	
C_{wg}=	Weir coefficient for grate	3.0	
C_o=	Orifice coefficient	0.67	
R_o=	Grate opening factor	0.60	
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

P_g=	Active grate weir length (agwl) = 2*W+Lg	5.50	ft
P_{agl}	Adjusted agwl = 2*(1-Cfg/100)*W+Lg	4.00	ft
A_g=	Grate area = W*L_g	3.75	ft^2
A_{aga}=	Adjusted open grate area = Ag*Ro*(1-Cfg/100)	1.13	ft^2
	check - If Dp<1.792*Aaga/Pagl; weir; else orifice	weir	
Q_{ig}=	Flow intercepted by grate If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$ If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$	4.2	cfs

Curb Opening Capacity Calculations

Pc =	Active curb opening weir length (acowl) = Lc+1.8*W	7.70	ft
Pacl =	Adjusted acowl = Lc+1.8*(1-Cfc/100)*W	6.35	ft
Ac=	curb opening area (coa) = Lc*Hc	2.50	ft^2
A_{aca}=	Adjusted coa = Ac*(1-Cfc/100)	1.25	ft^2
	check - If Dp<Hc; weir; else orifice	orifice	
Qic=	Flow intercepted by curb opening If "weir" controls Qic=Cwc*Pacl*Dp1.5 If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5	4.7	cfs

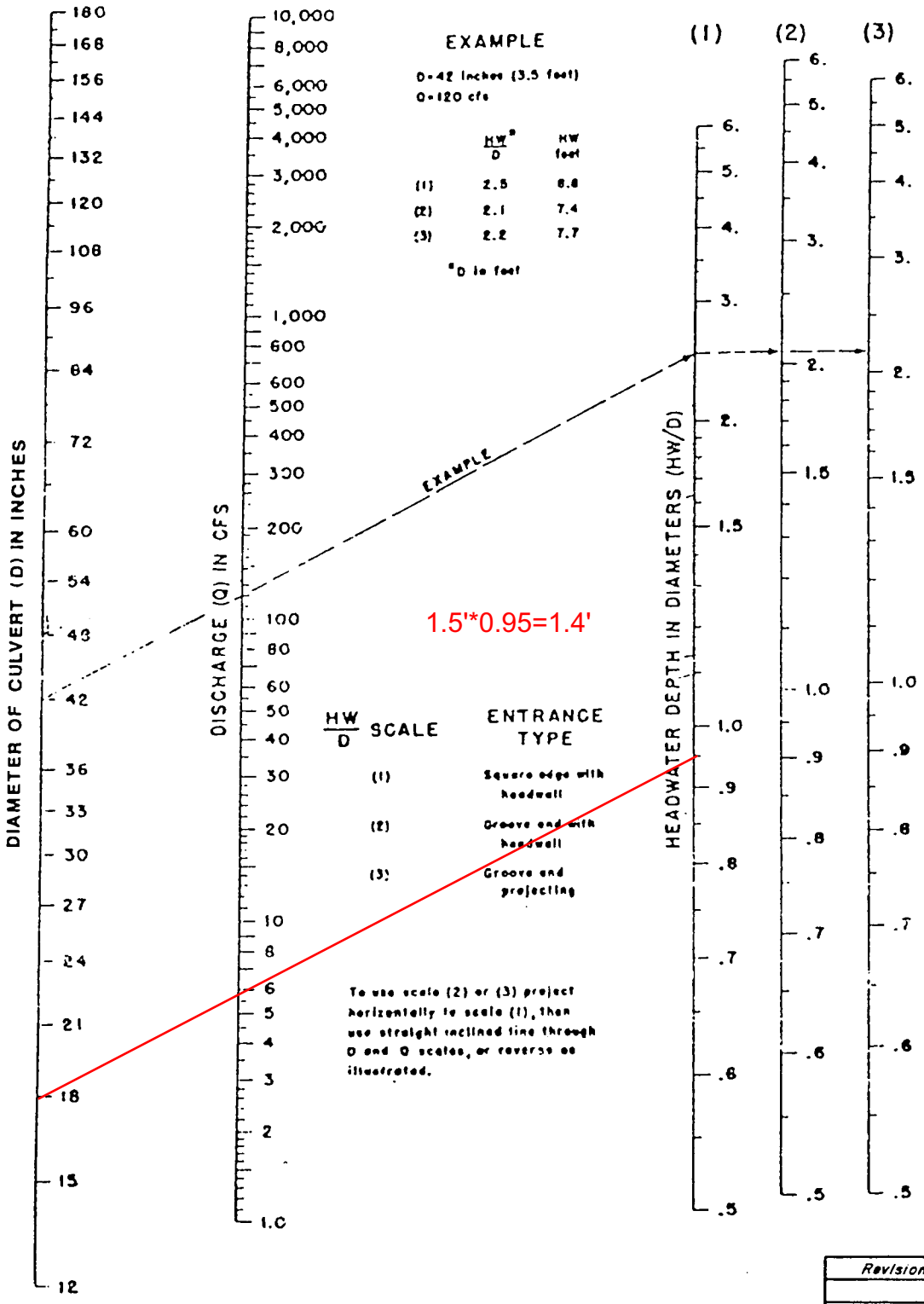
Total Inlet Calculations

Qti =	Flow Interception Capacity = Qig+Qic	9.0	cfs
q =	Interception per unit ratio = Q_{ti}/L_g	1.80	cfs/ft

Actual Flow Collected by Drop Inlet 6 cfs

NOMOGRAPH – INLET CONTROL RCP

FACILITY 8



1.5'*0.95=1.4'

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

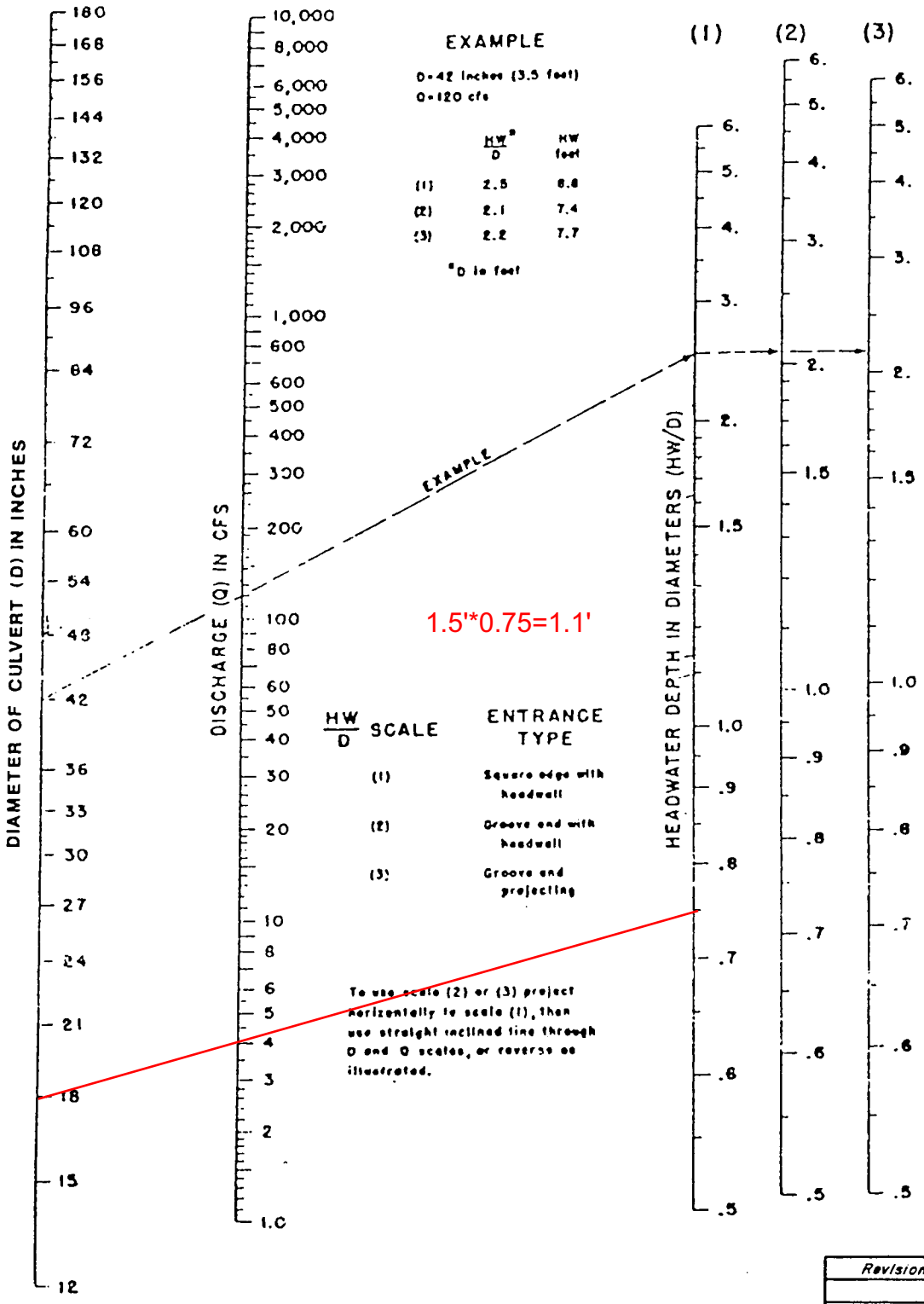
Grate Inlet Headwater Depth

1.5'X1.5' Grate Inlet
Facility 9

Known:		
Q=	Flow (cfs)	4
W=	Width of Grate (ft)	1.5
L=	Length of Grate (ft)	1.5
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	6.0
Pc=	Perimeter (w/clogging) (ft)	3.0
Hw=	Headwater depth (ft)	0.58
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	2.3
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	0.9
Hw=	Headwater depth (ft)	0.73
	Worst Case Scenario Occurs Under Orifice Conditions	
	Headwater Depth (ft) =	**0.7**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 9



1.5'*0.75=1.1'

Revision	Date

WRC ENGINEERING	REFERENCE: USDOT, FHWA, HDS, No. 5, 1985	FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

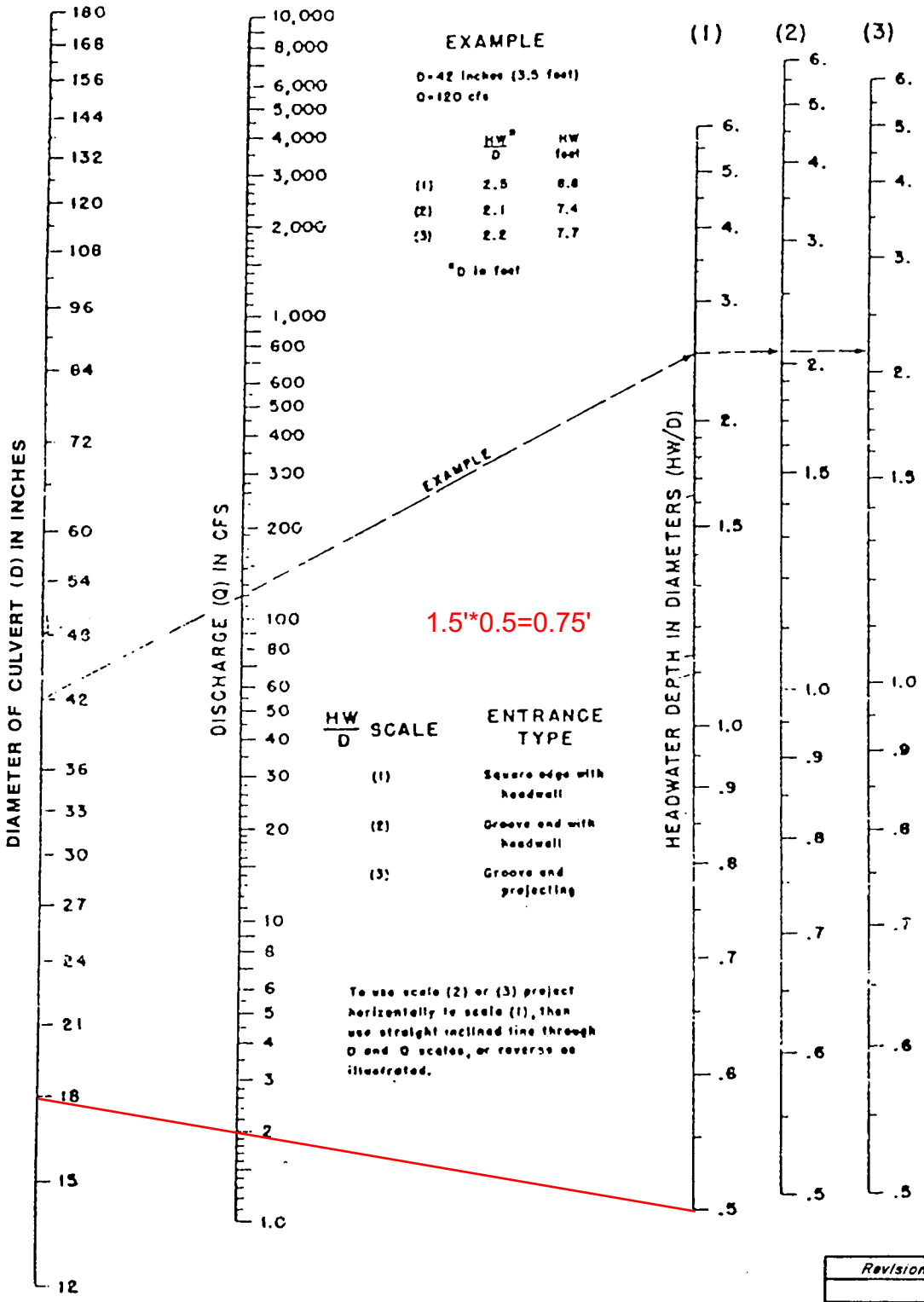
Grate Inlet Headwater Depth

1.5'X1.5' Grate Inlet
Facility 12

Known:		
Q=	Flow (cfs)	2
W=	Width of Grate (ft)	1.5
L=	Length of Grate (ft)	1.5
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	6.0
Pc=	Perimeter (w/clogging) (ft)	3.0
Hw=	Headwater depth (ft)	0.37
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	2.3
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	0.9
Hw=	Headwater depth (ft)	0.18
	Worst Case Scenario Occurs Under Weir Conditions	
	Headwater Depth (ft) =	**0.4**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 12



Revision	Date

WRC ENGINEERING

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

FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

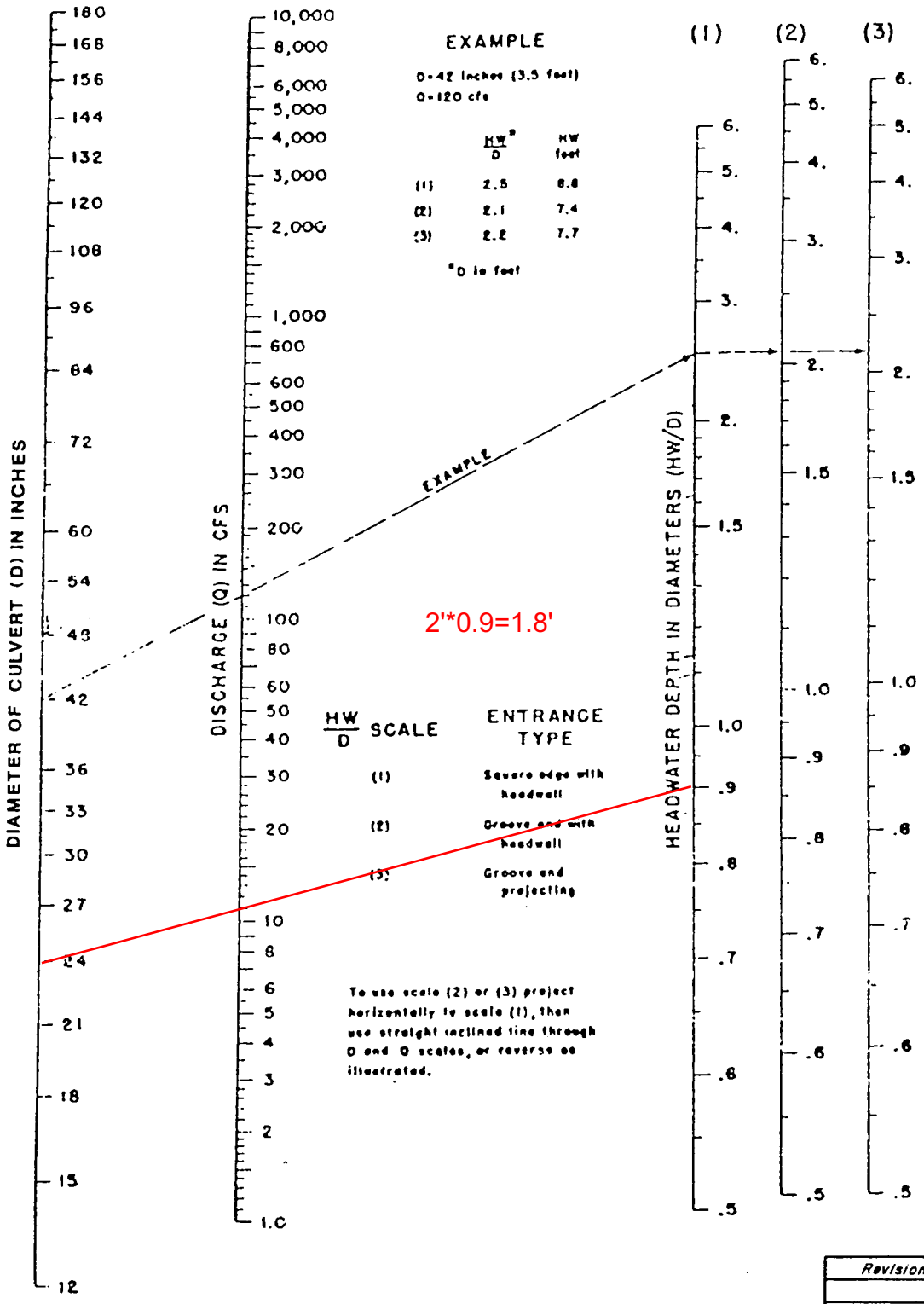
Grate Inlet Headwater Depth

2'X3' Grate Inlet
Facility 15

Known:		
Q=	Flow (cfs)	11
W=	Width of Grate (ft)	2.0
L=	Length of Grate (ft)	3.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	10.0
Pc=	Perimeter (w/clogging) (ft)	5.0
Hw=	Headwater depth (ft)	0.81
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	6.0
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	2.4
Hw=	Headwater depth (ft)	0.77
	Worst Case Scenario Occurs Under Weir Conditions	
	Headwater Depth (ft) =	**0.8**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 15



Revision	Date

WRC ENGINEERING

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

FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

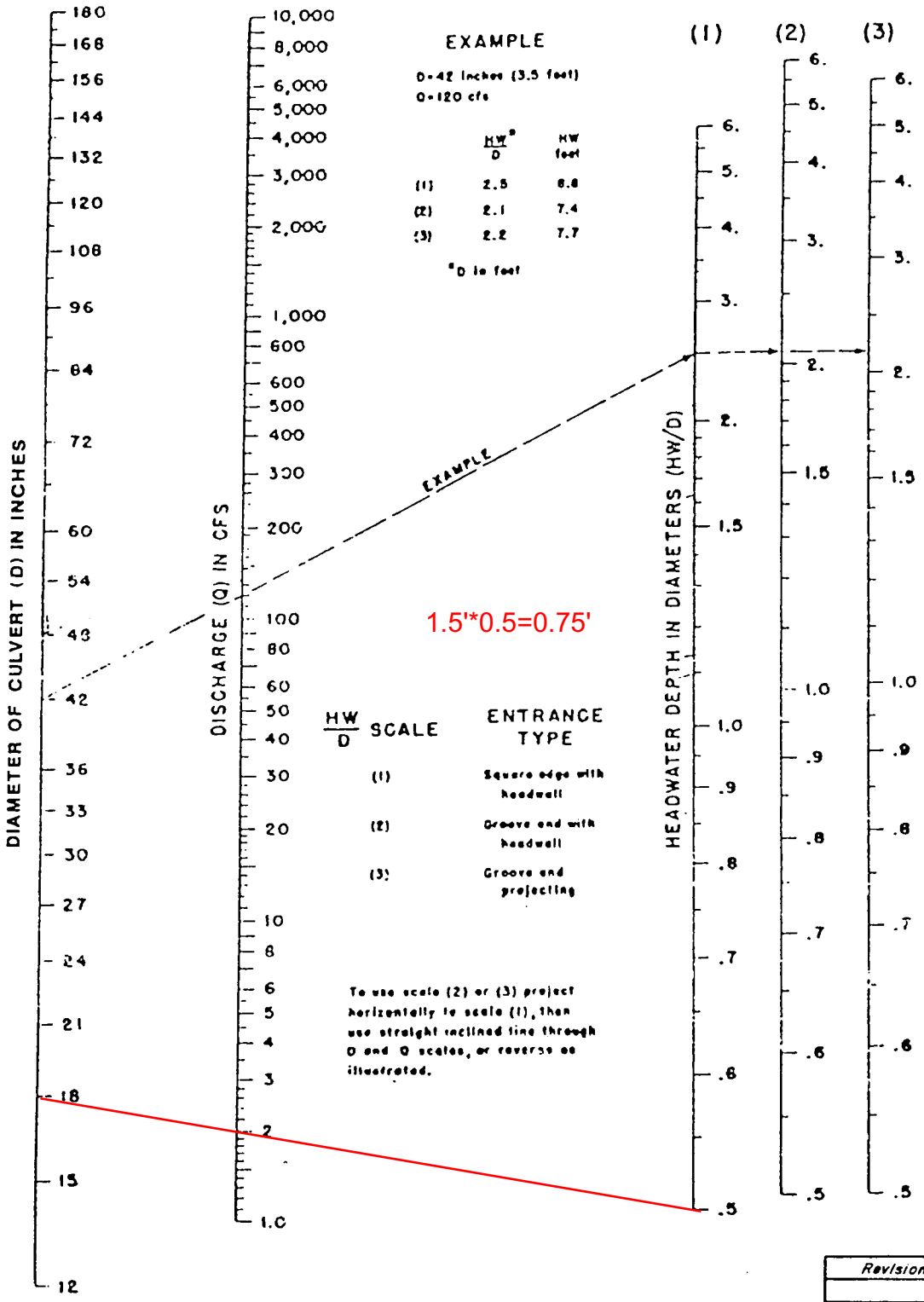
Grate Inlet Headwater Depth

1.5'X1.5' Grate Inlet
Facility 17

Known:		
Q=	Flow (cfs)	2
W=	Width of Grate (ft)	1.5
L=	Length of Grate (ft)	1.5
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	6.0
Pc=	Perimeter (w/clogging) (ft)	3.0
Hw=	Headwater depth (ft)	0.37
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	2.3
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	0.9
Hw=	Headwater depth (ft)	0.18
	Worst Case Scenario Occurs Under Weir Conditions	
	Headwater Depth (ft) =	**0.4**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 17



Revision	Date

WRC ENGINEERING

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

FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

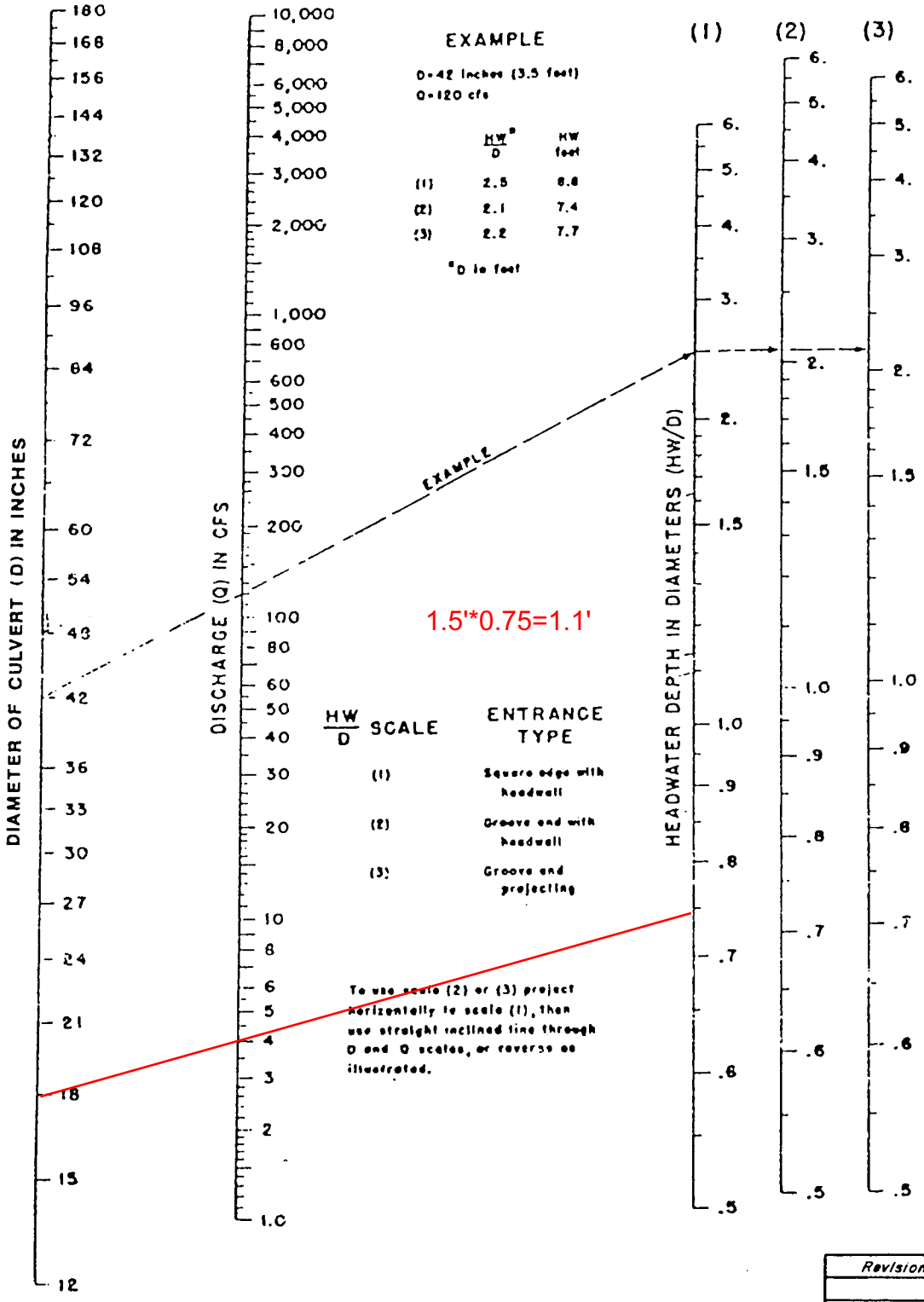
Grate Inlet Headwater Depth

2'X2' Grate Inlet
Facility 20

Known:		
Q=	Flow (cfs)	4
W=	Width of Grate (ft)	2.0
L=	Length of Grate (ft)	2.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	8.0
Pc=	Perimeter (w/clogging) (ft)	4.0
Hw=	Headwater depth (ft)	0.48
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	4.0
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	1.6
Hw=	Headwater depth (ft)	0.23
	Worst Case Scenario Occurs Under Weir Conditions	
	Headwater Depth (ft) =	**0.5**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 20



1.5'*0.75=1.1'

Revision	Date

WRC ENGINEERING	REFERENCE: USDOT, FHWA, HDS, No. 5, 1985	FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

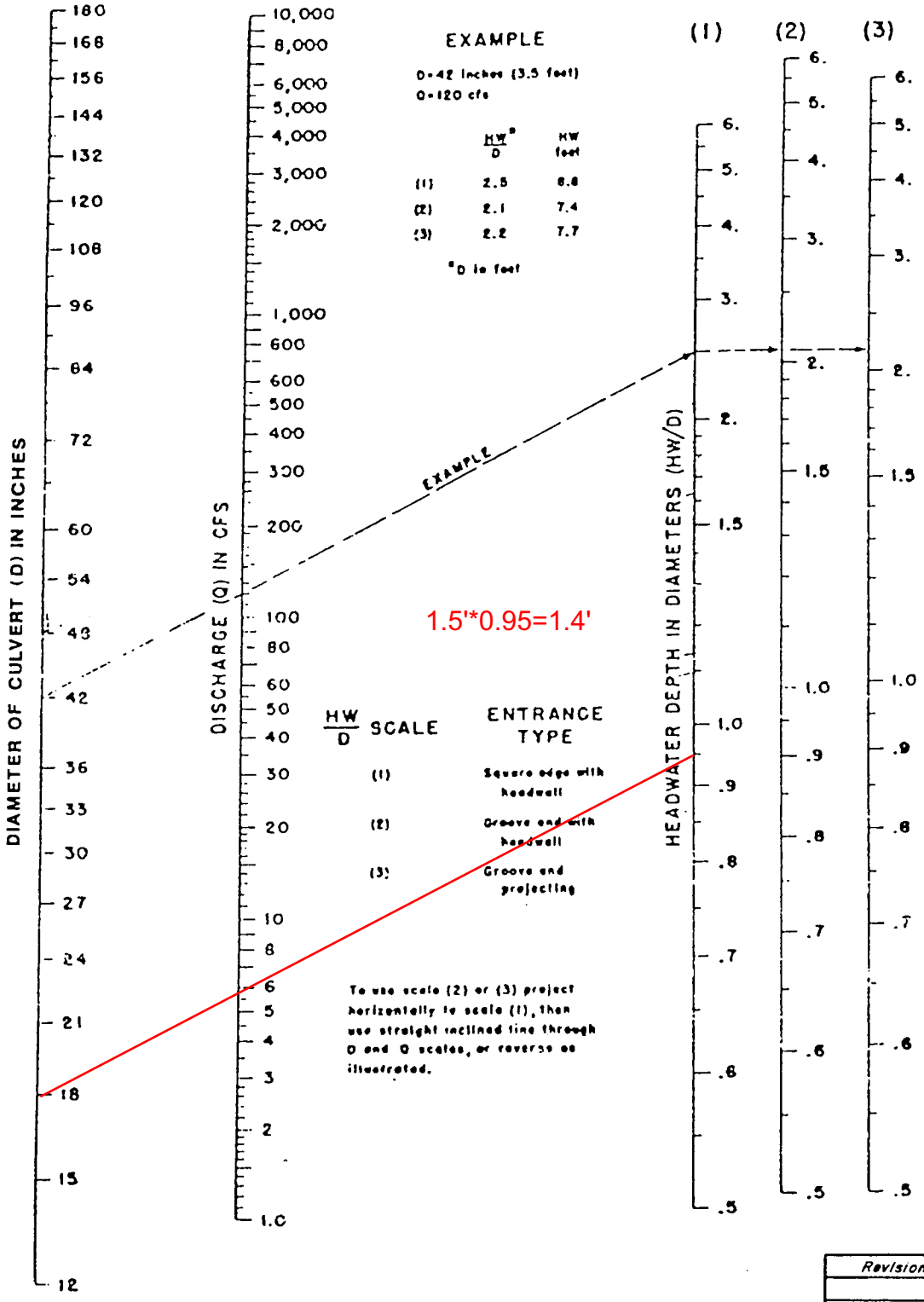
Grate Inlet Headwater Depth

2'X2' Grate Inlet
Facility 22

Known:		
Q=	Flow (cfs)	6
W=	Width of Grate (ft)	2.0
L=	Length of Grate (ft)	2.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	8.0
Pc=	Perimeter (w/clogging) (ft)	4.0
Hw=	Headwater depth (ft)	0.63
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	4.0
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	1.6
Hw=	Headwater depth (ft)	0.52
	Worst Case Scenario Occurs Under Weir Conditions	
	Headwater Depth (ft) =	**0.6**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 22



1.5'*0.95=1.4'

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Worksheet for FAC 23

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.73 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+30.50	1.56

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+30.50, 1.56)	0.016

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

Results	
Normal Depth	0.28 ft
Roughness Coefficient	0.016
Elevation	0.28 ft
Elevation Range	0.00 to 1.56 ft
Flow Area	0.5 ft²
Wetted Perimeter	4.11 ft
Hydraulic Radius	0.11 ft
Top Width	3.78 ft
Normal Depth	0.28 ft
Critical Depth	0.43 ft
Critical Slope	0.72 %
Velocity	6.64 ft/s
Velocity Head	0.69 ft
Specific Energy	0.97 ft
Froude Number	3.389

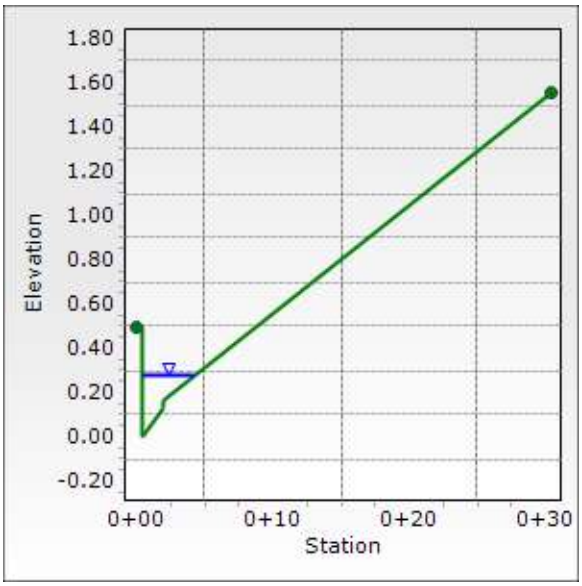
Worksheet for FAC 23

Results	
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	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.28 ft
Critical Depth	0.43 ft
Channel Slope	9.73 %
Critical Slope	0.72 %

Cross Section for FAC 23

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	9.73 %
Normal Depth	0.28 ft
Discharge	3.00 cfs



ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 SUMMERLIN COUNCIL PARK
By: NB
Date: 11/15/2022

Drop Inlet Sizing on a Continuous Grade

7.5' Drop Inlet
Facility 23

Known:

Q_s=	Street Flow	3.0	cfs
S_o=	Longitudinal Slope	0.097	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	6.64	fps
D=	Flow Depth	0.28	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Grate Width	1.5	ft
a=	Gutter Depression	4.0	in
L_g=	Length of Grate	5.0	ft
L_c=	Length of Curb Opening	7.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Ineffective Curb Opening Area	33.3333	%

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†	7.22	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.79	
	Q_w= Frontal flow=A_w*V_s	2.37	cfs
	Q_x= Side flow = Q_s-Q_w	0.63	cfs
R_s=	Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/(S_x*(L_g*(1-C_{fg}/100))$^{2.3}$))	0.04	
Q_{ig}=	Flow intercepted = [R_f*E_o+R_s*(1-E_o)]*(Q_s-Q_{ic})	1.1	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

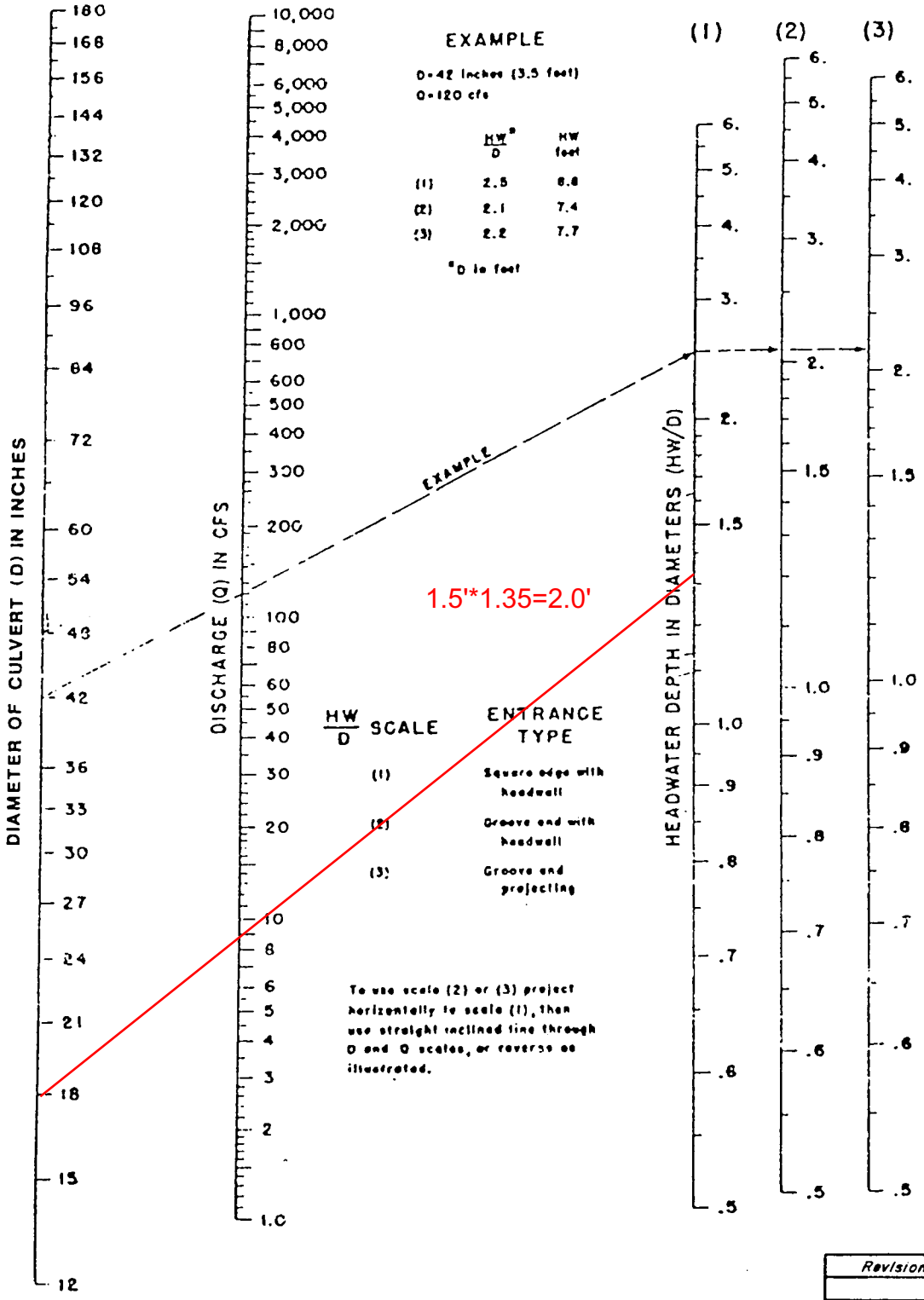
S_e=	Equivalent cross slope = Sx+Sw*Eo	0.202	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.230	ft/ft
L_t=	Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*S_e)$^{0.6}$	14.77	ft
Q_{ic}=	Flow intercepted = (1-(1-(L_c*(1-C_{fc}/100))/L_t)$^{1.8}$)*Q_s	1.6	cfs

Total Inlet Calculations

Q_{ti}=	**Total flow intercepted = Q_{ig}+Q_{ic}**	**2.7**	**cfs**
Q_{tq}=	**Flow bypass = Q_s-Q_{ti}**	**0.3**	**cfs**
q=	Interception per unit ratio = Q_{ti}/L_g	0.36	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	90	%

NOMOGRAPH – INLET CONTROL RCP

FACILITY 23



Revision	Date

WRC ENGINEERING

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

FIGURE 1005

GCW ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 SUMMERLIN COUNCIL PARK
By: NB
Date: 11/15/2022

Drop Inlet Sizing in Sump

5' Drop Inlet
Facility 25

Known:

Q=	Design Flow	2.0	cfs
D_p=	Ponding Depth at Inlet	0.5	ft
W=	Grate Width	1.5	ft
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	5.0	ft
H_c=	Curb Opening Height	0.5	ft
C_{wc}=	Weir coefficient for curb opening	2.3	
C_{wg}=	Weir coefficient for grate	3.0	
C_o=	Orifice coefficient	0.67	
R_o=	Grate opening factor	0.60	
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

P_g=	Active grate weir length (agwl) = 2*W+Lg	5.50	ft
P_{agl}	Adjusted agwl = 2*(1-Cfg/100)*W+Lg	4.00	ft
A_g=	Grate area = W*L_g	3.75	ft^2
A_{aga}=	Adjusted open grate area = Ag*Ro*(1-Cfg/100)	1.13	ft^2
	check - If Dp<1.792*Aaga/Pagl; weir; else orifice	weir	
Q_{ig}=	Flow intercepted by grate If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$ If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$	4.2	cfs

Curb Opening Capacity Calculations

Pc =	Active curb opening weir length (acowl) = Lc+1.8*W	7.70	ft
Pacl =	Adjusted acowl = Lc+1.8*(1-Cfc/100)*W	6.35	ft
Ac=	curb opening area (coa) = Lc*Hc	2.50	ft^2
A_{aca}=	Adjusted coa = Ac*(1-Cfc/100)	1.25	ft^2
	check - If Dp<Hc; weir; else orifice	orifice	
Qic=	Flow intercepted by curb opening If "weir" controls Qic=Cwc*Pacl*Dp1.5 If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5	4.7	cfs

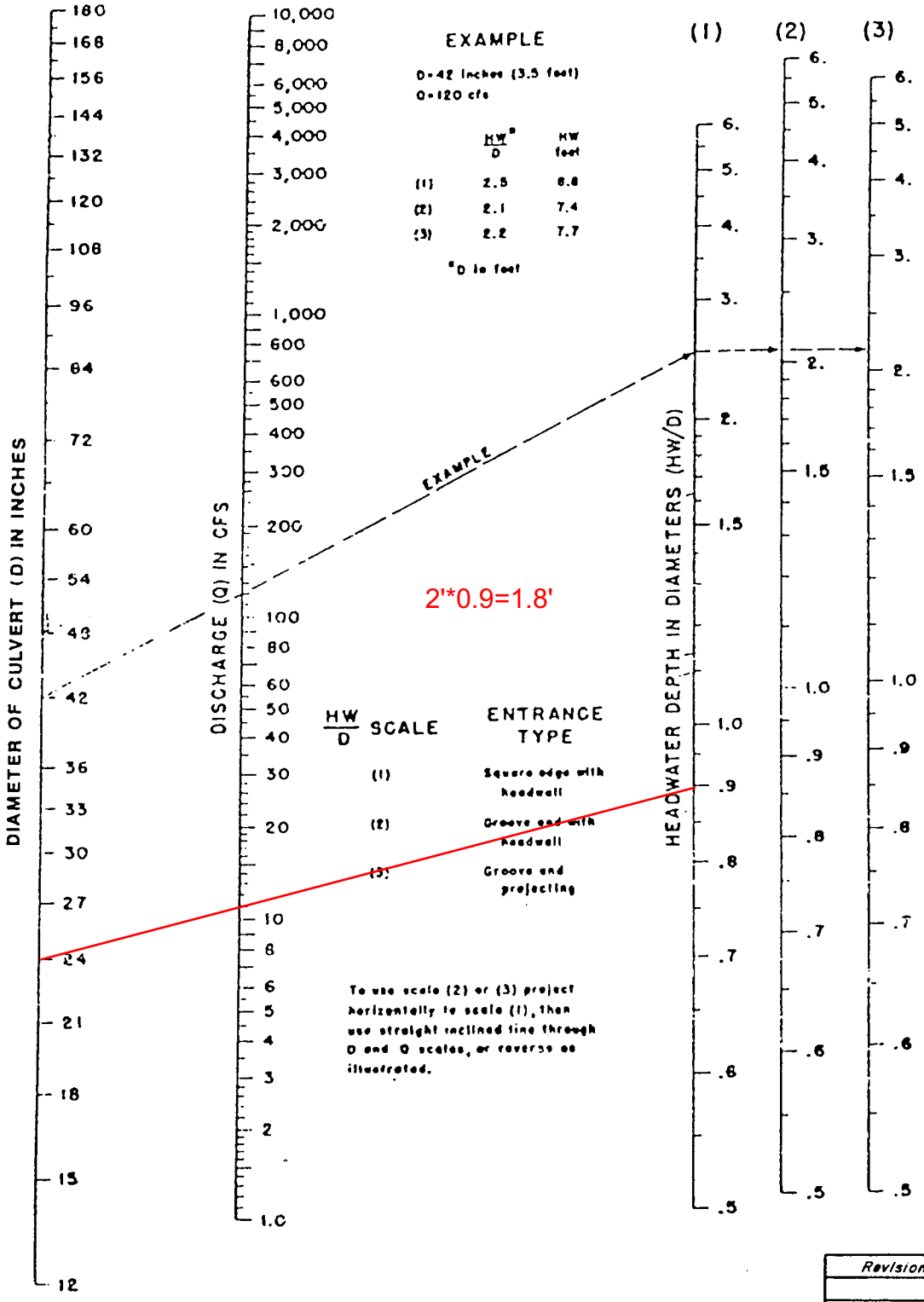
Total Inlet Calculations

Qti =	Flow Interception Capacity = Qig+Qic	9.0	cfs
q =	Interception per unit ratio = Q_{ti}/L_g	1.80	cfs/ft

Actual Flow Collected by Drop Inlet 2 cfs

NOMOGRAPH – INLET CONTROL RCP

FACILITY 25



Revision	Date

WRC ENGINEERING

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

FIGURE 1005

ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: V25 Summerlin Council Park
By: NB
Date: 11/15/2022

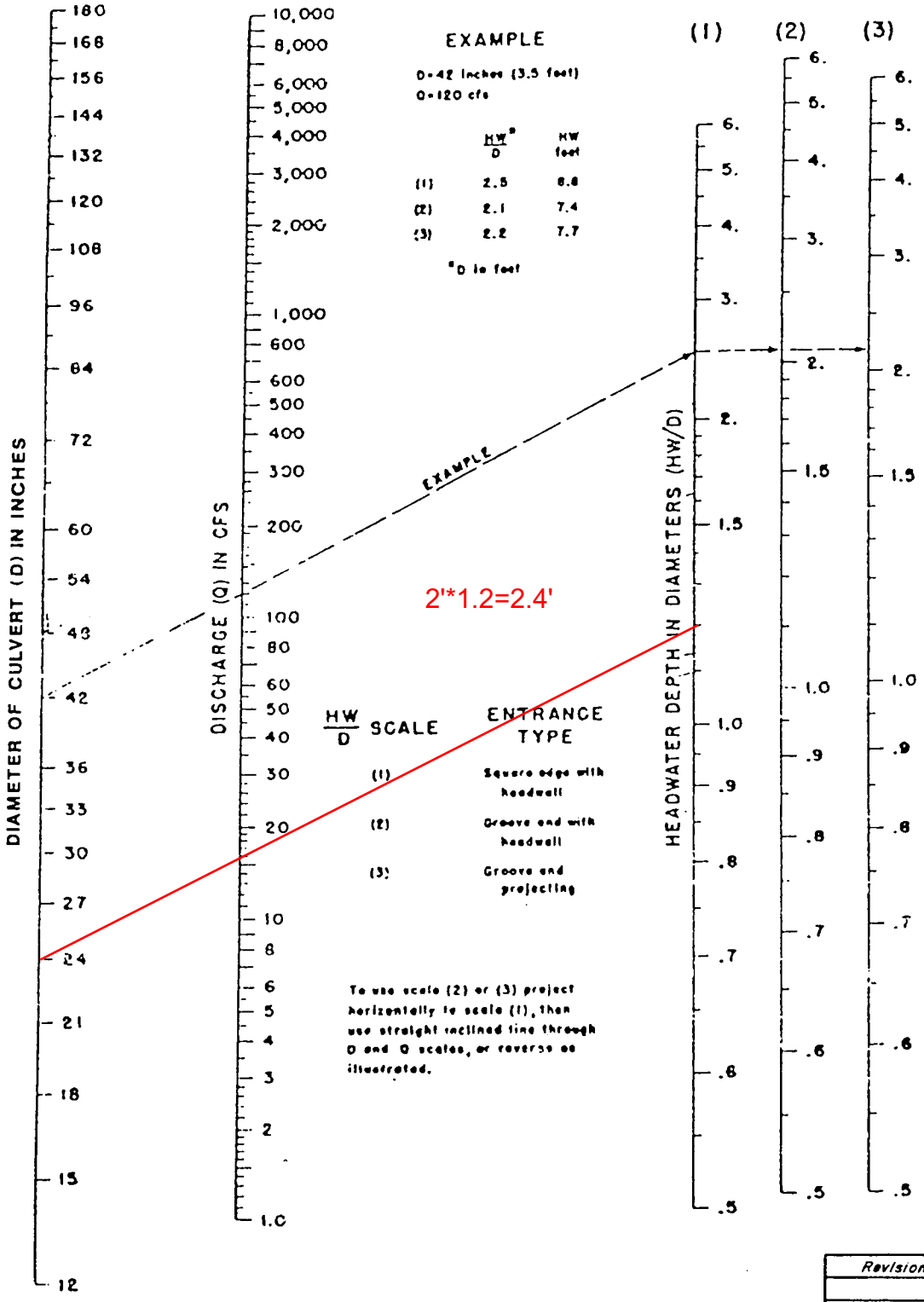
Grate Inlet Headwater Depth

2'X3' Grate Inlet
Facility 28

Known:		
Q=	Flow (cfs)	16
W=	Width of Grate (ft)	2.0
L=	Length of Grate (ft)	3.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
	$Hw=(Q/(Cw*P))^{2/3}$	
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	10.0
Pc=	Perimeter (w/clogging) (ft)	5.0
Hw=	Headwater depth (ft)	1.04
Orifice Conditions:		
	$Hw=(Q/(Co*Ac))^2/2*g$	
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft^2)	6.0
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft^2)	2.4
Hw=	Headwater depth (ft)	1.63
	Worst Case Scenario Occurs Under Orifice Conditions	
	Headwater Depth (ft) =	**1.6**

NOMOGRAPH – INLET CONTROL RCP

FACILITY 28

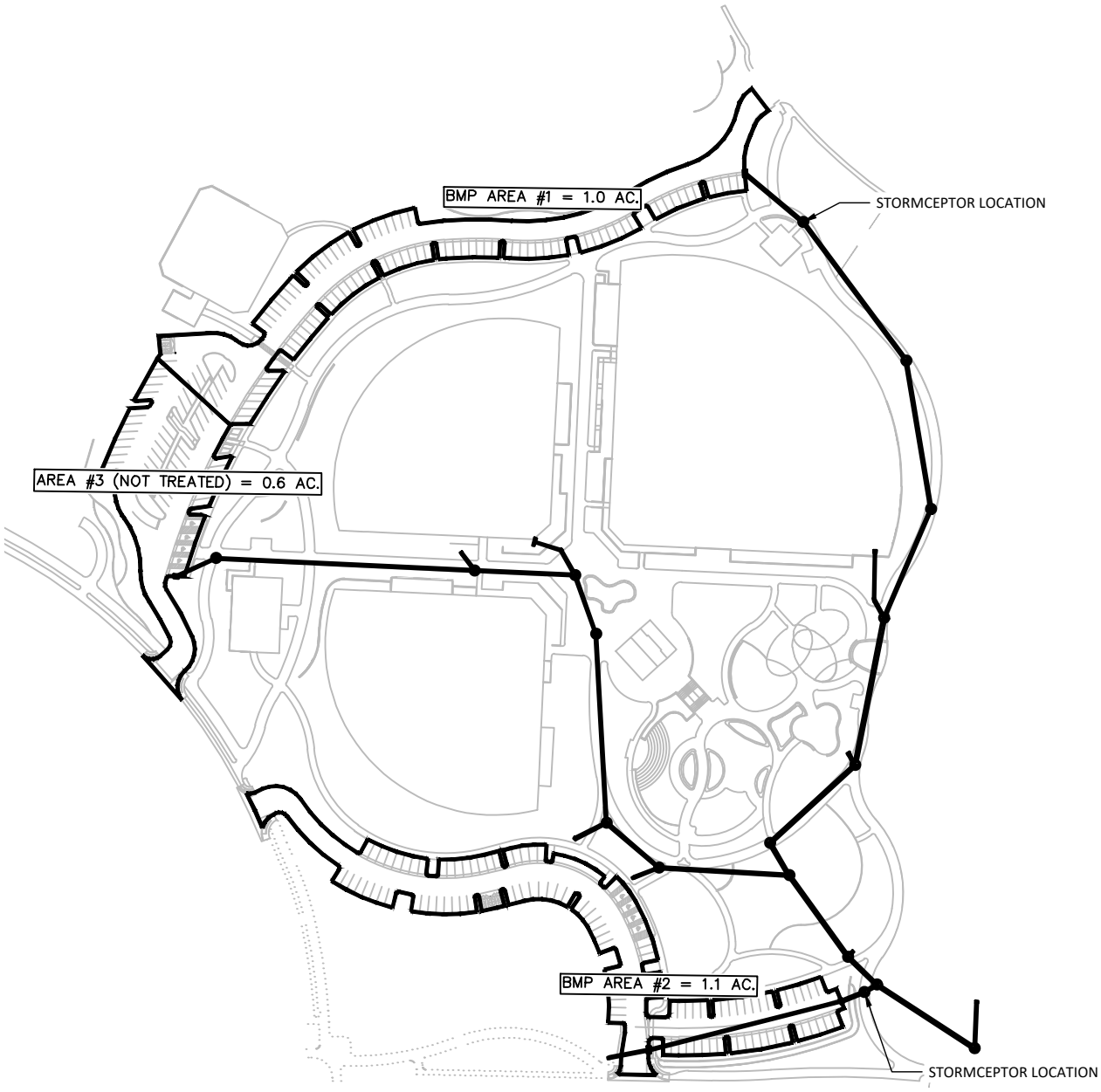


Revision	Date

WRC ENGINEERING

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

FIGURE 1005



PARKING LOT BMP TREATMENT SUMMARY	
PARKING LOT AREA TREATED (AC.)	2.7
TOTAL PARKING LOT AREA (AC.)	2.1
PERCENT TREATED	78%

NORTH

200 0 200 400

SCALE FEET

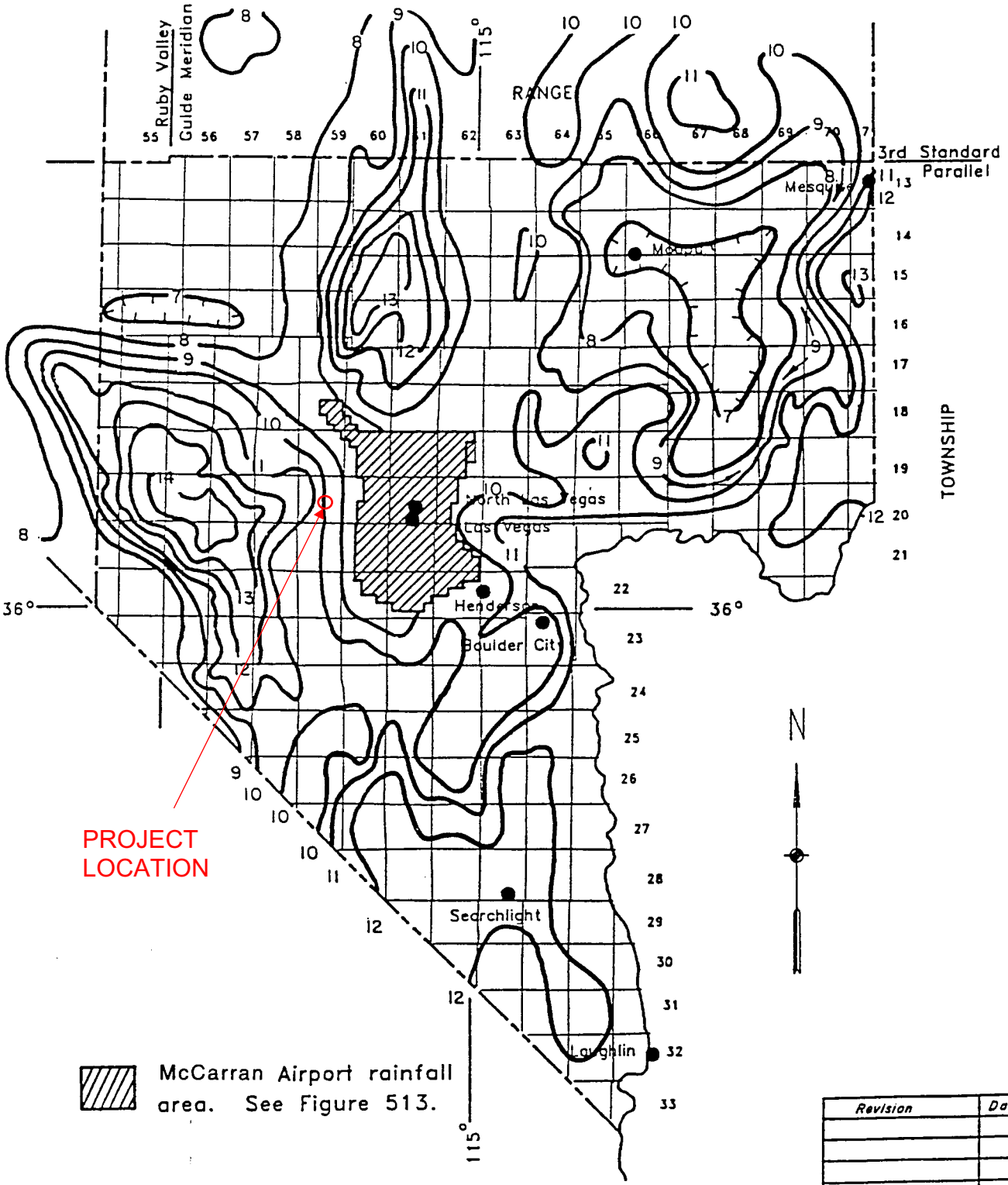
VILLAGE 25 SUMMERLIN COUNCIL PARK
AT GRAND PARK

BMP EXHIBIT

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

nb1½e1⅝e34-16-22 16:44:28 F:\P1¼8¼eP_3¼c5¼3¼\600\62025-660-1\D1⅛v1½3¼1½9¼sn\Fc5¼z.z\F1⅛15¼e7¼1¼3¼e3¼\BMP TREATMENT EXHIBIT.13¼e1⅛1⅝e

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



Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 501

Project Name: V25 COUNCIL PARK	GCW ENGINEERS \ SURVEYORS
By: NB	
Date: 11/16/2022	

BMP Design Runoff
Area 1

Step 1	
Tributary Area	1.0
Parking Lot Area (ac)	1.0
Percent Impervious (ACTUAL)	100
Q_{100} (cfs)	**13**
D_2 SITE (in)	1.0
D_2 MCCARRAN (in)	0.72
RATIO (1c)	1.39
85TH PERCENTILE RAINFALL DEPTH (in)	0.44
Step 2	
BMP DESIGN DISCHARGE (90%) (cfs/ac)	0.66
ADJUSTMENT FACTOR (QP/A)	0.70
BMP DESIGN DISCHARGE (Qbmp) (cfs)	**0.70**

Project Name: V25 COUNCIL PARK	GCW ENGINEERS \ SURVEYORS
By: NB	
Date: 11/16/2022	

BMP Design Runoff
Area 2

Step 1	
Tributary Area	1.1
Parking Lot Area (ac)	1.1
Percent Impervious (ACTUAL)	100
Q_{100} (cfs)	**11**
D_2 SITE (in)	1.0
D_2 MCCARRAN (in)	0.72
RATIO (1c)	1.39
85TH PERCENTILE RAINFALL DEPTH (in)	0.44
Step 2	
BMP DESIGN DISCHARGE (90%) (cfs/ac)	0.66
ADJUSTMENT FACTOR (QP/A)	0.70
BMP DESIGN DISCHARGE (Qbmp) (cfs)	**0.77**

```
T1 V25 COUNCIL PARK                                                    0
T2 MAINLINE
T3 FACILITIES 1 THROUGH 7, 19, 27, AND 29

SO   1000.0003426.180  1                          3433.360
R    1041.3003432.990  1      .013                                .000    .000 0
JX   1041.3103432.990  1  1   .013    3.500         3432.990       90.0       15.000
R    1041.3203432.990  1      .013                                .000  10.000 0
R    1103.5003439.330  1      .013                                .000    .000 0
JX   1103.5103439.330  3  4   .013   16.000         3439.330       31.0       15.000
R    1103.5203439.330  3      .013                                .000  13.000 0
R    1242.5303443.500  3      .013                                .000    .000 1
JX   1242.5403443.500  3  4   .013   11.000         3443.500       64.0        5.000
R    1290.7303451.770  3      .013                                .000    .000 0
JX   1290.7403451.770  3  2   .013    4.000         3451.770       90.0       10.000
R    1410.4403463.000  3      .013                                .000    .000 0
JX   1410.4503463.000  3  4   .013   25.000         3463.000       51.0         .000
R    1455.2703468.110  3      .013                                .000  15.000 1
R    1455.2803468.110  3      .013                                .000  15.000 0
R    1455.2903468.110  3      .013                                .000  15.000 0
R    1455.3003468.110  3      .013                                .000  15.000 0
R    1455.3103468.110  3      .013                                .000  15.000 0
R    1455.3203468.110  3      .013                                .000   3.000 0
R    1592.6403468.800  3      .013                                .000    .000 0
JX   1592.6503468.800  3  2   .013    6.000         3468.800       76.0       15.000
R    1592.6603468.800  3      .013                                .000  15.000 0
R    1592.6703468.800  3      .013                                .000   6.000 0
R    1771.4603469.820  3      .013                                .000    .000 0
JX   1771.4703469.820  4  4   .013   11.000         3469.820       40.0       12.000
R    1913.0003470.400  4      .013                                .000  15.000 1
R    1913.0103470.400  4      .013                                .000  15.000 0
R    1913.0203470.400  4      .013                                .000   3.000 0
R    2092.0203473.380  4      .013                                .000  15.000 1
R    2092.0303473.380  4      .013                                .000  12.000 0
R    2298.4403478.950  4      .013                                .000  13.000 1
R    2388.7803479.400  4      .013                                .000    .000 0
SH   2388.7803479.400  4
CD   1  4   1    .000   3.500     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
CD   3  4   1    .000   2.500     .000  .000  .000   .00
CD   4  4   1    .000   2.000     .000  .000  .000   .00
CD   5  4   1    .000   3.000     .000  .000  .000   .00
Q            13.000   .0
```

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:20:19

V25 COUNCIL PARK
MAINLINE
FACILITIES 1 THROUGH 7, 19, 27, AND 29

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
1000.000	3426.180	7.180	3433.360	89.50	9.30	1.34	3434.70	.00	2.94	.00	3.500	.000	.00	1 .0
1.455	.1649					.0079	.01	7.18	.00	1.11	.013	.00	.00	PIPE
1001.455	3426.420	6.949	3433.369	89.50	9.30	1.34	3434.71	.00	2.94	.00	3.500	.000	.00	1 .0
HYDRAULIC JUMP														
1001.455	3426.420	1.330	3427.750	89.50	26.67	11.04	3438.79	.00	2.94	3.40	3.500	.000	.00	1 .0
2.235	.1649					.0829	.19	1.33	4.73	1.11	.013	.00	.00	PIPE
1003.690	3426.788	1.340	3428.128	89.50	26.39	10.82	3438.94	.00	2.94	3.40	3.500	.000	.00	1 .0
10.591	.1649					.0767	.81	1.34	4.66	1.11	.013	.00	.00	PIPE
1014.281	3428.535	1.389	3429.924	89.50	25.16	9.83	3439.76	.00	2.94	3.42	3.500	.000	.00	1 .0
8.646	.1649					.0673	.58	1.39	4.35	1.11	.013	.00	.00	PIPE
1022.927	3429.960	1.439	3431.400	89.50	23.99	8.94	3440.34	.00	2.94	3.44	3.500	.000	.00	1 .0
7.178	.1649					.0591	.42	1.44	4.06	1.11	.013	.00	.00	PIPE
1030.105	3431.144	1.492	3432.636	89.50	22.88	8.13	3440.76	.00	2.94	3.46	3.500	.000	.00	1 .0
6.051	.1649					.0519	.31	1.49	3.79	1.11	.013	.00	.00	PIPE
1036.156	3432.142	1.547	3433.689	89.50	21.81	7.39	3441.08	.00	2.94	3.48	3.500	.000	.00	1 .0
5.144	.1649					.0456	.23	1.55	3.54	1.11	.013	.00	.00	PIPE
1041.300	3432.990	1.605	3434.595	89.50	20.80	6.72	3441.31	3.50	2.94	3.49	3.500	.000	.00	1 .0
JUNCT STR	.0000					.0490	.00	3.50	3.30		.013	.00	.00	PIPE

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:20:19

V25 COUNCIL PARK
MAINLINE
FACILITIES 1 THROUGH 7, 19, 27, AND 29

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
1041.320	3432.990	1.460	3434.450	86.00	22.64	7.96	3442.41	.00	2.89	3.45	3.500	.000	.00	1 .0
13.105	.1020					.0520	.68	1.46	3.80	1.24	.013	.00	.00	PIPE
1054.424	3434.326	1.512	3435.838	86.00	21.60	7.25	3443.08	.00	2.89	3.47	3.500	.000	.00	1 .0
10.713	.1020					.0457	.49	1.51	3.55	1.24	.013	.00	.00	PIPE
1065.137	3435.418	1.568	3436.987	86.00	20.60	6.59	3443.57	.00	2.89	3.48	3.500	.000	.00	1 .0
8.752	.1020					.0402	.35	1.57	3.31	1.24	.013	.00	.00	PIPE
1073.889	3436.311	1.626	3437.937	86.00	19.64	5.99	3443.93	.00	2.89	3.49	3.500	.000	.00	1 .0
7.253	.1020					.0353	.26	1.63	3.09	1.24	.013	.00	.00	PIPE
1081.142	3437.050	1.687	3438.737	86.00	18.72	5.44	3444.18	.00	2.89	3.50	3.500	.000	.00	1 .0
6.079	.1020					.0311	.19	1.69	2.88	1.24	.013	.00	.00	PIPE
1087.221	3437.670	1.751	3439.421	86.00	17.85	4.95	3444.37	.00	2.89	3.50	3.500	.000	.00	1 .0
5.120	.1020					.0274	.14	1.75	2.68	1.24	.013	.00	.00	PIPE
1092.341	3438.192	1.819	3440.011	86.00	17.02	4.50	3444.51	.00	2.89	3.50	3.500	.000	.00	1 .0
4.356	.1020					.0241	.11	1.82	2.50	1.24	.013	.00	.00	PIPE
1096.697	3438.636	1.889	3440.525	86.00	16.23	4.09	3444.62	.00	2.89	3.49	3.500	.000	.00	1 .0

	3.679	.1020					.0213	.08	1.89	2.32	1.24	.013	.00	.00	PIPE				
1100.376	3439.011	1.964	3440.976	86.00	15.47	3.72	3444.69	.00	2.89	3.47	3.500	.000	.00	1	.0				
	3.124	.1020					.0188	.06	1.96	2.16	1.24	.013	.00	.00	PIPE				

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	
1103.500	3439.330	2.042	3441.372	86.00	14.75	3.38	3444.75	3.50	2.89	3.45	3.500	.000	.00	1 .0
JUNCT STR	.0000					.0275	.00	3.50	2.00		.013	.00	.00	PIPE
1103.510	3439.330	1.826	3441.156	70.00	18.22	5.15	3446.31	.00	2.44	2.22	2.500	.000	.00	1 .0
.010	.0000					.0373	.00	1.83	2.44	.00	.013	.00	.00	PIPE
1103.520	3439.330	1.826	3441.156	70.00	18.22	5.16	3446.31	.00	2.44	2.22	2.500	.000	.00	1 .0
15.761	.0300					.0380	.60	1.83	2.44	2.02	.013	.00	.00	PIPE
1119.281	3439.803	1.801	3441.604	70.00	18.49	5.31	3446.91	.00	2.44	2.24	2.500	.000	.00	1 .0
41.617	.0300					.0409	1.70	1.80	2.51	2.02	.013	.00	.00	PIPE
1160.899	3441.051	1.724	3442.775	70.00	19.39	5.84	3448.61	.00	2.44	2.31	2.500	.000	.00	1 .0
32.207	.0300					.0459	1.48	1.72	2.73	2.02	.013	.00	.00	PIPE
1193.105	3442.017	1.652	3443.669	70.00	20.33	6.42	3450.09	.00	2.44	2.37	2.500	.000	.00	1 .0
26.602	.0300					.0516	1.37	1.65	2.97	2.02	.013	.00	.00	PIPE
1219.707	3442.815	1.585	3444.401	70.00	21.33	7.06	3451.46	.00	2.44	2.41	2.500	.000	.00	1 .0
22.823	.0300					.0582	1.33	1.59	3.22	2.02	.013	.00	.00	PIPE
1242.530	3443.500	1.522	3445.022	70.00	22.37	7.77	3452.79	2.50	2.44	2.44	2.500	.000	.00	1 .0
JUNCT STR	.0000					.0861	.00	2.50	3.48		.013	.00	.00	PIPE
1242.540	3443.500	1.149	3444.650	59.00	26.78	11.14	3455.78	.00	2.39	2.49	2.500	.000	.00	1 .0
4.788	.1716					.1083	.52	1.15	5.02	1.02	.013	.00	.00	PIPE

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	
1247.328	3444.322	1.162	3445.484	59.00	26.37	10.80	3456.28	.00	2.39	2.49	2.500	.000	.00	1 .0
13.040	.1716					.0997	1.30	1.16	4.91	1.02	.013	.00	.00	PIPE
1260.367	3446.560	1.206	3447.766	59.00	25.15	9.82	3457.58	.00	2.39	2.50	2.500	.000	.00	1 .0
10.095	.1716					.0877	.89	1.21	4.57	1.02	.013	.00	.00	PIPE
1270.462	3448.292	1.252	3449.544	59.00	23.98	8.93	3458.47	.00	2.39	2.50	2.500	.000	.00	1 .0
8.094	.1716					.0773	.63	1.25	4.26	1.02	.013	.00	.00	PIPE
1278.556	3449.681	1.300	3450.981	59.00	22.86	8.12	3459.10	.00	2.39	2.50	2.500	.000	.00	1 .0
6.636	.1716					.0681	.45	1.30	3.96	1.02	.013	.00	.00	PIPE
1285.192	3450.820	1.351	3452.171	59.00	21.80	7.38	3459.55	.00	2.39	2.49	2.500	.000	.00	1 .0
5.538	.1716					.0601	.33	1.35	3.69	1.02	.013	.00	.00	PIPE
1290.730	3451.770	1.404	3453.174	59.00	20.78	6.71	3459.88	2.50	2.39	2.48	2.500	.000	.00	1 .0
JUNCT STR	.0000					.0663	.00	2.50	3.42		.013	.00	.00	PIPE
1290.740	3451.770	1.229	3452.998	55.00	22.91	8.15	3461.15	.00	2.35	2.50	2.500	.000	.00	1 .0

17.648	.0938						.0739	1.30	1.23	4.12	1.16	.013	.00	.00	PIPE				
1308.387	3453.426	1.251	3454.677	55.00	22.37	7.77	3462.44	.00	2.35	2.50	2.500	.000	.00	1	.0				
24.784	.0938						.0673	1.67	1.25	3.97	1.16	.013	.00	.00	PIPE				
1333.172	3455.751	1.299	3457.050	55.00	21.33	7.06	3464.11	.00	2.35	2.50	2.500	.000	.00	1	.0				
17.118	.0938						.0593	1.02	1.30	3.70	1.16	.013	.00	.00	PIPE				

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	ZR	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall			Type Ch
1350.290	3457.357	1.350	3458.707	55.00	20.33	6.42	3465.13	.00	2.35	2.49	2.500	.000	.00	1	.0
12.786	.0938					.0523	.67	1.35	3.44	1.16	.013	.00	.00	PIPE	
1363.076	3458.556	1.403	3459.959	55.00	19.39	5.84	3465.80	.00	2.35	2.48	2.500	.000	.00	1	.0
9.966	.0938					.0462	.46	1.40	3.20	1.16	.013	.00	.00	PIPE	
1373.042	3459.491	1.459	3460.950	55.00	18.48	5.31	3466.26	.00	2.35	2.46	2.500	.000	.00	1	.0
7.992	.0938					.0409	.33	1.46	2.96	1.16	.013	.00	.00	PIPE	
1381.034	3460.241	1.518	3461.759	55.00	17.62	4.82	3466.58	.00	2.35	2.44	2.500	.000	.00	1	.0
6.514	.0938					.0362	.24	1.52	2.75	1.16	.013	.00	.00	PIPE	
1387.548	3460.852	1.581	3462.433	55.00	16.80	4.38	3466.82	.00	2.35	2.41	2.500	.000	.00	1	.0
5.372	.0938					.0321	.17	1.58	2.54	1.16	.013	.00	.00	PIPE	
1392.920	3461.356	1.648	3463.004	55.00	16.02	3.99	3466.99	.00	2.35	2.37	2.500	.000	.00	1	.0
4.462	.0938					.0285	.13	1.65	2.35	1.16	.013	.00	.00	PIPE	
1397.382	3461.775	1.719	3463.494	55.00	15.28	3.62	3467.12	.00	2.35	2.32	2.500	.000	.00	1	.0
3.690	.0938					.0254	.09	1.72	2.16	1.16	.013	.00	.00	PIPE	
1401.072	3462.121	1.796	3463.917	55.00	14.57	3.29	3467.21	.00	2.35	2.25	2.500	.000	.00	1	.0
3.031	.0938					.0227	.07	1.80	1.98	1.16	.013	.00	.00	PIPE	
1404.103	3462.405	1.880	3464.285	55.00	13.89	2.99	3467.28	.00	2.35	2.16	2.500	.000	.00	1	.0
2.456	.0938					.0204	.05	1.88	1.81	1.16	.013	.00	.00	PIPE	

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	ZR	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall			Type Ch
1406.559	3462.636	1.972	3464.608	55.00	13.24	2.72	3467.33	.00	2.35	2.04	2.500	.000	.00	1	.0
1.918	.0938					.0185	.04	1.97	1.64	1.16	.013	.00	.00	PIPE	
1408.477	3462.816	2.075	3464.891	55.00	12.63	2.48	3467.37	.00	2.35	1.88	2.500	.000	.00	1	.0
1.352	.0938					.0169	.02	2.08	1.46	1.16	.013	.00	.00	PIPE	
1409.829	3462.943	2.196	3465.139	55.00	12.04	2.25	3467.39	.00	2.35	1.63	2.500	.000	.00	1	.0
.611	.0938					.0159	.01	2.20	1.27	1.16	.013	.00	.00	PIPE	
1410.440	3463.000	2.354	3465.354	55.00	11.47	2.04	3467.40	.00	2.35	1.17	2.500	.000	.00	1	.0
JUNCT STR	.0000					.0104	.00	2.35	1.00		.013	.00	.00	PIPE	
1410.450	3463.000	4.419	3467.419	30.00	6.11	.58	3468.00	.00	1.87	.00	2.500	.000	.00	1	.0
8.234	.1140					.0053	.04	4.42	.00	.79	.013	.00	.00	PIPE	

1418.684	3463.939		3.542	3467.481		30.00	6.11	.58	3468.06		.00	1.87		.00	2.500		.000	.00	1	.0
HYDRAULIC JUMP																				
1418.684	3463.939		.951	3464.890		30.00	17.50	4.75	3469.64		.00	1.87		2.43	2.500		.000	.00	1	.0
2.500	.1140							.0552	.14		.95	3.67		.79	.013		.00	.00	PIPE	
1421.184	3464.224		.964	3465.188		30.00	17.16	4.57	3469.76		.00	1.87		2.43	2.500		.000	.00	1	.0
5.986	.1140							.0504	.30		.96	3.57		.79	.013		.00	.00	PIPE	
1427.171	3464.907		.999	3465.906		30.00	16.37	4.16	3470.06		.00	1.87		2.45	2.500		.000	.00	1	.0
4.888	.1140							.0442	.22		1.00	3.33		.79	.013		.00	.00	PIPE	

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
1432.059	3465.464	1.036	3466.500	30.00	15.60	3.78	3470.28	.00	1.87	2.46	2.500	.000	.00	1 .0
4.067	.1140					.0389	.16	1.04	3.11	.79	.013	.00	.00	PIPE
1436.126	3465.928	1.074	3467.002	30.00	14.88	3.44	3470.44	.00	1.87	2.48	2.500	.000	.00	1 .0
3.423	.1140					.0341	.12	1.07	2.90	.79	.013	.00	.00	PIPE
1439.548	3466.318	1.113	3467.431	30.00	14.18	3.12	3470.56	.00	1.87	2.48	2.500	.000	.00	1 .0
2.880	.1140					.0300	.09	1.11	2.71	.79	.013	.00	.00	PIPE
1442.429	3466.646	1.155	3467.801	30.00	13.52	2.84	3470.64	.00	1.87	2.49	2.500	.000	.00	1 .0
2.456	.1140					.0264	.06	1.16	2.53	.79	.013	.00	.00	PIPE
1444.885	3466.926	1.198	3468.124	30.00	12.90	2.58	3470.71	.00	1.87	2.50	2.500	.000	.00	1 .0
2.078	.1140					.0232	.05	1.20	2.35	.79	.013	.00	.00	PIPE
1446.963	3467.163	1.244	3468.407	30.00	12.30	2.35	3470.75	.00	1.87	2.50	2.500	.000	.00	1 .0
1.778	.1140					.0204	.04	1.24	2.19	.79	.013	.00	.00	PIPE
1448.741	3467.366	1.291	3468.657	30.00	11.72	2.13	3470.79	.00	1.87	2.50	2.500	.000	.00	1 .0
1.500	.1140					.0180	.03	1.29	2.04	.79	.013	.00	.00	PIPE
1450.241	3467.537	1.341	3468.878	30.00	11.18	1.94	3470.82	.00	1.87	2.49	2.500	.000	.00	1 .0
1.257	.1140					.0159	.02	1.34	1.90	.79	.013	.00	.00	PIPE
1451.498	3467.680	1.394	3469.074	30.00	10.66	1.76	3470.84	.00	1.87	2.48	2.500	.000	.00	1 .0
1.043	.1140					.0140	.01	1.39	1.76	.79	.013	.00	.00	PIPE

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
1452.542	3467.799	1.450	3469.249	30.00	10.16	1.60	3470.85	.00	1.87	2.47	2.500	.000	.00	1 .0
.864	.1140					.0124	.01	1.45	1.64	.79	.013	.00	.00	PIPE
1453.406	3467.897	1.508	3469.406	30.00	9.69	1.46	3470.86	.00	1.87	2.45	2.500	.000	.00	1 .0
.684	.1140					.0110	.01	1.51	1.52	.79	.013	.00	.00	PIPE
1454.090	3467.976	1.570	3469.546	30.00	9.24	1.33	3470.87	.00	1.87	2.42	2.500	.000	.00	1 .0
.522	.1140					.0097	.01	1.57	1.40	.79	.013	.00	.00	PIPE
1454.612	3468.035	1.636	3469.671	30.00	8.81	1.20	3470.88	.00	1.87	2.38	2.500	.000	.00	1 .0
.365	.1140					.0086	.00	1.64	1.30	.79	.013	.00	.00	PIPE

1454.978	3468.077	1.707	3469.784	30.00	8.40	1.10	3470.88	.00	1.87	2.33	2.500	.000	.00	1 .0
.222	.1140					.0077	.00	1.71	1.19	.79	.013	.00	.00	PIPE
1455.199	3468.102	1.783	3469.885	30.00	8.01	1.00	3470.88	.00	1.87	2.26	2.500	.000	.00	1 .0
.071	.1140					.0069	.00	1.78	1.10	.79	.013	.00	.00	PIPE
1455.270	3468.110	1.867	3469.977	30.00	7.63	.90	3470.88	.00	1.87	2.17	2.500	.000	.00	1 .0
.010	.0000					.0065	.00	1.87	1.00	.00	.013	.00	.00	PIPE
1455.280	3468.110	1.875	3469.985	30.00	7.60	.90	3470.88	.00	1.87	2.16	2.500	.000	.00	1 .0
.010	.0000					.0064	.00	1.88	.99	.00	.013	.00	.00	PIPE
1455.290	3468.110	1.878	3469.989	30.00	7.58	.89	3470.88	.00	1.87	2.16	2.500	.000	.00	1 .0
.010	.0000					.0064	.00	1.88	.99	.00	.013	.00	.00	PIPE

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
1455.300	3468.110	1.881	3469.991	30.00	7.57	.89	3470.88	.00	1.87	2.16	2.500	.000	.00	1 .0
.010	.0000					.0064	.00	1.88	.98	.00	.013	.00	.00	PIPE
1455.320	3468.110	1.885	3469.995	30.00	7.55	.89	3470.88	.00	1.87	2.15	2.500	.000	.00	1 .0
11.197	.0050					.0060	.07	1.89	.98	2.13	.013	.00	.00	PIPE
1466.517	3468.166	1.977	3470.143	30.00	7.20	.81	3470.95	.00	1.87	2.03	2.500	.000	.00	1 .0
70.116	.0050					.0055	.38	1.98	.89	2.13	.013	.00	.00	PIPE
1536.633	3468.519	2.081	3470.600	30.00	6.87	.73	3471.33	.00	1.87	1.87	2.500	.000	.00	1 .0
56.007	.0050					.0052	.29	2.08	.79	2.13	.013	.00	.00	PIPE
1592.640	3468.800	2.102	3470.902	30.00	6.81	.72	3471.62	2.50	1.87	1.83	2.500	.000	.00	1 .0
JUNCT STR	.0000					.0043	.00	2.50	.77		.013	.00	.00	PIPE
1592.650	3468.800	2.649	3471.449	24.00	4.89	.37	3471.82	.00	1.67	.00	2.500	.000	.00	1 .0
.010	.0000					.0034	.00	2.65	.00	.00	.013	.00	.00	PIPE
1592.660	3468.800	2.667	3471.467	24.00	4.89	.37	3471.84	.00	1.67	.00	2.500	.000	.00	1 .0
.010	.0000					.0034	.00	2.67	.00	.00	.013	.00	.00	PIPE
1592.670	3468.800	2.675	3471.475	24.00	4.89	.37	3471.85	.00	1.67	.00	2.500	.000	.00	1 .0
76.539	.0057					.0034	.26	2.67	.00	1.65	.013	.00	.00	PIPE
1669.209	3469.237	2.500	3471.737	24.00	4.89	.37	3472.11	.00	1.67	.00	2.500	.000	.00	1 .0
76.758	.0057					.0032	.24	2.50	.00	1.65	.013	.00	.00	PIPE

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
1745.966	3469.675	2.268	3471.943	24.00	5.13	.41	3472.35	.00	1.67	1.45	2.500	.000	.00	1 .0
25.494	.0057					.0031	.08	2.27	.50	1.65	.013	.00	.00	PIPE
1771.460	3469.820	2.174	3471.994	24.00	5.30	.44	3472.43	2.50	1.67	1.68	2.500	.000	.00	1 .0
JUNCT STR	.0000					.0032	.00	2.50	.57		.013	.00	.00	PIPE
1771.470	3469.820	2.528	3472.349	13.00	4.14	.27	3472.61	.00	1.30	.00	2.000	.000	.00	1 .0

141.530	.0041					.0033	.47	2.53	.00	1.48	.013	.00	.00	PIPE					
1913.000	3470.400	2.443	3472.843	13.00	4.14	.27	3473.11	.00	1.30	.00	2.000	.000	.00	1	.0				
.010	.0000					.0033	.00	2.44	.00	.00	.013	.00	.00	PIPE					
1913.010	3470.400	2.456	3472.856	13.00	4.14	.27	3473.12	.00	1.30	.00	2.000	.000	.00	1	.0				
.010	.0000					.0033	.00	2.46	.00	.00	.013	.00	.00	PIPE					
1913.020	3470.400	2.458	3472.858	13.00	4.14	.27	3473.12	.00	1.30	.00	2.000	.000	.00	1	.0				
35.538	.0166					.0033	.12	2.46	.00	.93	.013	.00	.00	PIPE					
1948.558	3470.991	2.000	3472.991	13.00	4.14	.27	3473.26	.00	1.30	.00	2.000	.000	.00	1	.0				
11.654	.0166					.0031	.04	2.00	.00	.93	.013	.00	.00	PIPE					
1960.212	3471.186	1.814	3473.000	13.00	4.34	.29	3473.29	.00	1.30	1.16	2.000	.000	.00	1	.0				
2.056	.0166					.0029	.01	1.81	.48	.93	.013	.00	.00	PIPE					
1962.268	3471.220	1.777	3472.997	13.00	4.41	.30	3473.30	.00	1.30	1.26	2.000	.000	.00	1	.0				

HYDRAULIC JUMP

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:20:19

V25 COUNCIL PARK
MAINLINE
FACILITIES 1 THROUGH 7, 19, 27, AND 29

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
1962.268	3471.220	.935	3472.155	13.00	9.02	1.26	3473.42	.00	1.30	2.00	2.000	.000	.00	1 .0
57.011	.0166					.0175	.99	.93	1.87	.93	.013	.00	.00	PIPE
2019.279	3472.169	.910	3473.079	13.00	9.34	1.35	3474.43	.00	1.30	1.99	2.000	.000	.00	1 .0
36.088	.0166					.0195	.70	.91	1.97	.93	.013	.00	.00	PIPE
2055.367	3472.770	.878	3473.648	13.00	9.79	1.49	3475.14	.00	1.30	1.99	2.000	.000	.00	1 .0
21.048	.0166					.0222	.47	.88	2.11	.93	.013	.00	.00	PIPE
2076.415	3473.120	.846	3473.966	13.00	10.27	1.64	3475.60	.00	1.30	1.98	2.000	.000	.00	1 .0
15.605	.0166					.0253	.39	.85	2.26	.93	.013	.00	.00	PIPE
2092.020	3473.380	.817	3474.197	13.00	10.77	1.80	3476.00	.00	1.30	1.97	2.000	.000	.00	1 .0
.010	.0000					.0270	.00	.82	2.42	.00	.013	.00	.00	PIPE
2092.030	3473.380	.817	3474.197	13.00	10.78	1.80	3476.00	.00	1.30	1.97	2.000	.000	.00	1 .0
1.796	.0270					.0270	.05	.82	2.43	.82	.013	.00	.00	PIPE
2093.826	3473.429	.817	3474.245	13.00	10.78	1.80	3476.05	.00	1.30	1.97	2.000	.000	.00	1 .0
81.978	.0270					.0267	2.19	.82	2.43	.82	.013	.00	.00	PIPE
2175.804	3475.641	.821	3476.462	13.00	10.69	1.78	3478.24	.00	1.30	1.97	2.000	.000	.00	1 .0
59.203	.0270					.0248	1.47	.82	2.40	.82	.013	.00	.00	PIPE
2235.007	3477.239	.851	3478.090	13.00	10.19	1.61	3479.70	.00	1.30	1.98	2.000	.000	.00	1 .0
21.943	.0270					.0218	.48	.85	2.24	.82	.013	.00	.00	PIPE

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:20:19

V25 COUNCIL PARK
MAINLINE
FACILITIES 1 THROUGH 7, 19, 27, AND 29

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
2256.950	3477.831	.883	3478.714	13.00	9.72	1.47	3480.18	.00	1.30	1.99	2.000	.000	.00	1 .0
12.887	.0270					.0191	.25	.88	2.09	.82	.013	.00	.00	PIPE
2269.837	3478.178	.915	3479.093	13.00	9.27	1.33	3480.43	.00	1.30	1.99	2.000	.000	.00	1 .0

8.475	.0270					.0168	.14	.92	1.95	.82	.013	.00	.00	PIPE					
2278.312	3478.407	.950	3479.357	13.00	8.84	1.21	3480.57	.00	1.30	2.00	2.000	.000	.00	1	.0				
6.088	.0270					.0148	.09	.95	1.81	.82	.013	.00	.00	PIPE					
2284.399	3478.571	.986	3479.557	13.00	8.42	1.10	3480.66	.00	1.30	2.00	2.000	.000	.00	1	.0				
4.526	.0270					.0130	.06	.99	1.69	.82	.013	.00	.00	PIPE					
2288.925	3478.693	1.023	3479.717	13.00	8.03	1.00	3480.72	.00	1.30	2.00	2.000	.000	.00	1	.0				
3.293	.0270					.0115	.04	1.02	1.57	.82	.013	.00	.00	PIPE					
2292.219	3478.782	1.063	3479.845	13.00	7.66	.91	3480.76	.00	1.30	2.00	2.000	.000	.00	1	.0				
2.478	.0270					.0101	.03	1.06	1.46	.82	.013	.00	.00	PIPE					
2294.697	3478.849	1.104	3479.953	13.00	7.30	.83	3480.78	.00	1.30	1.99	2.000	.000	.00	1	.0				
1.732	.0270					.0089	.02	1.10	1.36	.82	.013	.00	.00	PIPE					
2296.429	3478.896	1.148	3480.044	13.00	6.96	.75	3480.80	.00	1.30	1.98	2.000	.000	.00	1	.0				
1.175	.0270					.0079	.01	1.15	1.26	.82	.013	.00	.00	PIPE					
2297.604	3478.927	1.194	3480.122	13.00	6.64	.68	3480.81	.00	1.30	1.96	2.000	.000	.00	1	.0				
.661	.0270					.0070	.00	1.19	1.17	.82	.013	.00	.00	PIPE					

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:20:19

V25 COUNCIL PARK
MAINLINE
FACILITIES 1 THROUGH 7, 19, 27, AND 29

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	
2298.265	3478.945	1.243	3480.188	13.00	6.33	.62	3480.81	.00	1.30	1.94	2.000	.000	.00	1 .0
.175	.0270					.0062	.00	1.24	1.08	.82	.013	.00	.00	PIPE
2298.440	3478.950	1.297	3480.247	13.00	6.03	.56	3480.81	.00	1.30	1.91	2.000	.000	.00	1 .0
7.444	.0050					.0055	.04	1.30	1.00	1.37	.013	.00	.00	PIPE
2305.884	3478.987	1.352	3480.339	13.00	5.75	.51	3480.85	.00	1.30	1.87	2.000	.000	.00	1 .0
50.770	.0050					.0051	.26	1.35	.92	1.37	.013	.00	.00	PIPE
2356.654	3479.240	1.371	3480.611	13.00	5.66	.50	3481.11	.00	1.30	1.86	2.000	.000	.00	1 .0
32.125	.0050					.0049	.16	1.37	.90	1.37	.013	.00	.00	PIPE
2388.780	3479.400	1.371	3480.771	13.00	5.66	.50	3481.27	.00	1.30	1.86	2.000	.000	.00	1 .0

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	4	1		3.500														
CD	2	4	1		1.500														
CD	3	4	1		2.500														
CD	4	4	1		2.000														
CD	5	4	1		3.000														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
V25 COUNCIL PARK
HEADING LINE NO 2 IS -
MAINLINE
HEADING LINE NO 3 IS -
FACILITIES 1 THROUGH 7, 19, 27, AND 29

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	3426.180	1	3433.360

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1041.300	3432.990	1	.013	.000	.000	.000	0

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
	1041.310	3432.990	1	1	0	.013	3.500	.000	3432.990	.000	90.000	.000

RADIUS	ANGLE
.038	15.000

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

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1041.320	3432.990	1	.013	.000	.000	10.000	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1103.500	3439.330	1	.013	.000	.000	.000	0

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
	1103.510	3439.330	3	4	0	.013	16.000	.000	3439.330	.000	31.000	.000

RADIUS	ANGLE
.038	15.000

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

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1103.520	3439.330	3	.013	.000	.000	13.000	0

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1242.530	3443.500	3	.013	.000	.000	.000	1

ELEMENT NO 9 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1242.540	3443.500	3	4	0	.013	11.000	.000	3443.500	.000	64.000	.000

RADIUS	ANGLE
.115	5.000

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

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1290.730	3451.770	3	.013	.000	.000	.000	0

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
	1290.740	3451.770	3	2	0	.013	4.000	.000	3451.770	.000	90.000	.000

RADIUS	ANGLE
.057	10.000

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

ELEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1410.440	3463.000	3	.013	.000	.000	.000	0

ELEMENT NO 13 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1410.450	3463.000	3	4	0	.013	25.000	.000	3463.000	.000	51.000	.000

RADIUS	ANGLE
.000	.000

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

ELEMENT NO 14 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1455.270	3468.110	3	.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
	1455.280	3468.110	3	.013	.000	.000	15.000	0

ELEMENT NO 16 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1455.290	3468.110	3	.013	.000	.000	15.000	0

ELEMENT NO 17 IS A REACH * * *

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                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1455.300 3468.110    3              .013                           .000     .000    15.000     0
 ELEMENT NO  18 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1455.310 3468.110    3              .013                           .000     .000    15.000     0
                                                 W S P G W                                                          PAGE NO   4
                           WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  19 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1455.320 3468.110    3              .013                           .000     .000     3.000     0
 ELEMENT NO  20 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1592.640 3468.800    3              .013                           .000     .000     .000      0
 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
                               1592.650 3468.800    3     2     0   .013     6.000      .000  3468.800      .000  76.000     .000
                                                                                              RADIUS    ANGLE
                                                                                                .038  15.000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO  22 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1592.660 3468.800    3              .013                           .000     .000    15.000     0
 ELEMENT NO  23 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1592.670 3468.800    3              .013                           .000     .000     6.000     0
 ELEMENT NO  24 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1771.460 3469.820    3              .013                           .000     .000     .000      0
 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
                               1771.470 3469.820    4     4     0   .013    11.000      .000  3469.820      .000  40.000     .000
                                                                                              RADIUS    ANGLE
                                                                                                .048  12.000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO  26 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1913.000 3470.400    4              .013                           .000     .000    15.000     1
 ELEMENT NO  27 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1913.010 3470.400    4              .013                           .000     .000    15.000     0
                                                 W S P G W                                                          PAGE NO   5
                           WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  28 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1913.020 3470.400    4              .013                           .000     .000     3.000     0
 ELEMENT NO  29 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               2092.020 3473.380    4              .013                           .000     .000    15.000     1
 ELEMENT NO  30 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               2092.030 3473.380    4              .013                           .000     .000    12.000     0
 ELEMENT NO  31 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               2298.440 3478.950    4              .013                           .000     .000    13.000     1
 ELEMENT NO  32 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               2388.780 3479.400    4              .013                           .000     .000      .000     0
 ELEMENT NO  33 IS A SYSTEM HEADWORKS                 *                   *
                    U/S DATA   STATION    INVERT  SECT                                      W S ELEV
                               2388.780 3479.400    4                                         .000
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T1 V25 COUNCIL PARK                                                    0
T2 MAINLINE LATERAL
T3 FACILITIES 8 THROUGH 18

SO   1000.0003463.000  1                          3467.419
R    1155.6503473.650  1      .013                                .000    .000 0
JX   1155.6603473.650  1  2   .013    2.000         3473.650       25.0       15.000
R    1155.6703473.650  1      .013                                .000  15.000 0
R    1155.6803473.650  1      .013                                .000   7.000 0
R    1237.9303476.280  1      .013                                .000    .000 0
JX   1237.9403476.280  2  1   .013   11.000         3476.280       67.0       15.000
R    1237.9503476.280  2      .013                                .000  15.000 0
R    1237.9603476.280  2      .013                                .000  15.000 0
R    1237.9703476.280  2      .013                                .000   1.000 0
R    1463.2903487.210  2      .013                                .000  15.000 1
R    1463.3003487.210  2      .013                                .000   1.000 0
R    1537.8203489.450  2      .013                                .000    .000 0
JX   1537.8303489.450  2  2   .013    2.000         3489.450       10.0       15.000
R    1537.8403489.450  2      .013                                .000  15.000 0
R    1537.8503489.450  2      .013                                .000  15.000 0
R    1537.8603489.450  2      .013                                .000  15.000 0
R    1537.8703489.450  2      .013                                .000   8.000 0
R    1657.7803494.050  2      .013                                .000    .000 0
JX   1657.7903494.050  2  2   .013    4.000         3494.050       51.0        .000
R    1966.8803505.540  2      .013                                .000  15.000 1
R    1966.8903505.540  2      .013                                .000  12.000 0
R    2018.7203506.300  2      .013                                .000    .000 0
SH   2018.7203506.300  2
CD   1  4   1    .000   2.000     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
Q            6.000   .0
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V25 COUNCIL PARK
MAINLINE LATERAL
FACILITIES 8 THROUGH 18

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
1000.000	3463.000	4.419	3467.419	25.00	7.96	.98	3468.40	.00	1.76	.00	2.000	.000	.00	1 .0
14.924	.0684					.0122	.18	4.42	.00	.91	.013	.00	.00	PIPE
1014.924	3464.021	3.580	3467.601	25.00	7.96	.98	3468.58	.00	1.76	.00	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1014.924	3464.021	.921	3464.942	25.00	17.70	4.87	3469.81	.00	1.76	1.99	2.000	.000	.00	1 .0
11.239	.0684					.0645	.73	.92	3.71	.91	.013	.00	.00	PIPE
1026.163	3464.790	.924	3465.714	25.00	17.61	4.82	3470.53	.00	1.76	1.99	2.000	.000	.00	1 .0
49.271	.0684					.0602	2.97	.92	3.68	.91	.013	.00	.00	PIPE
1075.435	3468.161	.958	3469.119	25.00	16.79	4.38	3473.50	.00	1.76	2.00	2.000	.000	.00	1 .0
23.402	.0684					.0530	1.24	.96	3.43	.91	.013	.00	.00	PIPE
1098.837	3469.762	.995	3470.758	25.00	16.01	3.98	3474.74	.00	1.76	2.00	2.000	.000	.00	1 .0
14.894	.0684					.0467	.70	1.00	3.19	.91	.013	.00	.00	PIPE
1113.731	3470.781	1.033	3471.815	25.00	15.27	3.62	3475.43	.00	1.76	2.00	2.000	.000	.00	1 .0
10.590	.0684					.0411	.44	1.03	2.97	.91	.013	.00	.00	PIPE
1124.321	3471.506	1.073	3472.579	25.00	14.56	3.29	3475.87	.00	1.76	1.99	2.000	.000	.00	1 .0
7.998	.0684					.0363	.29	1.07	2.76	.91	.013	.00	.00	PIPE
1132.319	3472.053	1.115	3473.168	25.00	13.88	2.99	3476.16	.00	1.76	1.99	2.000	.000	.00	1 .0
6.262	.0684					.0320	.20	1.12	2.57	.91	.013	.00	.00	PIPE

V25 COUNCIL PARK
MAINLINE LATERAL
FACILITIES 8 THROUGH 18

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
1138.581	3472.482	1.159	3473.641	25.00	13.23	2.72	3476.36	.00	1.76	1.97	2.000	.000	.00	1 .0
4.990	.0684					.0283	.14	1.16	2.38	.91	.013	.00	.00	PIPE
1143.571	3472.823	1.206	3474.030	25.00	12.62	2.47	3476.50	.00	1.76	1.96	2.000	.000	.00	1 .0
4.030	.0684					.0251	.10	1.21	2.21	.91	.013	.00	.00	PIPE
1147.601	3473.099	1.256	3474.355	25.00	12.03	2.25	3476.60	.00	1.76	1.93	2.000	.000	.00	1 .0
3.275	.0684					.0222	.07	1.26	2.04	.91	.013	.00	.00	PIPE
1150.876	3473.323	1.309	3474.632	25.00	11.47	2.04	3476.68	.00	1.76	1.90	2.000	.000	.00	1 .0
2.665	.0684					.0197	.05	1.31	1.89	.91	.013	.00	.00	PIPE
1153.541	3473.506	1.365	3474.871	25.00	10.94	1.86	3476.73	.00	1.76	1.86	2.000	.000	.00	1 .0
2.109	.0684					.0176	.04	1.37	1.74	.91	.013	.00	.00	PIPE
1155.650	3473.650	1.427	3475.077	25.00	10.43	1.69	3476.76	2.00	1.76	1.81	2.000	.000	.00	1 .0
JUNCT STR	.0000					.0220	.00	2.00	1.60		.013	.00	.00	PIPE
1155.660	3473.650	1.132	3474.782	23.00	12.53	2.44	3477.22	.00	1.71	1.98	2.000	.000	.00	1 .0
.010	.0000					.0275	.00	1.13	2.30	.00	.013	.00	.00	PIPE
1155.670	3473.650	1.132	3474.782	23.00	12.54	2.44	3477.22	.00	1.71	1.98	2.000	.000	.00	1 .0

.010	.0000					.0275	.00	1.13	2.30	.00	.013	.00	.00	PIPE			
1155.680	3473.650	1.131	3474.781	23.00	12.55	2.45	3477.23	.00	1.71	1.98	2.000	.000	.00	1	.0		
10.970	.0320					.0270	.30	1.13	2.30	1.08	.013	.00	.00	PIPE			

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
1166.650	3474.001	1.144	3475.145	23.00	12.38	2.38	3477.52	.00	1.71	1.98	2.000	.000	.00	1	.0		
24.493	.0320					.0250	.61	1.14	2.25	1.08	.013	.00	.00	PIPE			
1191.143	3474.784	1.190	3475.974	23.00	11.80	2.16	3478.14	.00	1.71	1.96	2.000	.000	.00	1	.0		
15.103	.0320					.0221	.33	1.19	2.09	1.08	.013	.00	.00	PIPE			
1206.246	3475.267	1.238	3476.505	23.00	11.25	1.97	3478.47	.00	1.71	1.94	2.000	.000	.00	1	.0		
10.252	.0320					.0196	.20	1.24	1.93	1.08	.013	.00	.00	PIPE			
1216.498	3475.595	1.290	3476.885	23.00	10.73	1.79	3478.67	.00	1.71	1.91	2.000	.000	.00	1	.0		
7.382	.0320					.0174	.13	1.29	1.79	1.08	.013	.00	.00	PIPE			
1223.880	3475.831	1.345	3477.176	23.00	10.23	1.63	3478.80	.00	1.71	1.88	2.000	.000	.00	1	.0		
5.383	.0320					.0155	.08	1.35	1.65	1.08	.013	.00	.00	PIPE			
1229.263	3476.003	1.404	3477.407	23.00	9.75	1.48	3478.88	.00	1.71	1.83	2.000	.000	.00	1	.0		
3.873	.0320					.0138	.05	1.40	1.51	1.08	.013	.00	.00	PIPE			
1233.136	3476.127	1.468	3477.595	23.00	9.30	1.34	3478.94	.00	1.71	1.77	2.000	.000	.00	1	.0		
2.659	.0320					.0124	.03	1.47	1.39	1.08	.013	.00	.00	PIPE			
1235.796	3476.212	1.538	3477.750	23.00	8.87	1.22	3478.97	.00	1.71	1.69	2.000	.000	.00	1	.0		
1.585	.0320					.0112	.02	1.54	1.26	1.08	.013	.00	.00	PIPE			
1237.381	3476.262	1.616	3477.879	23.00	8.45	1.11	3478.99	.00	1.71	1.58	2.000	.000	.00	1	.0		
.549	.0320					.0101	.01	1.62	1.13	1.08	.013	.00	.00	PIPE			

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
1237.930	3476.280	1.706	3477.986	23.00	8.06	1.01	3478.99	2.00	1.71	1.42	2.000	.000	.00	1	.0		
JUNCT STR	.0000					.0114	.00	2.00	1.00		.013	.00	.00	PIPE			
1237.940	3476.280	2.899	3479.179	12.00	6.79	.72	3479.90	.00	1.31	.00	1.500	.000	.00	1	.0		
.010	.0000					.0131	.00	2.90	.00	.00	.013	.00	.00	PIPE			
1237.950	3476.280	2.935	3479.215	12.00	6.79	.72	3479.93	.00	1.31	.00	1.500	.000	.00	1	.0		
.010	.0000					.0131	.00	2.93	.00	.00	.013	.00	.00	PIPE			
1237.960	3476.280	2.970	3479.250	12.00	6.79	.72	3479.97	.00	1.31	.00	1.500	.000	.00	1	.0		
.010	.0000					.0131	.00	2.97	.00	.00	.013	.00	.00	PIPE			
1237.970	3476.280	2.973	3479.253	12.00	6.79	.72	3479.97	.00	1.31	.00	1.500	.000	.00	1	.0		
20.340	.0485					.0131	.27	2.97	.00	.77	.013	.00	.00	PIPE			
1258.310	3477.267	2.272	3479.539	12.00	6.79	.72	3480.25	.00	1.31	.00	1.500	.000	.00	1	.0		
HYDRAULIC JUMP																	
1258.310	3477.267	.766	3478.033	12.00	13.21	2.71	3480.74	.00	1.31	1.50	1.500	.000	.00	1	.0		

53.856	.0485					.0485	2.61	.77	2.99	.77	.013	.00	.00	PIPE					
1312.167	3479.879	.766	3480.646	12.00	13.21	2.71	3483.36	.00	1.31	1.50	1.500	.000	.00	1	.0				
75.138	.0485					.0473	3.55	.77	2.99	.77	.013	.00	.00	PIPE					
1387.304	3483.524	.778	3484.302	12.00	12.95	2.61	3486.91	.00	1.31	1.50	1.500	.000	.00	1	.0				
39.632	.0485					.0433	1.72	.78	2.90	.77	.013	.00	.00	PIPE					

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 9:42:59

V25 COUNCIL PARK
MAINLINE LATERAL
FACILITIES 8 THROUGH 18

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
1426.936	3485.446	.808	3486.254	12.00	12.35	2.37	3488.62	.00	1.31	1.50	1.500	.000	.00	1 .0
17.765	.0485					.0382	.68	.81	2.70	.77	.013	.00	.00	PIPE
1444.701	3486.308	.840	3487.148	12.00	11.78	2.15	3489.30	.00	1.31	1.49	1.500	.000	.00	1 .0
10.950	.0485					.0337	.37	.84	2.51	.77	.013	.00	.00	PIPE
1455.651	3486.839	.874	3487.713	12.00	11.23	1.96	3489.67	.00	1.31	1.48	1.500	.000	.00	1 .0
7.639	.0485					.0298	.23	.87	2.33	.77	.013	.00	.00	PIPE
1463.290	3487.210	.909	3488.119	12.00	10.71	1.78	3489.90	.00	1.31	1.47	1.500	.000	.00	1 .0
.010	.0000					.0280	.00	.91	2.16	.00	.013	.00	.00	PIPE
1463.300	3487.210	.909	3488.119	12.00	10.71	1.78	3489.90	.00	1.31	1.47	1.500	.000	.00	1 .0
22.877	.0301					.0272	.62	.91	2.16	.89	.013	.00	.00	PIPE
1486.177	3487.897	.927	3488.824	12.00	10.45	1.70	3490.52	.00	1.31	1.46	1.500	.000	.00	1 .0
22.170	.0301					.0249	.55	.93	2.08	.89	.013	.00	.00	PIPE
1508.347	3488.564	.966	3489.530	12.00	9.97	1.54	3491.07	.00	1.31	1.44	1.500	.000	.00	1 .0
12.424	.0301					.0221	.27	.97	1.92	.89	.013	.00	.00	PIPE
1520.771	3488.938	1.007	3489.945	12.00	9.50	1.40	3491.35	.00	1.31	1.41	1.500	.000	.00	1 .0
7.920	.0301					.0196	.16	1.01	1.77	.89	.013	.00	.00	PIPE
1528.690	3489.176	1.052	3490.228	12.00	9.06	1.28	3491.50	.00	1.31	1.37	1.500	.000	.00	1 .0
5.423	.0301					.0175	.10	1.05	1.63	.89	.013	.00	.00	PIPE

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 9:42:59

V25 COUNCIL PARK
MAINLINE LATERAL
FACILITIES 8 THROUGH 18

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
1534.114	3489.339	1.100	3490.439	12.00	8.64	1.16	3491.60	.00	1.31	1.33	1.500	.000	.00	1 .0
3.706	.0301					.0157	.06	1.10	1.49	.89	.013	.00	.00	PIPE
1537.820	3489.450	1.152	3490.602	12.00	8.24	1.05	3491.66	1.50	1.31	1.27	1.500	.000	.00	1 .0
JUNCT STR	.0000					.0263	.00	1.50	1.35		.013	.00	.00	PIPE
1537.830	3489.450	.742	3490.192	10.00	11.48	2.05	3492.24	.00	1.22	1.50	1.500	.000	.00	1 .0
.010	.0000					.0377	.00	.74	2.66	.00	.013	.00	.00	PIPE
1537.840	3489.450	.741	3490.191	10.00	11.49	2.05	3492.24	.00	1.22	1.50	1.500	.000	.00	1 .0
.010	.0000					.0378	.00	.74	2.66	.00	.013	.00	.00	PIPE
1537.850	3489.450	.741	3490.191	10.00	11.50	2.05	3492.24	.00	1.22	1.50	1.500	.000	.00	1 .0
.010	.0000					.0379	.00	.74	2.66	.00	.013	.00	.00	PIPE

1537.860	3489.450	.740	3490.190	10.00	11.51	2.06	3492.25	.00	1.22	1.50	1.500	.000	.00	1	.0		
.010	.0000					.0380	.00	.74	2.66	.00	.013	.00	.00	PIPE			
1537.870	3489.450	.740	3490.190	10.00	11.52	2.06	3492.25	.00	1.22	1.50	1.500	.000	.00	1	.0		
60.486	.0384					.0358	2.16	.74	2.67	.74	.013	.00	.00	PIPE			
1598.356	3491.770	.767	3492.537	10.00	10.99	1.88	3494.41	.00	1.22	1.50	1.500	.000	.00	1	.0		
20.770	.0384					.0315	.66	.77	2.49	.74	.013	.00	.00	PIPE			
1619.126	3492.567	.796	3493.363	10.00	10.48	1.71	3495.07	.00	1.22	1.50	1.500	.000	.00	1	.0		
11.676	.0384					.0278	.32	.80	2.31	.74	.013	.00	.00	PIPE			

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
1630.801	3493.015	.828	3493.843	10.00	9.99	1.55	3495.39	.00	1.22	1.49	1.500	.000	.00	1	.0
7.896	.0384					.0246	.19	.83	2.15	.74	.013	.00	.00	PIPE	
1638.697	3493.318	.860	3494.178	10.00	9.53	1.41	3495.59	.00	1.22	1.48	1.500	.000	.00	1	.0
5.591	.0384					.0217	.12	.86	2.00	.74	.013	.00	.00	PIPE	
1644.289	3493.533	.895	3494.428	10.00	9.09	1.28	3495.71	.00	1.22	1.47	1.500	.000	.00	1	.0
4.151	.0384					.0192	.08	.90	1.85	.74	.013	.00	.00	PIPE	
1648.440	3493.692	.932	3494.624	10.00	8.66	1.17	3495.79	.00	1.22	1.46	1.500	.000	.00	1	.0
3.137	.0384					.0170	.05	.93	1.71	.74	.013	.00	.00	PIPE	
1651.577	3493.812	.971	3494.783	10.00	8.26	1.06	3495.84	.00	1.22	1.43	1.500	.000	.00	1	.0
2.379	.0384					.0151	.04	.97	1.58	.74	.013	.00	.00	PIPE	
1653.956	3493.904	1.012	3494.916	10.00	7.88	.96	3495.88	.00	1.22	1.41	1.500	.000	.00	1	.0
1.708	.0384					.0135	.02	1.01	1.46	.74	.013	.00	.00	PIPE	
1655.664	3493.969	1.057	3495.026	10.00	7.51	.88	3495.90	.00	1.22	1.37	1.500	.000	.00	1	.0
1.161	.0384					.0120	.01	1.06	1.34	.74	.013	.00	.00	PIPE	
1656.824	3494.013	1.106	3495.120	10.00	7.16	.80	3495.92	.00	1.22	1.32	1.500	.000	.00	1	.0
.738	.0384					.0108	.01	1.11	1.23	.74	.013	.00	.00	PIPE	
1657.562	3494.042	1.158	3495.200	10.00	6.83	.72	3495.92	.00	1.22	1.26	1.500	.000	.00	1	.0
.218	.0384					.0097	.00	1.16	1.11	.74	.013	.00	.00	PIPE	

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
1657.780	3494.050	1.219	3495.269	10.00	6.50	.66	3495.93	.00	1.22	1.17	1.500	.000	.00	1	.0
JUNCT STR	.0000					.0062	.00	1.22	1.00		.013	.00	.00	PIPE	
1657.790	3494.050	1.951	3496.001	6.00	3.40	.18	3496.18	.00	.95	.00	1.500	.000	.00	1	.0
12.852	.0372					.0033	.04	1.95	.00	.56	.013	.00	.00	PIPE	
1670.642	3494.528	1.500	3496.028	6.00	3.40	.18	3496.21	.00	.95	.00	1.500	.000	.00	1	.0
HYDRAULIC JUMP															
1670.642	3494.528	.560	3495.087	6.00	9.98	1.55	3496.64	.00	.95	1.45	1.500	.000	.00	1	.0
186.822	.0372					.0372	6.94	.56	2.73	.56	.013	.00	.00	PIPE	

1857.464	3501.472	.560	3502.032	6.00	9.98	1.55	3503.58	.00	.95	1.45	1.500	.000	.00	1	.0
52.586	.0372					.0359	1.89	.56	2.73	.56	.013		.00	.00	PIPE
1910.051	3503.427	.570	3503.997	6.00	9.73	1.47	3505.47	.00	.95	1.46	1.500	.000	.00	1	.0
24.253	.0372					.0325	.79	.57	2.64	.56	.013		.00	.00	PIPE
1934.303	3504.329	.590	3504.919	6.00	9.28	1.34	3506.26	.00	.95	1.47	1.500	.000	.00	1	.0
11.479	.0372					.0285	.33	.59	2.46	.56	.013		.00	.00	PIPE
1945.782	3504.756	.612	3505.368	6.00	8.85	1.22	3506.58	.00	.95	1.47	1.500	.000	.00	1	.0
7.283	.0372					.0250	.18	.61	2.30	.56	.013		.00	.00	PIPE
1953.065	3505.026	.634	3505.660	6.00	8.43	1.10	3506.77	.00	.95	1.48	1.500	.000	.00	1	.0
5.031	.0372					.0220	.11	.63	2.15	.56	.013		.00	.00	PIPE

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
1958.096	3505.213	.658	3505.872	6.00	8.04	1.00	3506.88	.00	.95	1.49	1.500	.000	.00	1	.0
3.769	.0372					.0193	.07	.66	2.00	.56	.013		.00	.00	PIPE
1961.865	3505.354	.682	3506.036	6.00	7.67	.91	3506.95	.00	.95	1.49	1.500	.000	.00	1	.0
2.823	.0372					.0170	.05	.68	1.87	.56	.013		.00	.00	PIPE
1964.688	3505.458	.708	3506.167	6.00	7.31	.83	3507.00	.00	.95	1.50	1.500	.000	.00	1	.0
2.192	.0372					.0149	.03	.71	1.74	.56	.013		.00	.00	PIPE
1966.890	3505.540	.735	3506.275	6.00	6.97	.75	3507.03	.00	.95	1.50	1.500	.000	.00	1	.0
19.416	.0147					.0136	.26	.73	1.62	.72	.013		.00	.00	PIPE
1986.306	3505.825	.748	3506.573	6.00	6.81	.72	3507.29	.00	.95	1.50	1.500	.000	.00	1	.0
15.854	.0147					.0124	.20	.75	1.57	.72	.013		.00	.00	PIPE
2002.160	3506.057	.777	3506.834	6.00	6.49	.65	3507.49	.00	.95	1.50	1.500	.000	.00	1	.0
7.836	.0147					.0109	.09	.78	1.46	.72	.013		.00	.00	PIPE
2009.996	3506.172	.807	3506.979	6.00	6.19	.60	3507.57	.00	.95	1.50	1.500	.000	.00	1	.0
4.570	.0147					.0096	.04	.81	1.36	.72	.013		.00	.00	PIPE
2014.567	3506.239	.838	3507.077	6.00	5.90	.54	3507.62	.00	.95	1.49	1.500	.000	.00	1	.0
2.457	.0147					.0085	.02	.84	1.26	.72	.013		.00	.00	PIPE
2017.023	3506.275	.872	3507.147	6.00	5.63	.49	3507.64	.00	.95	1.48	1.500	.000	.00	1	.0
1.356	.0147					.0075	.01	.87	1.17	.72	.013		.00	.00	PIPE

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
2018.379	3506.295	.907	3507.202	6.00	5.37	.45	3507.65	.00	.95	1.47	1.500	.000	.00	1	.0
.341	.0147					.0066	.00	.91	1.08	.72	.013		.00	.00	PIPE
2018.720	3506.300	.946	3507.246	6.00	5.11	.41	3507.65	.00	.95	1.45	1.500	.000	.00	1	.0

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	4	1		2.000														
CD	2	4	1		1.500														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
V25 COUNCIL PARK
HEADING LINE NO 2 IS -
MAINLINE LATERAL
HEADING LINE NO 3 IS -
FACILITIES 8 THROUGH 18

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	3463.000	1	3467.419

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1155.650	3473.650	1	.013	.000	.000	.000	0

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
	1155.660	3473.650	1	2	0	.013	2.000	.000	3473.650	.000	25.000	.000

RADIUS	ANGLE
.038	15.000

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

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1155.670	3473.650	1	.013	.000	.000	15.000	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1155.680	3473.650	1	.013	.000	.000	7.000	0

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1237.930	3476.280	1	.013	.000	.000	.000	0

ELEMENT NO 7 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1237.940	3476.280	2	1	0	.013	11.000	.000	3476.280	.000	67.000	.000

RADIUS	ANGLE
.038	15.000

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

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1237.950	3476.280	2	.013	.000	.000	15.000	0

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1237.960	3476.280	2	.013	.000	.000	15.000	0

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1237.970	3476.280	2	.013	.000	.000	1.000	0

ELEMENT NO 11 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1463.290	3487.210	2	.013	.000	.000	15.000	1

ELEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1463.300	3487.210	2	.013	.000	.000	1.000	0

ELEMENT NO 13 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1537.820	3489.450	2	.013	.000	.000	.000	0

ELEMENT NO 14 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1537.830	3489.450	2	2	0	.013	2.000	.000	3489.450	.000	10.000	.000

RADIUS	ANGLE
.038	15.000

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

ELEMENT NO 15 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1537.840	3489.450	2	.013	.000	.000	15.000	0

ELEMENT NO 16 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1537.850	3489.450	2	.013	.000	.000	15.000	0

ELEMENT NO 17 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1537.860	3489.450	2	.013	.000	.000	15.000	0

ELEMENT NO 18 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1537.870	3489.450	2	.013	.000	.000	8.000	0

ELEMENT NO 19 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1657.780	3494.050	2	.013	.000	.000	.000	0

ELEMENT NO 20 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1657.790	3494.050	2	2	0	.013	4.000	.000	3494.050	.000	51.000	.000

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                                                                                                    RADIUS    ANGLE
                                                                                                      .000    .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
                                              W S P G W                                                                  PAGE NO   4
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  21 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT               N                          RADIUS    ANGLE     ANG PT  MAN H
                                1966.880 3505.540    2               .013                          .000     .000    15.000     1
 ELEMENT NO  22 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT               N                          RADIUS    ANGLE     ANG PT  MAN H
                                1966.890 3505.540    2               .013                          .000     .000    12.000     0
 ELEMENT NO  23 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT               N                          RADIUS    ANGLE     ANG PT  MAN H
                                2018.720 3506.300    2               .013                          .000     .000      .000     0
 ELEMENT NO  24 IS A SYSTEM HEADWORKS                 *                     *
                     U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                2018.720 3506.300    2                                     .000
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T1 V25 COUNCIL PARK                                                    0
T2 COUNCIL PARK LATERAL 2
T3 FACILITIES 22 THROUGH 26

SO   1000.0003443.500  1                          3445.022
R    1017.3603443.590  1      .013                                .000   9.000 1
R    1046.9703453.230  1      .013                                .000    .000 0
JX   1046.9803453.230  1  1   .013    2.000         3443.740        90.0        7.000
R    1283.8103464.000  1      .013                                .000    .000 0
JX   1283.8303464.000  2  2   .013    3.000         3464.000        90.0         .000
R    1332.6503465.020  2      .013                                .000    .000 0
SH   1332.6503465.020  2                          3465.020
CD   1  4   1    .000   2.000     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
Q             6.000   .0
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Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:25:22

V25 COUNCIL PARK
COUNCIL PARK LATERAL 2
FACILITIES 22 THROUGH 26

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
1000.000	3443.500	.512	3444.012	11.00	17.32	4.66	3448.67	.00	1.19	1.75	2.000	.000	.00	1 .0
3.478	.0052					.1222	.43	.51	5.06	1.20	.013	.00	.00	PIPE
1003.479	3443.518	.496	3444.014	11.00	18.10	5.09	3449.10	.00	1.19	1.73	2.000	.000	.00	1 .0
3.675	.0052					.1389	.51	.50	5.38	1.20	.013	.00	.00	PIPE
1007.154	3443.537	.479	3444.016	11.00	18.98	5.59	3449.61	.00	1.19	1.71	2.000	.000	.00	1 .0
3.537	.0052					.1588	.56	.48	5.74	1.20	.013	.00	.00	PIPE
1010.691	3443.556	.463	3444.019	11.00	19.91	6.15	3450.17	.00	1.19	1.69	2.000	.000	.00	1 .0
3.402	.0052					.1817	.62	.46	6.13	1.20	.013	.00	.00	PIPE
1014.092	3443.573	.448	3444.021	11.00	20.88	6.77	3450.79	.00	1.19	1.67	2.000	.000	.00	1 .0
3.268	.0052					.2080	.68	.45	6.55	1.20	.013	.00	.00	PIPE
1017.360	3443.590	.434	3444.023	11.00	21.90	7.45	3451.47	.00	1.19	1.65	2.000	.000	.00	1 .0
.674	.3256					.2200	.15	.43	6.99	.39	.013	.00	.00	PIPE
1018.035	3443.809	.435	3444.244	11.00	21.76	7.35	3451.60	.00	1.19	1.65	2.000	.000	.00	1 .0
5.383	.3256					.2042	1.10	.44	6.93	.39	.013	.00	.00	PIPE
1023.417	3445.562	.450	3446.012	11.00	20.75	6.68	3452.70	.00	1.19	1.67	2.000	.000	.00	1 .0
4.025	.3256					.1786	.72	.45	6.49	.39	.013	.00	.00	PIPE
1027.443	3446.872	.466	3447.338	11.00	19.78	6.08	3453.41	.00	1.19	1.69	2.000	.000	.00	1 .0
3.168	.3256					.1562	.49	.47	6.08	.39	.013	.00	.00	PIPE

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:25:22

V25 COUNCIL PARK
COUNCIL PARK LATERAL 2
FACILITIES 22 THROUGH 26

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
1030.610	3447.903	.482	3448.385	11.00	18.86	5.52	3453.91	.00	1.19	1.71	2.000	.000	.00	1 .0
2.572	.3256					.1366	.35	.48	5.69	.39	.013	.00	.00	PIPE
1033.183	3448.741	.498	3449.239	11.00	17.98	5.02	3454.26	.00	1.19	1.73	2.000	.000	.00	1 .0
2.132	.3256					.1194	.25	.50	5.33	.39	.013	.00	.00	PIPE
1035.314	3449.435	.515	3449.950	11.00	17.15	4.57	3454.51	.00	1.19	1.75	2.000	.000	.00	1 .0
1.795	.3256					.1044	.19	.52	4.99	.39	.013	.00	.00	PIPE
1037.110	3450.019	.533	3450.552	11.00	16.35	4.15	3454.70	.00	1.19	1.77	2.000	.000	.00	1 .0
1.534	.3256					.0913	.14	.53	4.67	.39	.013	.00	.00	PIPE
1038.644	3450.519	.551	3451.070	11.00	15.59	3.77	3454.84	.00	1.19	1.79	2.000	.000	.00	1 .0
1.315	.3256					.0799	.11	.55	4.37	.39	.013	.00	.00	PIPE
1039.958	3450.947	.571	3451.518	11.00	14.86	3.43	3454.95	.00	1.19	1.81	2.000	.000	.00	1 .0
1.142	.3256					.0700	.08	.57	4.09	.39	.013	.00	.00	PIPE
1041.100	3451.319	.591	3451.910	11.00	14.17	3.12	3455.03	.00	1.19	1.83	2.000	.000	.00	1 .0
.997	.3256					.0613	.06	.59	3.83	.39	.013	.00	.00	PIPE
1042.097	3451.643	.611	3452.254	11.00	13.51	2.83	3455.09	.00	1.19	1.84	2.000	.000	.00	1 .0

.867	.3256					.0536	.05	.61	3.58	.39	.013	.00	.00	PIPE			
1042.964	3451.926	.633	3452.559	11.00	12.88	2.58	3455.14	.00	1.19	1.86	2.000	.000	.00	1	.0		
.762	.3256					.0470	.04	.63	3.35	.39	.013	.00	.00	PIPE			

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
1043.726	3452.174	.655	3452.829	11.00	12.28	2.34	3455.17	.00	1.19	1.88	2.000	.000	.00	1	.0		
.668	.3256					.0412	.03	.66	3.13	.39	.013	.00	.00	PIPE			
1044.394	3452.391	.678	3453.069	11.00	11.71	2.13	3455.20	.00	1.19	1.89	2.000	.000	.00	1	.0		
.586	.3256					.0361	.02	.68	2.93	.39	.013	.00	.00	PIPE			
1044.980	3452.582	.702	3453.284	11.00	11.17	1.94	3455.22	.00	1.19	1.91	2.000	.000	.00	1	.0		
.514	.3256					.0316	.02	.70	2.74	.39	.013	.00	.00	PIPE			
1045.493	3452.749	.727	3453.476	11.00	10.65	1.76	3455.24	.00	1.19	1.92	2.000	.000	.00	1	.0		
.450	.3256					.0277	.01	.73	2.56	.39	.013	.00	.00	PIPE			
1045.943	3452.896	.753	3453.649	11.00	10.15	1.60	3455.25	.00	1.19	1.94	2.000	.000	.00	1	.0		
.390	.3256					.0243	.01	.75	2.39	.39	.013	.00	.00	PIPE			
1046.333	3453.022	.781	3453.803	11.00	9.68	1.45	3455.26	.00	1.19	1.95	2.000	.000	.00	1	.0		
.343	.3256					.0213	.01	.78	2.23	.39	.013	.00	.00	PIPE			
1046.676	3453.134	.809	3453.943	11.00	9.23	1.32	3455.27	.00	1.19	1.96	2.000	.000	.00	1	.0		
.294	.3256					.0187	.01	.81	2.09	.39	.013	.00	.00	PIPE			
1046.970	3453.230	.839	3454.069	11.00	8.80	1.20	3455.27	2.00	1.19	1.97	2.000	.000	.00	1	.0		
JUNCT STR	.0000					.0315	.00	2.00	1.95		.013	.00	.00	PIPE			
1046.980	3453.230	.585	3453.815	9.00	11.76	2.15	3455.96	.00	1.07	1.82	2.000	.000	.00	1	.0		
110.487	.0455					.0455	5.03	.59	3.19	.59	.013	.00	.00	PIPE			

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
1157.467	3458.254	.585	3458.840	9.00	11.76	2.15	3460.99	.00	1.07	1.82	2.000	.000	.00	1	.0		
61.778	.0455					.0430	2.66	.59	3.19	.59	.013	.00	.00	PIPE			
1219.244	3461.064	.602	3461.666	9.00	11.28	1.98	3463.64	.00	1.07	1.83	2.000	.000	.00	1	.0		
21.160	.0455					.0380	.80	.60	3.01	.59	.013	.00	.00	PIPE			
1240.404	3462.026	.623	3462.649	9.00	10.76	1.80	3464.45	.00	1.07	1.85	2.000	.000	.00	1	.0		
11.565	.0455					.0333	.38	.62	2.82	.59	.013	.00	.00	PIPE			
1251.969	3462.552	.645	3463.197	9.00	10.26	1.63	3464.83	.00	1.07	1.87	2.000	.000	.00	1	.0		
7.678	.0455					.0291	.22	.65	2.64	.59	.013	.00	.00	PIPE			
1259.648	3462.901	.668	3463.569	9.00	9.78	1.48	3465.05	.00	1.07	1.89	2.000	.000	.00	1	.0		
5.565	.0455					.0255	.14	.67	2.47	.59	.013	.00	.00	PIPE			
1265.213	3463.154	.692	3463.846	9.00	9.32	1.35	3465.20	.00	1.07	1.90	2.000	.000	.00	1	.0		
4.231	.0455					.0224	.09	.69	2.31	.59	.013	.00	.00	PIPE			
1269.444	3463.346	.717	3464.063	9.00	8.89	1.23	3465.29	.00	1.07	1.92	2.000	.000	.00	1	.0		

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:25:22

V25 COUNCIL PARK
COUNCIL PARK LATERAL 2
FACILITIES 22 THROUGH 26

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
1277.537	3463.715	.797	3464.512	9.00	7.71	.92	3465.43	.00	1.07	1.96	2.000	.000	.00	1 .0
1.701	.0455					.0133	.02	.80	1.76	.59	.013	.00	.00	PIPE
1279.237	3463.792	.826	3464.618	9.00	7.35	.84	3465.46	.00	1.07	1.97	2.000	.000	.00	1 .0
1.365	.0455					.0116	.02	.83	1.64	.59	.013	.00	.00	PIPE
1280.602	3463.854	.856	3464.710	9.00	7.00	.76	3465.47	.00	1.07	1.98	2.000	.000	.00	1 .0
1.057	.0455					.0102	.01	.86	1.53	.59	.013	.00	.00	PIPE
1281.659	3463.902	.888	3464.790	9.00	6.68	.69	3465.48	.00	1.07	1.99	2.000	.000	.00	1 .0
.821	.0455					.0090	.01	.89	1.43	.59	.013	.00	.00	PIPE
1282.480	3463.939	.921	3464.861	9.00	6.37	.63	3465.49	.00	1.07	1.99	2.000	.000	.00	1 .0
.618	.0455					.0079	.00	.92	1.33	.59	.013	.00	.00	PIPE
1283.098	3463.968	.955	3464.923	9.00	6.07	.57	3465.50	.00	1.07	2.00	2.000	.000	.00	1 .0
.416	.0455					.0069	.00	.96	1.24	.59	.013	.00	.00	PIPE
1283.515	3463.987	.991	3464.978	9.00	5.79	.52	3465.50	.00	1.07	2.00	2.000	.000	.00	1 .0
.236	.0455					.0061	.00	.99	1.16	.59	.013	.00	.00	PIPE
1283.751	3463.997	1.029	3465.026	9.00	5.52	.47	3465.50	.00	1.07	2.00	2.000	.000	.00	1 .0
.059	.0455					.0054	.00	1.03	1.08	.59	.013	.00	.00	PIPE
1283.810	3464.000	1.071	3465.071	9.00	5.26	.43	3465.50	.00	1.07	1.99	2.000	.000	.00	1 .0
JUNCT STR	.0000					.0042	.00	1.07	1.00		.013	.00	.00	PIPE

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:25:22

V25 COUNCIL PARK
COUNCIL PARK LATERAL 2
FACILITIES 22 THROUGH 26

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
1283.830	3464.000	1.552	3465.552	6.00	3.40	.18	3465.73	.00	.95	.00	1.500	.000	.00	1 .0
2.932	.0209					.0032	.01	1.55	.00	.66	.013	.00	.00	PIPE
1286.762	3464.061	1.500	3465.561	6.00	3.40	.18	3465.74	.00	.95	.00	1.500	.000	.00	1 .0
6.770	.0209					.0030	.02	1.50	.00	.66	.013	.00	.00	PIPE
1293.532	3464.203	1.360	3465.563	6.00	3.56	.20	3465.76	.00	.95	.87	1.500	.000	.00	1 .0
3.341	.0209					.0030	.01	1.36	.45	.66	.013	.00	.00	PIPE
1296.874	3464.272	1.280	3465.552	6.00	3.74	.22	3465.77	.00	.95	1.06	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1296.874	3464.272	.672	3464.944	6.00	7.83	.95	3465.90	.00	.95	1.49	1.500	.000	.00	1 .0
7.237	.0209					.0181	.13	.67	1.93	.66	.013	.00	.00	PIPE

1304.110	3464.424	.694	3465.118	6.00	7.49	.87	3465.99	.00	.95	1.50	1.500	.000	.00	1	.0		
10.559	.0209					.0159	.17	.69	1.80	.66	.013	.00	.00	PIPE			
1314.669	3464.644	.721	3465.365	6.00	7.14	.79	3466.16	.00	.95	1.50	1.500	.000	.00	1	.0		
6.567	.0209					.0140	.09	.72	1.68	.66	.013	.00	.00	PIPE			
1321.236	3464.781	.748	3465.530	6.00	6.81	.72	3466.25	.00	.95	1.50	1.500	.000	.00	1	.0		
4.274	.0209					.0124	.05	.75	1.57	.66	.013	.00	.00	PIPE			
1325.511	3464.871	.777	3465.648	6.00	6.49	.65	3466.30	.00	.95	1.50	1.500	.000	.00	1	.0		
2.952	.0209					.0109	.03	.78	1.46	.66	.013	.00	.00	PIPE			

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:11-17-2022 Time: 3:25:22

V25 COUNCIL PARK
COUNCIL PARK LATERAL 2
FACILITIES 22 THROUGH 26

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 "N"	Base Wt or I.D. X-Fall	ZL	ZR	No Wth Prs/Pip Type Ch
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp					
1328.463	3464.933	.807	3465.740	6.00	6.19	.60	3466.33	.00	.95	1.50	1.500	.000	.00	1	.0
2.047	.0209					.0096	.02	.81	1.36	.66	.013	.00	.00	PIPE	
1330.510	3464.975	.838	3465.813	6.00	5.90	.54	3466.35	.00	.95	1.49	1.500	.000	.00	1	.0
1.223	.0209					.0085	.01	.84	1.26	.66	.013	.00	.00	PIPE	
1331.733	3465.001	.872	3465.873	6.00	5.63	.49	3466.36	.00	.95	1.48	1.500	.000	.00	1	.0
.725	.0209					.0075	.01	.87	1.17	.66	.013	.00	.00	PIPE	
1332.458	3465.016	.907	3465.923	6.00	5.37	.45	3466.37	.00	.95	1.47	1.500	.000	.00	1	.0
.192	.0209					.0066	.00	.91	1.08	.66	.013	.00	.00	PIPE	
1332.650	3465.020	.946	3465.966	6.00	5.11	.41	3466.37	.00	.95	1.45	1.500	.000	.00	1	.0

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

 CD      1    4      1             2.000
 CD      2    4      1             1.500
```


WATER SURFACE PROFILE - TITLE CARD LISTING

```
HEADING LINE NO 1 IS -
  V25 COUNCIL PARK
HEADING LINE NO 2 IS -
  COUNCIL PARK LATERAL 2
HEADING LINE NO 3 IS -
  FACILITIES 22 THROUGH 26
```


WATER SURFACE PROFILE - ELEMENT CARD LISTING

```
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                           1000.000 3443.500    1                                    3445.022
 ELEMENT NO   2 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT               N                        RADIUS    ANGLE     ANG PT  MAN H
                           1017.360 3443.590    1               .013                        .000     .000     9.000     1
 ELEMENT NO   3 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT               N                        RADIUS    ANGLE     ANG PT  MAN H
                           1046.970 3453.230    1               .013                        .000     .000      .000     0
 ELEMENT NO   4 IS A JUNCTION          *         *     *     *                 *                *              *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                           1046.980 3453.230    1     1     0   .013     2.000      .000  3443.740      .000  90.000     .000
                                                                                        RADIUS    ANGLE
                                                                                          .082   7.000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO   5 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT               N                        RADIUS    ANGLE     ANG PT  MAN H
                           1283.810 3464.000    1               .013                        .000     .000      .000     0
 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
                           1283.830 3464.000    2     2     0   .013     3.000      .000  3464.000      .000  90.000     .000
                                                                                        RADIUS    ANGLE
                                                                                          .000    .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO   7 IS A REACH             *         *     *
                U/S DATA   STATION    INVERT  SECT               N                        RADIUS    ANGLE     ANG PT  MAN H
                           1332.650 3465.020    2               .013                        .000     .000      .000     0
 ELEMENT NO   8 IS A SYSTEM HEADWORKS                *                     *
                U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                           1332.650 3465.020    2                                   3465.020
```

GCW ENGINEERS \ SURVEYORS

MINOR STORM DRAIN LATERAL - CCRFCD MANUAL FRICTION LOSS CALCULATION SHEET

STORM DRAIN DESIGN						PIPE HYDRAULIC CHARACTERISTICS						LOSS	HGL			DESCRIPTION	
Q_{DESIGN}			INVERTS			A	R		V	H_V =	S_f	PIPE	PIPE				
(CFS)	DIAMETER (FT)	MANNING'S 'n'	D / S ELEV.	U / S ELEV.	LENGTH	(FT^2)	(FT)	Φ	(FPS)	$V^2/2g$ (FT)	(FT/FT)	H_f (FT)	TRUNK WSE (from Model)	LATERAL PIPE D/S HGL ELEV.[1]	LATERAL PIPE U/S HGL ELEV.	PARTIAL FLOW?	LATERAL
11	2	0.013	3469.82	3469.94	24.93	3.14	0.5	0.004925	3.50	0.190371	0.002356948	0.059	3472.35	3472.35	3472.41	No	FAC 4 LATERAL
6	1.5	0.013	3468.80	3468.97	15.8	1.77	0.375	0.004925	3.40	0.179008	0.003249306	0.051	3471.48	3471.48	3471.53	No	FAC 6 LATERAL
4	1.5	0.013	3494.05	3494.95	25.9	1.77	0.375	0.004925	2.26	0.079559	0.001444136	0.037	3496.00	3496.00	3496.45	No	FAC 9 LATERAL
2	1.5	0.013	3489.45	3489.7	34.11	1.77	0.375	0.004925	1.13	0.01989	0.000361034	0.012	3490.60	3490.95	3491.20	No	FAC 13 LATERAL
11	2	0.013	3476.28	3477.73	41.67	3.14	0.5	0.004925	3.50	0.190371	0.002356948	0.098	3479.25	3479.25	3479.73	No	FAC 15 LATERAL
2	1.5	0.013	3473.65	3474.24	33.15	1.77	0.375	0.004925	1.13	0.01989	0.000361034	0.012	3475.08	3475.15	3475.74	No	FAC 17 LATERAL
4	1.5	0.013	3451.77	3454.51	8.21	1.77	0.375	0.004925	2.26	0.079559	0.001444136	0.012	3453.17	3453.27	3456.01	No	FAC 20 LATERAL
16	2	0.013	3439.33	3440.21	55.53	3.14	0.5	0.004925	5.09	0.402767	0.0049866	0.277	3441.37	3441.37	3442.21	No	FAC 28 LATERAL

Pipe Friction Loss Calculations per CCRFCD Manual 804.2.1

$\Phi = 2g\,(n^2) / 2.21$

$Sf = \Phi\, Hv / R^{1.33}$

$H_f = \text{Length} \times S_f$

1 - Where HGL in lateral is below top of pipe, assume HGL is at top of pipe.

APPENDIX B

Reference Material

COMMENT LETTER

CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**				**DATE:** **June 23, 2022**
TO: **Land Development Services** Department of Building & Safety				**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:			**COPIES TO:**
Council Park at Grand Park				GCW Engineers / Surveyors
Cross Streets:	SWC of Sunset Run Dr. & Kettle Ridge Dr.			Howard Hughes Company
File Number:	F:\Depot\DSMemos\DS5579A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-301-007			CCRFCD
Zoning Action:	SDR?????			
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	6/7/2022	6/23/2022	See Comments Below	$400.00	4820344: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS:

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

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

1. Provide a copy of the zoning/planning conditions associated with this site with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.

2. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.

3. The site is adjacent to or crosses 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

4. **Sheet GD1 & Sheet GD2**: The *Grand Park Detention Basin* is under construction or has been built already, ie, the detention basin must be shown as existing and developed on all pertinent grading plans. Clearly identify the detention basin right-of-way limit and features such as maintenance ramp and inlet/outlet pipes etc adjacent to the proposed park in the next submittal.

5. Provide typical cross sections to reflect the interface between the detention basin and the proposed Summerlin park.

6. **Sheets GD2, GD4, GD6 & GD7**: The label of an existing storm drain in *Sunset Run Drive* and *Kettle Ridge Drive* to be RCB is wrong. Revise to show "**RCP**" with diameter and label with **City of Las Vegas** recorded drawing number in the next submittal.

7. **Sheet GD5**: The north side of the driveway in *Fox Hill Drive* does not meet a minimum hump of six inches above the 100-year water surface in the main street. Review and revise accordingly.

8. **Sheet GD5 & Sheet GD7**: Show the size of the RCB in *Sky Vista Drive* and label with *City of Las Vegas* recorded drawing number on the plans.

9. The overall parking lot improvement area is larger than 1 acre. Per ***Section 1500*** of the *Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual*, the subject improvements must provide for Low Impact Development (LID) measures. Review and address the issue in the next submittal.

10. Provide a note on all grading plans: "The onsite storm drains and the associated facilities are privately owned and to be privately maintained by the Summerlin Master HOA".

11. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

12. Provide a note on all grading plans (Standard Note No. 6): Post-Construction BMPs (PCBMPs) / Control Measures noted on the Grading Plans are mandatory permanent regulatory stormwater pollution controls. These PCBMPs must be installed per the approved plans and must be permanently maintained.

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

LAS VEGAS
CITY COUNCIL

CAROLYN G. GOODMAN
Mayor

STAVROS S. ANTHONY
Mayor Pro Tem

MICHELE FIORE
CEDRIC CREAR
BRIAN KNUDSEN
VICTORIA SEAMAN
OLIVIA DIAZ

JORGE CERVANTES
City Manager

DEPARTMENT OF PLANNING
SETH T. FLOYD
DIRECTOR OF
COMMUNITY DEVELOPMENT

CITY HALL
495 S. MAIN ST.
3RD FLOOR
LAS VEGAS, NV 89101
702.229.6301 | VOICE
702.464.2545 | FAX
711 | TTY

cityoflasvegas
lasvegasnevada.gov

August 17, 2022

Howard Hughes Company LLC
10845 Griffith Peak Suite 160
Las Vegas, Nevada 89135

RE: 22-0359-CRG1 - CITY REFERRAL GROUP

Dear Applicant:

The City Referral Group at a regular meeting held on **August 17, 2022** ***APPROVED*** your request FOR A PROPOSED VILLAGE 25 SUMMERLIN COUNCIL PARK AT GRAND PARK on a portion of 129.62 acres on northwest corner of Sky Vista Drive and Kettle Ridge Drive (APN 137-22-301-013), P-C (Planned Community) Zone, Ward 2 (Seaman).

This approval is subject to the following conditions:

Planning

1. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.

2. Conformance to the requirements and conditions of the Summerlin Non-Residential Design Review Committee letter dated 07/01/22.

3. Prior to the issuance of building permits the associated Final Map (#100222-FMP) must record to create the developer parcel.

4. All development shall be in conformance with the site plan, landscape plan and building elevations date stamped 07/06/22 and additional site plan date stamped 07/12/22, except as amended by conditions herein.

5. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.

6. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.

7. A technical landscape plan, signed and sealed by a Registered Architect, Landscape Architect, Residential Designer or Civil Engineer, must be submitted prior to or at the same time application is made for a building permit. A permanent underground sprinkler system is required, and shall be permanently maintained in a satisfactory manner; the landscape plan shall include irrigation specifications. Installed landscaping shall not impede visibility of any traffic control device.

8. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.

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

Public Works

10. Grant a minimum 20' wide Public Sewer Easement over the public sewer main that runs within the northwest vicinity of the site as shown in the Summerlin West Wastewater Masterplan. No structures, and no trees or vegetation taller than three feet shall be allowed within any Public Sewer Easements nor will any such things obstruct the City's access to public sewer facilities.

11. All landscaping and private improvements installed with this project shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections.

12. An update to the previously approved Traffic Impact Analysis must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or the submittal of any construction drawings, whichever may occur first. Comply with the recommendations of the approved update to the Traffic Impact Analysis prior to occupancy of the site. Phased compliance will be allowed if recommended by the approved Traffic Impact Analysis. No recommendation of the approved Traffic Impact Analysis, nor compliance therewith, shall be deemed to modify or eliminate any condition of approval imposed by the Planning Commission or the City Council on the development of this site. Left turns for the driveway on Sunset Run Drive and appropriate storage must be approved through this required update.

13. The submitted Drainage Plan and Technical Drainage Study (DS5579) shall be approved prior to the issuance of any permits for this site.

14. Site development to comply with all applicable conditions of approval for Summerlin Village 25 Tentative Map (TMP-76354) and all other applicable site-related actions.

This administrative action by the City Referral Group on August 17, 2022 is final unless a written appeal is filed with the Director of the Department of Planning within ten (10) days of the date of the City Referral Group's decision.

Sincerely,

Nicole Eddowes
Community Development Coordinator
Case Planning Division

NE:nl

cc:

Jennifer Veras
GCW Inc
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146

APPROVED
DEPARTMENT OF COMMUNITY
DEVELOPMENT | PLANNING DIVISION
CITY OF LAS VEGAS, NEVADA
2-Foot Grade Difference Only
mrex
Oct 13 2022

GCW
ENGINEERS \ SURVEYORS

62025-660-1

October 12, 2022

City of Las Vegas Planning Department
Clark County Comprehensive Planning
495 S. Main Street
Las Vegas, NV 89101

Re: V25 Summerlin Council Park At Grand Park APN: 137-22-301-013
CLV # 22-0359-CRG1

Dear City Planners:

On behalf of our client, Howard Hughes Company, LLC is respectfully requesting approval for the 2-foot grade difference as shown on the improvement plans. Village 25 Summerlin Council Park was previously rough graded as part of the Summerlin West Village 21 & 25 Mass Grading & Drainage Plan L20-00242 107V8172. As part of that plan set the preliminary park grading concept was rough graded in anticipation of the Council Park Improvements. Excess fill was placed on the site to allow for final park grading as shown on this improvement plan set.

The proposed park grading is removing some of the excess fill located onsite.

V25 Council Park is bordered by Sunset Run Drive to the north, Sky Vista Drive to the east, Fox Hill Drive to the south and existing V25 Grand Park Detention Basin to the west. There is no impact to the adjacent parcels.

If you have any questions or need additional information, please do not hesitate to contact me at 702-804-2113.

Cordially,

GCW, INC.

Robert Murnane, PE
Executive Vice President

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT A MURNANE
Exp: 12-31-2022
CIVIL
No. 9680
10-13-22

1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
O 702.804.2000
F 702.804.2299
info@gcwengineering.com
gcwengineering.com

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

REGIONAL FLOOD CONTROL DISTRICT

Steven C. Parrish, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

Lawrence L. Brown, III
Chair
Clark County

Mayor Debra March
Vice-Chair
City of Henderson

George Gault
City of Mesquite

James B. Gibson
Clark County

Mayor Carolyn Goodman
City of Las Vegas

Stavros Anthony
City of Las Vegas

Isaac Barron
City of North Las Vegas

Mayor Kiernan McManus
City of Boulder City

March 23, 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: UPDATE #1 FOR SUMMERLIN WEST VILLAGE 25 (DS5104E) (RFCD No. 20-12439)

Dear Mr. Kwon:

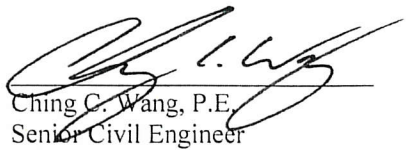
Clark County Regional Flood Control District (District) reviewed Conceptual Drainage Study dated December 23, 2019 for above-mentioned project as submitted by VTN NEVADA. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Department of Public Works dated January 23, 2020.

District concurs with acceptance of this Technical Drainage Study by City of Las Vegas Department of Public Works.

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*.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by VTN NEVADA 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 C. Wang, P.E.
Senior Civil Engineer

CCW:jb

c: Brian Troy Ruiz, P.E., VTN Nevada

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600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 685-0000 • FAX: (702) 685-0001
Website: http://www.regionalflood.org

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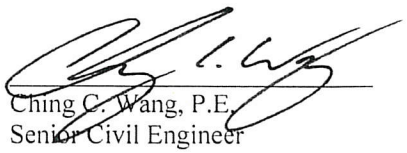
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CURVE NUMBERS FOR SOILS - W.O. #7919

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes									
Soil	Percent	Group	Residential$_{1}$ (Apartment/Condo)	Residential$_{2}$ (7,000 ft^2)	Open Space $_{3}$(Poor Condition)	Urban Districts $_{4}$(Commercial)	Impervious $_{5}$(Streets and roads(Paved)	Urban Districts $_{6}$(Industrial)	Residential$_{7}$ (Townhomes)
Cave	100%	D	93	91	89	95	98	93	92
Total	**100%**		**93**	**91**	**89**	**95**	**98**	**93**	**92**

Soil # 155 Cave gravelly fine sandy loam, 4 to 15 percent slopes									
Soil	Percent	Group	Residential$_{1}$ (Apartment/Condo)	Residential$_{2}$ (7,000 ft^2)	Open Space $_{3}$(Poor Condition)	Urban Districts $_{4}$(Commercial)	Impervious $_{5}$(Streets and roads(Paved)	Urban Districts $_{6}$(Industrial)	Residential$_{7}$ (Townhomes)
Cave	100%	D	93	91	89	95	98	93	92
Total	**100%**		**93**	**91**	**89**	**95**	**98**	**93**	**92**

Soil # 156 Vace - Wechech association									
Soil	Percent	Group	Residential$_{1}$ (Apartment/Condo)	Residential$_{2}$ (7,000 ft^2)	Open Space $_{3}$(Poor Condition)	Urban Districts $_{4}$(Commercial)	Impervious $_{5}$(Streets and roads(Paved)	Urban Districts $_{6}$(Industrial)	Residential$_{7}$ (Townhomes)
Vace and Similar	45%	D	93	91	89	95	98	93	92
Wechech and Similar	25%	D	93	91	89	95	98	93	92
Wechech, steep, and similar	15%	D	93	91	89	95	98	93	92
Weiser	8%	B	88	84	79	92	98	88	87
Irongold	4%	D	93	91	89	95	98	93	92
Commski	2%	B	88	84	79	92	98	88	87
Threelakes	1%	A	81	76	68	89	98	81	80
Total	**100%**		**93**	**91**	**88**	**95**	**98**	**93**	**92**

Soil # 502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes									
Soil	Percent	Group	Residential$_{1}$ (Apartment/Condo)	Residential$_{2}$ (7,000 ft^2)	Open Space $_{3}$(Poor Condition)	Urban Districts $_{4}$(Commercial)	Impervious $_{5}$(Streets and roads(Paved)	Urban Districts $_{6}$(Industrial)	Residential$_{7}$ (Townhomes)
Canutio	55%	A	81	76	68	89	98	81	80
Cave	40%	D	93	91	89	95	98	93	92
Arizo	5%	D	93	91	89	95	98	93	92
Total	**100%**		**87**	**83**	**78**	**92**	**98**	**87**	**86**

Soil # 731 Purob-Irongold association									
Soil	Percent	Group	Residential$_{1}$ (Apartment/Condo)	Residential$_{2}$ (7,000 ft^2)	Open Space $_{3}$(Poor Condition)	Urban Districts $_{4}$(Commercial)	Impervious $_{5}$(Streets and roads(Paved)	Urban Districts $_{6}$(Industrial)	Residential$_{7}$ (Townhomes)
Purob	60%	D	93	91	89	95	98	93	92
Irongold	25%	D	93	91	89	95	98	93	92
Typic torriorthents	5%	A	81	76	68	89	98	81	80
Arizo	3%	A	81	76	68	89	98	81	80
Purob	3%	D	93	91	89	95	98	93	92
Typic haplocalcids	2%	B	88	84	79	92	98	88	87
Xeric haplocambids	1%	A	81	76	68	89	98	81	80
Aridic calcixerolls	1%	A	81	76	68	89	98	81	80
Total	**100%**		**92**	**90**	**87**	**95**	**98**	**92**	**91**

1-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* Residential (Apartments / Condos)

2-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* Residential (7,000 sq ft lots)

3-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
* Open spaces in poor condition (grass cover < 50%)

4-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
* Urban Districts (Commercial / Business & Residential with average lot size <6000 sqft)

5-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
*Impervious (Paved Streets)

6-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
*Urban Districts (Industrial)

7-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
*Residential (Townhomes)

INCLUDES REFERENCED BASINS
UTILIZED BY ADJACENT STUDIES

Curve Number calculations for basins										
Basin Name	Type	Soil Percentage	1	2	3	4	5	6	7	CN Value
A	156	100%				100%				95.0
B	156	100%				100%				95.0
C	156	74%				100%				95.0
	731	26%				100%				
D	156	100%				100%				95.0
DC-1	731	100%						100%		92.0
E	156	100%				100%				95.0
ES-1	156	48%				100%				95.0
	731	52%				100%				
F	152	79%				100%				95.0
	156	21%				100%				
G	152	84%	100%							93.0
	156	16%	100%							
H	156	5%				100%				95.0
	731	95%				100%				
HS-1A	155	6%				100%				95.0
	502	94%				100%				
HS-1B	155	93%				100%				94.8
	502	7%				100%				
I	156	2%				100%				95.0
	731	98%				100%				
J	731	100%				100%				95.0
K	156	3%				100%				95.0
	731	97%				100%				
L	156	80%				100%				95.0
	731	20%				100%				
M	156	100%				100%				95.0
N	152	5%				100%				95.0
	156	95%				100%				
O	155	1%				100%				81.3
	156	32%				100%				
	502	67%				100%				
P	156	40%				100%				93.2
	502	60%				100%				
COS-1	156	100%			100%					88.0
COS-2	156	100%			100%					88.0
COS-3	152	9%			100%					88.1
	156	91%			100%					
COS-4	156	100%			100%					88.0
	731	0%			100%					
CP-1	156	94%			100%					87.1
	731	5%			100%					
NP-1	152	37%			100%					88.4
	156	63%			100%					
FOX1	156	75%					100%			98.0
	731	25%					100%			
FOX2	156	100%					100%			98.0
FOX3	156	100%					100%			98.0
FOX4	152	67%					100%			98.0
	156	33%					100%			
FOX5A	156	100%					100%			98.0
FOX5B	156	100%					100%			98.0
LM	155	12%					100%			98.0
	156	58%								
	502	30%								
RES3	156	100%					100%			98.0
RES4	156	90%					100%			98.0
	731	10%					100%			
SKY0	156	100%					100%			98.0
SKY1	156	22%					100%			98.0
	731	78%					100%			
SKY2	152	43%					100%			98.0
	156	55%					100%			
	731	2%					100%			
STAA	152	72%					100%			98.0
	156	28%					100%			
STAB	731	100%					100%			98.0
STA1	156	82%					100%			98.0
	731	18%					100%			
STA2	156	100%					100%			98.0
STBE	156	72%					100%			98.0
	731	28%					100%			

STL1	156	80%					100%			**98.0**
	731	20%					100%			
STL2	156	100%					100%			**98.0**
STM	731	17%					100%			**98.0**
	156	83%					100%			
STN	155	68%					100%			**98.0**
	502	32%					100%			
STO	156	97%					100%			**98.0**
	502	3%					100%			
STO1	155	25%					100%			**98.0**
	502	75%					100%			
STO2	155	45%					100%			**98.0**
	502	55%					100%			
STP	156	35%					100%			**98.0**
	502	65%					100%			
STQ	155	66%					100%			**98.0**
	502	34%					100%			
STQ1	155	33%					100%			**98.0**
	502	67%					100%			
STQ2	502	100%					100%			**98.0**
STQ3	156	87%					100%			**98.0**
	502	13%					100%			
SUMM	156	100%					100%			**98.0**
V30-A	731	100%				100%				**95.0**
V30-B	731	40%				100%				**95.0**
	156	60%				100%				
V30-E	156	100%				100%				**95.0**
V27-G	155	99%				100%				**95.0**
	502	1%				100%				
V27-H	155	58%							100%	**89.5**
	502	42%							100%	
V27-I	155	16%							100%	**87.0**
	502	84%							100%	
V27-K	155	13%				100%				**93.0**
	156	20%				100%				
	502	67%				100%				

INCLUDES REFERENCED BASINS
UTILIZED BY ADJACENT STUDIES

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Summerlin West Village 25

W.O. # 7919 **CALCULATED BY:** AH

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:		Urbanized	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
DEVELOPED CONDITION								
A	1409	3502	3452	0.036	20.2	3.8	30.6	5.8
B	1311	3499	3452	0.036	20.2	3.8	30.6	5.8
C	1465	3537	3497	0.027	20.2	3.3	30.6	5.1
COS-1	1898	3564	3550	0.008	20.2	1.8	30.6	2.7
COS-2	1036	3507	3496	0.010	20.2	2.1	30.6	3.1
COS-3	390	3453	3422	0.079	20.2	5.7	30.6	8.6
COS-4	1205	3538	3451	0.072	20.2	5.4	30.6	8.2
CP-1	2646	3737	3440	0.112	20.2	6.8	30.6	10.3
D	1417	3562	3497	0.045	20.2	4.3	30.6	6.5
DC-1	917	3680	3638	0.045	20.2	4.3	30.6	6.5
E	1250	3447	3406	0.033	20.2	3.7	30.6	5.5
ES-1	1032	3623	3545	0.075	20.2	5.5	30.6	8.4
F	1030	3538	3455	0.081	20.2	5.7	30.6	8.7
G	879	3491	3422	0.078	20.2	5.7	30.6	8.6
H	999	3602	3564	0.038	20.2	3.9	30.6	6.0
HS-1A	1494	3643	3531	0.075	20.2	5.5	30.6	8.4
HS-1B	1541	3648	3523	0.081	20.2	5.8	30.6	8.7
I	1122	3637	3593	0.039	20.2	4.0	30.6	6.0
J	1097	3740	3680	0.055	20.2	4.7	30.6	7.2
K	1721	3729	3618	0.064	20.2	5.1	30.6	7.7
L	846	3661	3604	0.067	20.2	5.2	30.6	7.9
M	743	3601	3530	0.095	20.2	6.2	30.6	9.4
N	877	3550	3505	0.052	20.2	4.6	30.6	7.0
NP-1	442	3569	3540	0.066	20.2	5.2	30.6	7.9
O	1301	3696	3610	0.066	20.2	5.2	30.6	7.8
P	656	3616	3562	0.083	20.2	5.8	30.6	8.8
FOX1	2115	3711	3599	0.053	20.2	4.6	30.6	7.0
FOX2	641	3589	3546	0.067	20.2	5.2	30.6	7.9
FOX3	907	3544	3504	0.044	20.2	4.2	30.6	6.4
FOX4	1230	3502	3452	0.041	20.2	4.1	30.6	6.2
FOX5A	1182	n/a	n/a	0.005	20.2	1.4	30.6	2.2
FOX5B	1004	3451	3444	0.007	20.2	1.7	30.6	2.6
LM	1577	3741	3655	0.055	20.2	4.7	30.6	7.1
RES3	978	3571	3528	0.045	20.2	4.3	30.6	6.5
RES4	909	3603	3548	0.060	20.2	5.0	30.6	7.5
SKY0	1325	3565	3559	0.005	20.2	1.4	30.6	2.1
SKY1	1241	3565	3544	0.017	20.2	2.6	30.6	4.0
SKY2	1114	3543	3500	0.038	20.2	4.0	30.6	6.0
STAA	314	3555	3538	0.052	20.2	4.6	30.6	7.0
STAB	722	3634	3631	0.004	20.2	1.3	30.6	2.0
STA1	1455	3537	3456	0.056	20.2	4.8	30.6	7.2

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Summerlin West Village 25

W.O. # 7919 **CALCULATED BY:** AH

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:		Urbanized	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
STA2	1555	3450	3360	0.058	20.2	4.9	30.6	7.4
STBE	1169	3635	3566	0.059	20.2	4.9	30.6	7.4
STL1	1750	3635	3606	0.017	20.2	2.6	30.6	3.9
STL2	780	3606	3597	0.012	20.2	2.2	30.6	3.3
STM	2493	3711	3568	0.057	20.2	4.8	30.6	7.3
STN	2716	3551	3514	0.014	20.2	2.4	30.6	3.6
STO	2302	3701	3557	0.062	20.2	5.0	30.6	7.6
STO1	667	3722	3706	0.024	20.2	3.1	30.6	4.7
STO2	408	3722	3703	0.047	20.2	4.4	30.6	6.6
STP	995	3635	3603	0.032	20.2	3.6	30.6	5.5
STQ	2010	3798	3650	0.074	20.2	5.5	30.6	8.3
STQ1	804	3648	3603	0.056	20.2	4.8	30.6	7.3
STQ2	691	3599	3563	0.052	20.2	4.6	30.6	7.0
STQ3	1530	3555	3465	0.059	20.2	4.9	30.6	7.4
SUMM	753	3492	3448	0.058	20.2	4.9	30.6	7.4
V30-A	834	3715	3665	0.060	20.2	5.0	30.6	7.5
V30-B	876	3629	3594	0.040	20.2	4.1	30.6	6.1
V30-E	472	3594	3565	0.061	20.2	5.0	30.6	7.6
V27-G	1390	3769	3715	0.039	20.2	4.0	30.6	6.0
V27-H	622	3719	3661	0.093	20.2	6.2	30.6	9.3
V27-I	947	3782	3707	0.079	20.2	5.7	30.6	8.6
V27-K	655	3756	3710	0.070	20.2	5.4	30.6	8.1

INCLUDES REFERENCED BASINS
UTILIZED BY ADJACENT STUDIES

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 25

W.O. # 7919 **CALCULATED BY:** JYA/ RBR

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance

Existing:		Developed	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132 C_n - 0.39 \qquad T_c = T_i + T_t$$

SUB-BASIN					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
DEVELOPED CONDITION																	
A	95.0	0.864	21.35	0.0334	100	1.0	4.25	1409	3.6	3.8	5.8	4.81	1509	18.38	9.06	0.091	
B	95.0	0.864	19.86	0.0310	100	1.0	4.25	1311	3.6	3.8	5.8	4.51	1411	17.84	8.76	0.088	
C	95.0	0.864	26.54	0.0415	100	1.0	4.25	1465	2.7	3.3	5.1	5.68	1565	18.69	9.93	0.099	
COS-1	88.0	0.772	3.48	0.0054	100	1.0	5.91	1898	0.8	1.8	2.7	13.49	1998	21.10	19.40	0.194	
COS-2	88.0	0.772	1.72	0.0027	100	1.0	5.91	1036	1.0	2.1	3.1	6.94	1136	16.31	12.85	0.128	
COS-3	88.1	0.773	2.40	0.0038	100	1.0	5.89	390	7.9	5.7	8.6	1.14	490	12.72	7.03	0.070	
COS-4	88.0	0.772	5.04	0.0079	100	1.0	5.91	1205	7.2	5.4	8.2	2.96	1305	17.25	8.88	0.089	
CP-1	87.1	0.759	93.32	0.1458	100	1.0	6.13	2646	11.2	6.8	10.3	4.72	2746	25.26	10.85	0.109	
D	95.0	0.864	27.15	0.0424	100	1.0	4.25	1417	4.5	4.3	6.5	4.28	1517	18.43	8.53	0.085	
DC-1	92.0	0.824	9.42	0.0147	100	1.0	4.96	917	4.5	4.3	6.5	3.00	1017	15.65	7.96	0.080	
E	95.0	0.864	17.14	0.0268	100	1.0	4.25	1250	3.3	3.7	5.5	4.53	1350	17.50	8.78	0.088	
ES-1	95.0	0.864	10.20	0.0159	100	1.0	4.25	1032	7.5	5.5	8.4	2.57	1132	16.29	6.81	0.068	
F	95.0	0.864	10.44	0.0163	100	1.0	4.25	1030	8.1	5.7	8.7	2.47	1130	16.28	6.72	0.067	
G	93.0	0.838	11.44	0.0179	100	1.0	4.72	879	7.8	5.7	8.6	2.21	979	15.44	6.93	0.069	
H	95.0	0.864	12.11	0.0189	100	1.0	4.25	999	3.8	3.9	6.0	3.51	1099	16.11	7.76	0.078	
HS-1A	95.0	0.864	11.70	0.0183	100	1.0	4.25	1494	7.5	5.8	8.7	3.35	1594	18.86	7.60	0.076	
HS-1B	94.8	0.861	49.79	0.0778	100	1.0	4.30	1541	8.1	5.8	8.7	3.44	1641	19.12	7.74	0.077	
I	95.0	0.864	13.23	0.0207	100	1.0	4.25	1122	3.9	4.0	6.0	3.82	1222	16.79	8.07	0.081	
J	95.0	0.864	16.90	0.0264	100	1.0	4.25	1097	5.5	4.7	7.2	3.15	1197	16.65	7.40	0.074	
K	95.0	0.864	25.71	0.0402	100	1.0	4.25	1721	6.4	5.1	7.7	4.26	1821	20.12	8.51	0.085	
L	95.0	0.864	16.19	0.0253	100	1.0	4.25	846	6.7	5.2	7.9	2.33	946	15.25	6.58	0.066	
M	95.0	0.864	11.09	0.0173	100	1.0	4.25	743	9.5	6.2	9.4	1.77	843	14.69	6.01	0.060	
N	95.0	0.864	9.91	0.0155	100	1.0	4.25	877	5.2	4.6	7.0	2.72	977	15.43	6.97	0.070	
NP-1	88.4	0.776	2.70	0.0042	100	1.0	5.82	442	6.6	5.2	7.9	1.42	542	13.01	7.24	0.072	
O	81.3	0.683	19.18	0.0300	100	1.0	7.50	1301	6.6	5.2	7.8	3.31	1401	17.79	10.81	0.108	
P	93.2	0.840	10.31	0.0161	100	1.0	4.67	656	8.3	5.8	8.8	1.73	756	14.20	6.40	0.064	
FOX1	98.0	0.904	2.91	0.0045	26	2.0	1.44	2115	5.3	4.6	7.0	5.62	2141	21.90	7.06	0.071	
FOX2	98.0	0.904	1.67	0.0026	27	2.0	1.45	641	6.7	5.2	7.9	1.89	667	13.71	3.35	0.033	Use Min TLAG = 0.050 per HCDDM
FOX3	98.0	0.904	1.51	0.0024	36	2.0	1.69	907	4.4	4.2	6.4	3.03	943	15.24	4.72	0.047	Use Min TLAG = 0.050 per HCDDM
FOX4	98.0	0.904	3.20	0.0050	60	2.0	2.17	1230	4.1	4.1	6.2	4.02	1290	17.17	6.19	0.062	
FOX5A	98.0	0.904	3.15	0.0049	60	2.0	2.17	1182	0.5	1.4	2.2	11.09	1242	16.90	13.26	0.133	
FOX5B	98.0	0.904	3.19	0.0050	60	2.0	2.17	1004	0.7	1.7	2.6	8.22	1064	15.91	10.39	0.104	
LM	98.0	0.904	4.65	0.0073	30	2.0	1.54	1577	5.5	4.7	7.1	4.28	1607	18.93	5.82	0.058	
RES3	98.0	0.904	1.97	0.0031	44	2.0	1.87	978	4.5	4.3	6.5	3.19	1022	15.68	5.05	0.051	Use Min TLAG = 0.050 per HCDDM
RES4	98.0	0.904	1.60	0.0025	33	2.0	1.62	909	6.0	5.0	7.5	2.59	942	15.23	4.20	0.042	
SKY0	98.0	0.904	4.15	0.0065	60	2.0	2.17	1325	0.5	1.4	2.1	12.81	1385	17.69	14.98	0.150	
SKY1	98.0	0.904	3.91	0.0061	61	2.0	2.18	1241	1.7	2.6	4.0	6.32	1301	17.23	8.50	0.085	

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 25

W.O. # 7919 **CALCULATED BY:** JYA/ RBR

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance

Existing:		Developed	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39 \qquad T_c = T_i + T_t$$

SUB-BASIN					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
SKY2	98.0	0.904	3.78	0.0059	65	2.0	2.27	1114	3.8	4.0	6.0	3.81	1179	16.55	6.07	0.061	Use Min TLAG = 0.050 per HCDDM
STAA	98.0	0.904	0.44	0.0007	32	2.0	1.59	314	5.2	4.6	7.0	1.13	347	11.93	2.73	0.027	
STAB	98.0	0.904	0.80	0.0013	24	2.0	1.37	722	0.4	1.3	2.0	8.28	746	14.14	9.65	0.097	
STA1	98.0	0.904	2.29	0.0036	32	2.0	1.59	1455	5.6	4.8	7.2	3.95	1487	18.26	5.54	0.055	
STA2	98.0	0.904	2.84	0.0044	35	2.0	1.67	1555	5.8	4.9	7.4	4.10	1590	18.84	5.77	0.058	
STBE	98.0	0.904	1.67	0.0026	27	2.0	1.46	1169	5.9	4.9	7.4	3.20	1196	16.64	4.66	0.047	
STL1	98.0	0.904	5.60	0.0088	62	2.0	2.22	1750	1.7	2.6	3.9	8.49	1812	20.07	10.71	0.107	
STL2	98.0	0.904	2.26	0.0035	62	2.0	2.21	780	1.2	2.2	3.3	5.26	842	14.68	7.47	0.075	
STM	98.0	0.904	4.76	0.0074	38	2.0	1.74	2493	5.7	4.8	7.3	6.26	2531	24.06	7.99	0.080	
STN	98.0	0.904	7.67	0.0120	57	2.0	2.13	2716	1.4	2.4	3.6	13.83	2773	25.41	15.95	0.160	
STO	98.0	0.904	4.10	0.0064	36	2.0	1.67	2302	6.2	5.0	7.6	5.58	2338	22.99	7.26	0.073	
STO1	98.0	0.904	1.24	0.0019	20	2.0	1.25	995	3.2	3.6	5.5	3.81	1015	15.64	5.06	0.051	
STO2	98.0	0.904	0.76	0.0012	20	2.0	1.25	2010	7.4	5.5	8.3	4.55	2030	21.28	5.81	0.058	
STP	98.0	0.904	2.05	0.0032	37	2.0	1.72	995	3.2	3.6	5.5	3.81	1033	15.74	5.52	0.055	Use Min TLAG = 0.050 per HCDDM
STQ	98.0	0.904	4.13	0.0065	20	2.0	1.25	2010	7.4	5.5	8.3	4.55	2030	21.28	5.81	0.058	Use Min TLAG = 0.050 per HCDDM
STQ1	98.0	0.904	2.49	0.0039	61	2.0	2.19	804	5.6	4.8	7.3	2.44	865	14.81	4.63	0.046	Use Min TLAG = 0.050 per HCDDM
STQ2	98.0	0.904	2.11	0.0033	65	2.0	2.27	691	5.2	4.6	7.0	2.26	757	14.20	4.53	0.045	
STQ3	98.0	0.904	4.22	0.0066	60	2.0	2.18	1530	5.9	4.9	7.4	4.02	1590	18.83	6.19	0.062	Use Min TLAG = 0.050 per HCDDM
SUMM	98.0	0.904	1.65	0.0026	41	1.0	2.26	753	5.8	4.9	7.4	2.28	793	14.41	4.54	0.045	
V30-A	95.0	0.864	19.05	0.0298	100	1.0	4.25	834	6.0	5.0	7.5	2.42	934	15.19	6.67	0.067	
V30-B	95.0	0.864	20.53	0.0321	100	1.0	4.25	876	4.0	4.1	6.1	3.07	976	15.42	7.32	0.073	
V30-E	95.0	0.864	10.36	0.0162	100	1.0	4.25	472	6.1	5.0	7.6	1.57	572	13.18	5.82	0.058	
V27-G	95.0	0.864	18.08	0.0283	100	1.0	4.26	1390	3.9	4.0	6.0	4.55	1490	18.28	8.81	0.088	
V27-H	89.5	0.791	10.40	0.0163	100	1.0	5.56	622	9.3	6.2	9.3	1.57	722	14.01	7.13	0.071	
V27-I	87.0	0.758	11.97	0.0187	100	1.0	6.16	947	7.9	5.7	8.6	2.33	1047	15.82	8.49	0.085	
V27-K	93.0	0.837	11.98	0.0187	100	1.0	4.73	655	7.0	5.4	8.1	1.88	755	14.19	6.60	0.066	
																	Tc Min (Urban)= 5 min
																	Tc Min (Non Urb)= 10 min

INCLUDES REFERENCED BASINS
UTILIZED BY ADJACENT STUDIES

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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   18DEC19  TIME  17:42:07  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

                                        X     X  XXXXXXX   XXXXX          X
                                        X     X  X        X     X        XX
                                        X     X  X        X              X
                                        XXXXXXX  XXXX     X        XXXXX  X
                                        X     X  X        X              X
                                        X     X  X        X     X        X
                                        X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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


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

                        *DIAGRAM
 *** FREE ***
              1         ID    ULTIMATE CONDITION HYDROLOGIC MODEL
              2         ID    OFFSITE BASINS DRAINING TO STUB AT STREET A
              3         ID    INPUT FILE DATE = JUNE 27, 2018
              4         ID    DESIGN STORM = 100-YEAR 6-HR STORM
              5         ID    STORM DISTRIBUTION = SDN #3
              6         ID    MODELED BY VTN (AH)
              7         ID
              8         ID    ********************************************************
              9         ID    * SUMMERLIN WEST VILLAGE 25                           *
             10         ID    ********************************************************
             11         ID
             12         ID
             13         ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
             14         ID
             15         ID  100-YEAR,  6-HOUR STORM,  SDN3
             16         ID
             17         IT       5       0       0     300
             18         IO       5       0       0
             19         IN       5       0       0
             20         JR    PREC    1.00
                        *
             21         KK       J
             22         KM   ONSITE BASIN
             23         BA  0.0264
             24         PB    3.49
             25         PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
             26         PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
             27         PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
             28         PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
             29         PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
             30         PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
             31         PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
             32         PC   0.998   0.999       1
             33         LS       0    95.0
             34         UD   0.074
                        *
             35         KK     STM
             36         KM   ONSITE BASIN
             37         BA  0.0074
             38         PB    3.46
             39         LS       0    98.0
             40         UD   0.080
                        *
             41         KK      CJ
             42         KM   COMBINE J AND STM
             43         HC       2
                        *
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LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  44          KK    DC-1
  45          KM   ONSITE BASIN
  46          BA  0.0147
  47          PB    3.47
  48          LS       0    92.0
  49          UD   0.080
              *

  50          KK   CDC-1
  51          KM   COMBINE CJ AND DC-1
  52          HC       2
              *

  53          KK       I
  54          KM   ONSITE BASIN
  55          BA  0.0207
  56          PB    3.47
  57          LS       0    95.0
  58          UD   0.081
              *

  59          KK      CI
  60          KM   COMBINE I AND CJ
  61          HC       2
              *

  62          KK    SKY0
  63          KM   ONSITE BASIN
  64          BA  0.0065
  65          PB    3.45
  66          LS       0    98.0
  67          UD   0.150
              *

  68          KK   V30-B
  69          KM   OFFSITE BASIN
  70          BA  0.0321
  71          PB    3.45
  72          LS       0    95.0
  73          UD   0.073
              *

  74          KK   CV30B
  75          KM   COMBINE CI, SKY0, AND V30-B
  76          HC       3
              *

  77          KK   V30-A
  78          BA  0.0298
  79          PB    3.48
  80          LS       0    95.0
  81          UD   0.067
              *
1                                      HEC-1 INPUT                                        PAGE  3

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

  82          KK    STAB
  83          BA  0.0013
  84          PB    3.46
  85          LS       0    98.0
  86          UD   0.097
              *

  87          KK  CV30-A
  88          KM   COMBINE CR AND V30-S
  89          HC       2
              *

  90          KK    STBE
  91          BA  0.0026
  92          PB    3.45
  93          LS       0    98.0
  94          UD   0.050
              *

  95          KK   CSTBE
  96          KM   COMBINE CV30-A, STBE, AND CV30-B
  97          HC       3
              *

  98          KK   V30-E
  99          KM   ONSITE BASIN
 100          BA  0.0162
 101          PB    3.45
 102          LS       0    95.0
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 103          UD   0.058
              *

 104          KK  CV30-E
 105          KM   COMBINE V30-E AND CSTBE
 106          HC       2
              *

 107          KK    SKY1
 108          KM   STREET BASIN
 109          BA  0.0061
 110          PB    3.45
 111          LS       0    98.0
 112          UD   0.085
              *

 113          KK       H
 114          KM   ONSITE BASIN
 115          BA  0.0189
 116          PB    3.45
 117          LS       0    95.0
 118          UD   0.078
              *
1                                        HEC-1 INPUT                                          PAGE  4

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


 119          KK      CH
 120          KM   COMBINE SKY1 AND H
 121          HC       2
              *

 122          KK     RCH
 123          KM   ROUTE CH TO CES-1
 124          RD     670   0.028   0.013       0    CIRC     3.5
              *

 125          KK    ES-1
 126          KM   ONSITE BASIN
 127          BA  0.0159
 128          PB    3.46
 129          LS       0    95.0
 130          UD   0.068
              *

 131          KK   CES-1
 132          KM   COMBINE CH AND ES-1
 133          HC       2
              *

 134          KK  RCES-1
 135          KM   ROUTE CES-1 TO CNP-1
 136          RD     330   0.018   0.013       0    CIRC     3.5
              *

 137          KK    SKY2
 138          KM   STREET BASIN
 139          BA  0.0059
 140          PB    3.44
 141          LS       0    98.0
 142          UD   0.061
              *

 143          KK    NP-1
 144          KM   ONSITE BASIN
 145          BA  0.0042
 146          PB    3.44
 147          LS       0    88.4
 148          UD   0.072
              *

 149          KK   CNP-1
 150          KM   COMBINE CES-1, SKY2, AND NP-1
 151          HC       3
              *
1                                        HEC-1 INPUT                                          PAGE  5

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


 152          KK    STL1
 153          KM   STREET BASIN
 154          BA  0.0088
 155          PB    3.46
 156          LS       0    98.0
 157          UD   0.107
              *

 158          KK       K
 159          KM   ONSITE BASIN
```

```
160          BA  0.0402
161          PB    3.49
162          LS       0    95.0
163          UD   0.085
             *

164          KK      CK
165          KM   COMBINE K AND STL1
166          HC       2
             *

167          KK     RCK
168          KM   ROUTE CK TO CL
169          RD     825   0.032   0.013       0    CIRC     3.5
             *

170          KK       L
171          KM   ONSITE BASIN
172          BA  0.0253
173          PB    3.47
174          LS       0    95.0
175          UD   0.066
             *

176          KK     RCL
177          KM   ROUTE CL TO CRES4
178          RD     650   0.059   0.013       0    CIRC     3.5
             *

179          KK      CL
180          KM   COMBINE CK AND L
181          HC       2
             *

182          KK    RES4
183          KM   STREET BASIN
184          BA  0.0025
185          PB    3.46
186          LS       0    98.0
187          UD   0.050
             *
1                                        HEC-1 INPUT                                          PAGE  6

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

188          KK   CRES4
189          KM   COMBINE CL AND RES4
190          HC       2
             *

191          KK   CRES4
192          KM   ROUTE CRES4 TO CRES3
193          RD     340   0.033   0.013       0    CIRC     3.5
             *

194          KK    RES3
195          KM   STREET BASIN
196          BA  0.0031
197          PB    3.44
198          LS       0    98.0
199          UD   0.051
             *

200          KK       M
201          KM   ONSITE BASIN
202          BA  0.0173
203          PB    3.44
204          LS       0    95.0
205          UD   0.060
             *

206          KK   CRES3
207          KM   COMBINE CRES4, RES3, AND M
208          HC       3
             *

209          KK  RCRES3
210          KM   ROUTE CRES3 TO CSTAA
211          RD     450   0.046   0.013       0    CIRC       4
             *

212          KK    STAA
213          KM   ONSITE BASIN
214          BA  0.0007
215          PB    3.44
216          LS       0    98.0
217          UD   0.050
             *

218          KK   CSTAA
```

```
 219          KM   COMBINE CRES3 AND STAA
 220          HC       2
              *
1                                      HEC-1 INPUT                                      PAGE  7

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


 221          KK  DUMMY1
 222          KM   COMBINE CNP-1 AND CSTAA
 223          HC       2
              *

 224          KK       N
 225          KM   ONSITE BASIN
 226          BA  0.0155
 227          PB    3.44
 228          LS       0    95.0
 229          UD   0.070
              *

 230          KK  DUMMY2
 231          KM   COMBINE DUMMY1, N
 232          HC       2
              *

 233          KK    CP-1
 234          KM   ONSITE BASIN
 235          BA  0.1458
 236          PB    3.45
 237          LS       0    87.1
 238          UD   0.109
              *

 239          KK    STL2
 240          KM   STREET BASIN
 241          BA  0.0035
 242          PB    3.46
 243          LS       0    98.0
 244          UD   0.075
              *

 245          KK    FOX1
 246          KM   STREET BASIN
 247          BA  0.0045
 248          PB    3.47
 249          LS       0    98.0
 250          UD   0.071
              *

 251          KK    FOX2
 252          KM   STREET BASIN
 253          BA  0.0026
 254          PB    3.45
 255          LS       0    98.0
 256          UD   0.050
              *
1                                      HEC-1 INPUT                                      PAGE  8

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


 257          KK    FOX3
 258          KM   STREET BASIN
 259          BA  0.0024
 260          PB    3.42
 261          LS       0    98.0
 262          UD   0.050
              *

 263          KK DUMMY2B
 264          KM   COMBINE DUMMY2, FOX1, FOX2, FOX3
 265          HC       5
              *

 266          KK    SUMM
 267          KM   SUMMERLIN PARKWAY STREET BASIN
 268          BA  0.0026
 269          PB    3.42
 270          LS       0    98.0
 271          UD   0.050
              *

 272          KK       G
 273          KM   ONSITE BASIN
 274          BA  0.0179
 275          PB    3.41
 276          LS       0    93.0
 277          UD   0.069
              *
```

```
 278          KK  DUMMY3
 279          KM   COMBINE DUMMY2, SUMM, AND G
 280          HC       3
              *

 281          KK       D
 282          KM   ONSITE BASIN
 283          BA  0.0424
 284          PB    3.44
 285          LS       0    95.0
 286          UD   0.085
              *

 287          KK   FOX5B
 288          KM   1/2 FOX5 STREET BASIN
 289          BA  0.0050
 290          PB    3.40
 291          LS       0    98.0
 292          UD   0.104
              *
1                                        HEC-1 INPUT                                        PAGE  9

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


 293          KK   COS-1
 294          KM   ONSITE BASIN
 295          BA  0.0054
 296          PB    3.42
 297          LS       0    88.0
 298          UD   0.194
              *

 299          KK  CCOS-1
 300          KM   COMBINE FOX5B AND COS-1
 301          HC       2
              *

 302          KK   FOX5A
 303          KM   1/2 FOX5 STREET BASIN
 304          BA  0.0049
 305          PB    3.41
 306          LS       0    98.0
 307          UD   0.133
              *

 308          KK       A
 309          KM   ONSITE BASIN
 310          BA  0.0334
 311          PB    3.41
 312          LS       0    95.0
 313          UD   0.091
              *

 314          KK   CFOX5
 315          KM   COMBINE FOX5A,CCOS-1, AND A
 316          HC       3
              *

 317          KK DUMMY3B
 318          KM   COMBINE COMBINE CFOX5 AND D
 319          HC       2
              *

 320          KK       C
 321          KM   ONSITE BASIN
 322          BA  0.0415
 323          PB    3.45
 324          LS       0    95.0
 325          UD   0.099
              *

 326          KK    STA1
 327          KM   STREET BASIN
 328          BA  0.0036
 329          PB    3.43
 330          LS       0    98.0
 331          UD   0.055
              *
1                                        HEC-1 INPUT                                        PAGE 10

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


 332          KK      CC
 333          KM   COMBINE STA1, AND C
 334          HC       2
              *

 335          KK   COS-2
 336          KM   ONSITE BASIN
```

```
337          BA  0.0027
338          PB    3.43
339          LS       0    88.0
340          UD   0.128
             *

341          KK  CCOS-2
342          KM   COMBINE CC AND COS-2
343          HC       2
             *

344          KK    FOX4
345          KM   STREET BASIN
346          BA  0.0050
347          PB    3.42
348          LS       0    98.0
349          UD   0.062
             *

350          KK       F
351          KM   ONSITE BASIN
352          BA  0.0163
353          PB    3.44
354          LS       0    95.0
355          UD   0.067
             *

356          KK   COS-4
357          KM   ONSITE BASIN
358          BA  0.0079
359          PB    3.43
360          LS       0    88.0
361          UD   0.089
             *

362          KK  CFOX4A
363          KM   COMBINE F, COS-4, AND FOX4
364          HC       3
             *

365          KK       B
366          KM   ONSITE BASIN
367          BA  0.0310
368          PB    3.42
369          LS       0    95.0
370          UD   0.088
             *
```



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

371          KK  CFOX4B
372          KM   COMBINE CCOS-2, B AND CFOX4A
373          HC       3
             *

374          KK    STA2
375          KM   STREET BASIN
376          BA  0.0044
377          PB    3.39
378          LS       0    98.0
379          UD   0.058
             *

380          KK   CSTA2
381          KM   COMBINE CFOX4B AND STA2
382          HC       2
             *

383          KK   COS-3
384          KM   STREET  BASIN
385          BA  0.0038
386          PB    3.41
387          LS       0    88.1
388          UD   0.070
             *

389          KK       E
390          KM   ONSITE BASIN
391          BA  0.0268
392          PB    3.40
393          LS       0    95.0
394          UD   0.088
             *

395          KK    CSTE
396          KM   COMBINE CSTA2, COS-3 AND E
397          HC       3
             *
```

```
 398          KK   V27-G
 399          BA  0.0283
 400          PB    3.50
 401          LS       0    95.0
 402          UD   0.088
              *

 403          KK   V27-I
 404          BA  0.0187
 405          PB    3.50
 406          LS       0    87.0
 407          UD   0.085
              *
1                                        HEC-1 INPUT                                          PAGE 12

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


 408          KK    STO2
 409          KM   STREET BASIN
 410          BA  0.0012
 411          PB    3.48
 412          LS       0    98.0
 413          UD   0.058
              *

 414          KK     STQ
 415          KM   STREET BASIN
 416          BA  0.0065
 417          PB    3.48
 418          LS       0    98.0
 419          UD   0.058
              *

 420          KK    CSTQ
 421          KM   COMBINE V27-G, V27-I, STO2, AND STQ
 422          HC       4
              *

 423          KK   V27-K
 424          BA  0.0187
 425          PB    3.50
 426          LS       0    93.0
 427          UD   0.066
              *

 428          KK    STO1
 429          BA  0.0019
 430          PB    3.48
 431          LS       0    98.0
 432          UD   0.051
              *

 433          KK   CSTO1
 434          KM   COMBINE V27K AND STO1
 435          HC       2
              *

 436          KK      LM
 437          KM   STREET BASIN
 438          BA  0.0073
 439          PB    3.48
 440          LS       0    98.0
 441          UD   0.058
              *

 442          KK   V27-H
 443          BA  0.0163
 444          PB    3.48
 445          LS       0    89.5
 446          UD   0.071
              *
1                                        HEC-1 INPUT                                          PAGE 13

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


 447          KK  DUMMY4
 448          KM   COMBINE CSTO3, CSTQ, LM, V27-H
 449          HC       4
              *

 450          KK    STQ1
 451          KM   STREET BASIN
 452          BA  0.0039
 453          PB    3.46
 454          LS       0    98.0
 455          UD   0.050
              *

 456          KK       O
```

```
          457          KM   ONSITE BASIN
          458          BA  0.0300
          459          PB    3.48
          460          LS       0    81.3
          461          UD   0.108
                       *

          462          KK     STP
          463          KM   STREET BASIN
          464          BA  0.0032
          465          PB    3.46
          466          LS       0    98.0
          467          UD   0.055
                       *

          468          KK    STQ2
          469          KM   STREET BASIN
          470          BA  0.0033
          471          PB    3.46
          472          LS       0    98.0
          473          UD   0.050
                       *

          474          KK  DUMMY5
          475          KM   COMBINE DUMMY4, STQ1, O, STP, STQ2
          476          HC       5
                       *

          477          KK       P
          478          KM   ONSITE BASIN
          479          BA  0.0161
          480          PB    3.46
          481          LS       0    93.2
          482          UD   0.064
                       *
1                                        HEC-1 INPUT                                        PAGE 14

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

          483          KK     STO
          484          KM   STREET BASIN
          485          BA  0.0064
          486          PB    3.46
          487          LS       0    98.0
          488          UD   0.073
                       *

          489          KK  DUMMY6
          490          KM   COMBINE P, STO, AND DUMMY5
          491          HC       3
                       *

          492          KK    STQ3
          493          KM   STREET BASIN
          494          BA  0.0066
          495          PB    3.44
          496          LS       0    98.0
          497          UD   0.062
                       *

          498          KK     STN
          499          KM   ONSITE BASIN
          500          BA  0.0120
          501          PB    3.44
          502          LS       0    98.0
          503          UD   0.160
                       *

          504          KK   HS-1A
          505          KM   ONSITE BASIN
          506          BA  0.0183
          507          PB    3.44
          508          LS       0    95.0
          509          UD   0.076
                       *

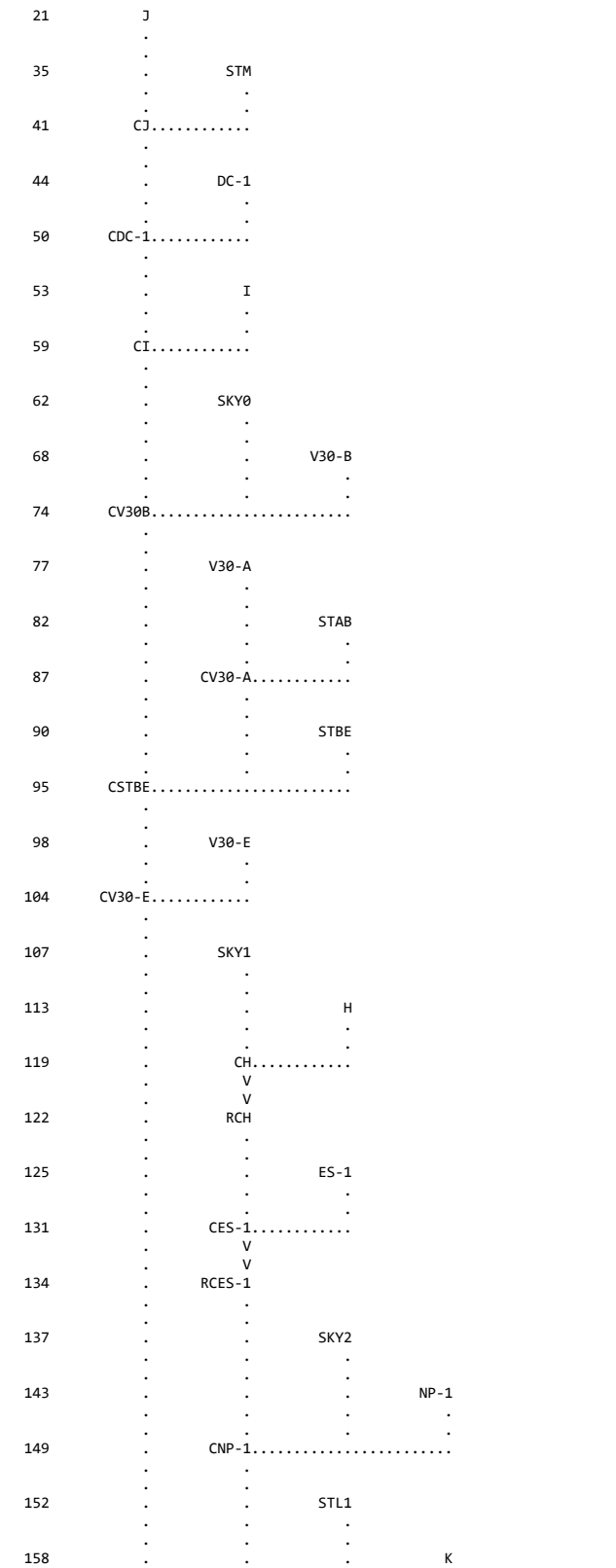
          510          KK   HS-1B
          511          KM   ONSITE BASIN
          512          BA  0.0778
          513          PB    3.44
          514          LS       0    94.8
          515          UD   0.077
                       *

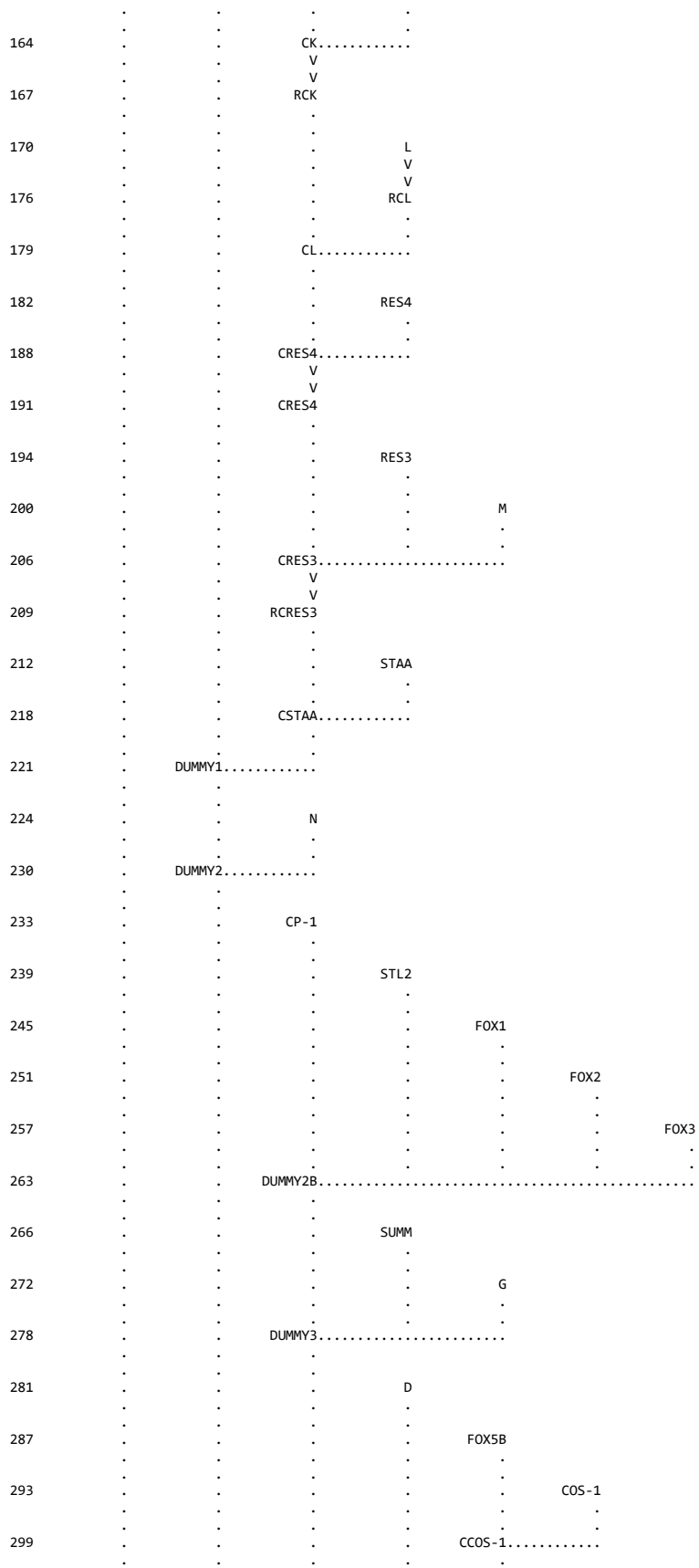
          516          KK    CSTN
          517          KM   COMBINE STN AND HS-1A AND HS-1B
          518          HC       3
                       *
          519          ZZ
1
```

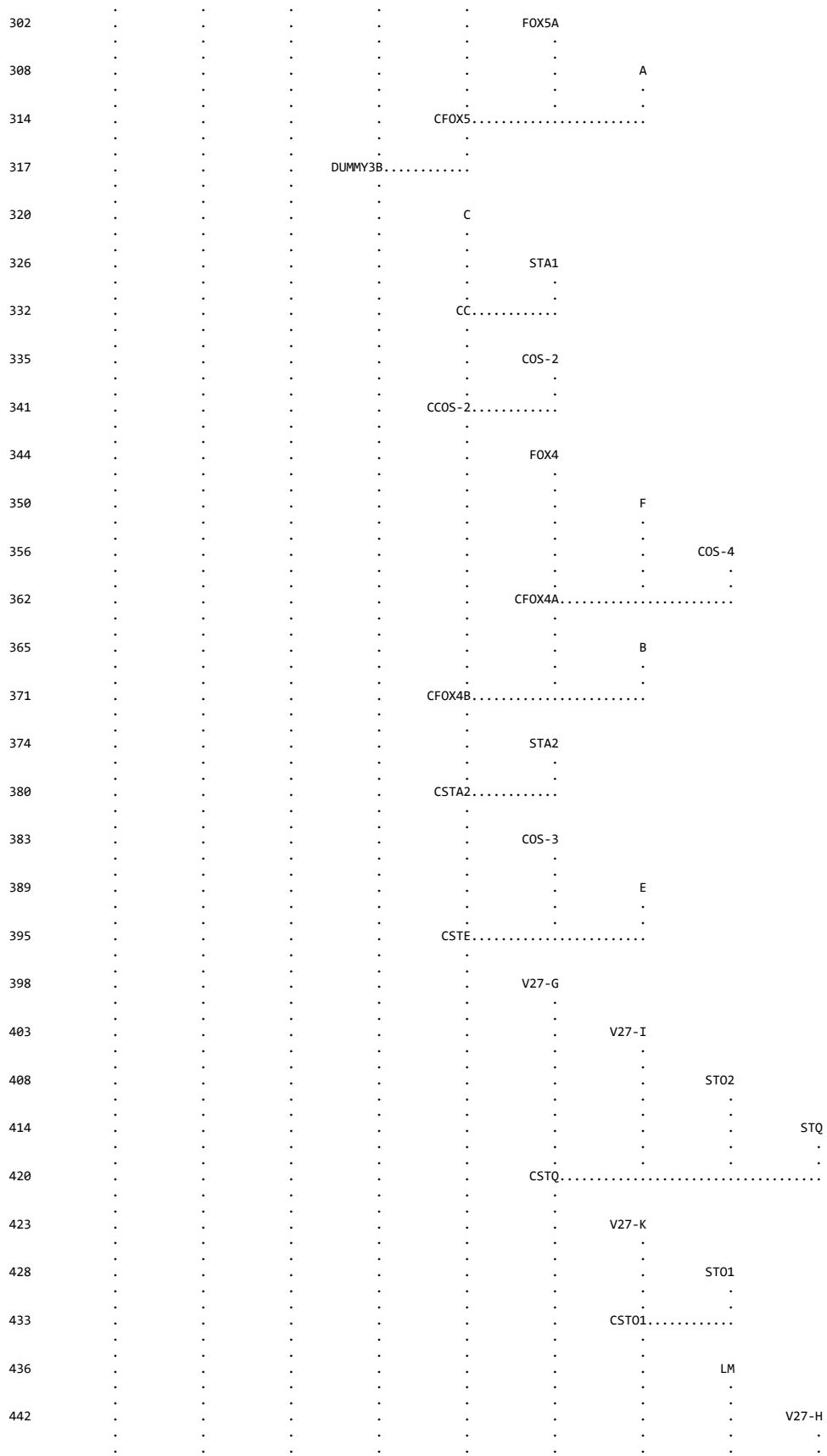
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (.) CONNECTOR (--->) DIVERSION OR PUMP FLOW (<---) RETURN OF DIVERTED OR PUMPED FLOW




164
CK
167
RCK
170
L
176
RCL
179
CL
182
RES4
188
CRES4
191
CRES4
194
RES3
200
M
206
CRES3
209
RCRES3
212
STAA
218
CSTAA
221
DUMMY1
224
N
230
DUMMY2
233
CP-1
239
STL2
245
FOX1
251
FOX2
257
FOX3
263
DUMMY2B
266
SUMM
272
G
278
DUMMY3
281
D
287
FOX5B
293
COS-1
299
CCOS-1


302 FOX5A
308 A
314 CFOX5
317 DUMMY3B
320 C
326 STA1
332 CC
335 COS-2
341 CCOS-2
344 FOX4
350 F
356 COS-4
362 CFOX4A
365 B
371 CFOX4B
374 STA2
380 CSTA2
383 COS-3
389 E
395 CSTE
398 V27-G
403 V27-I
408 STO2
414 STQ
420 CSTQ
423 V27-K
428 STO1
433 CSTO1
436 LM
442 V27-H

```
  447          .          .          .          .          .      DUMMY4.................................
               .          .          .          .          .          .
               .          .          .          .          .          .
  450          .          .          .          .          .          .        STQ1
               .          .          .          .          .          .          .
               .          .          .          .          .          .          .
  456          .          .          .          .          .          .          .          O
               .          .          .          .          .          .          .          .
               .          .          .          .          .          .          .          .
  462          .          .          .          .          .          .          .          .        STP
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
               .          .          .          .          .          .          .          .
               .          .          .          .          .          .          .          .
  468          .          .          .          .          .          .          .          .       STQ2
               .          .          .          .          .          .          .          .          .
               .          .          .          .          .          .          .          .          .
  474          .          .          .          .      DUMMY5.............................................
               .          .          .          .          .
               .          .          .          .          .
  477          .          .          .          .          .          P
               .          .          .          .          .          .
               .          .          .          .          .          .
  483          .          .          .          .          .          .        STO
               .          .          .          .          .          .          .
               .          .          .          .          .          .          .
  489          .          .          .          .      DUMMY6.......................
               .          .          .          .          .
               .          .          .          .          .
  492          .          .          .          .          .       STQ3
               .          .          .          .          .          .
               .          .          .          .          .          .
  498          .          .          .          .          .          .        STN
               .          .          .          .          .          .          .
               .          .          .          .          .          .          .
  504          .          .          .          .          .          .          .      HS-1A
               .          .          .          .          .          .          .          .
               .          .          .          .          .          .          .          .
  510          .          .          .          .          .          .          .          .      HS-1B
               .          .          .          .          .          .          .          .          .
               .          .          .          .          .          .          .          .          .
  516          .          .          .          .          .          .       CSTN.......................

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION

        1 ERRORS IN STREAM SYSTEM
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   18DEC19  TIME  17:42:07   *                                *          (916) 756-1104           *
 *                                   *                                    *                                   *
 *************************************                                    *************************************
```

ULTIMATE CONDITION HYDROLOGIC MODEL
OFFSITE BASINS DRAINING TO STUB AT STREET A
INPUT FILE DATE = JUNE 27, 2018
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (AH)

****
* SUMMERLIN WEST VILLAGE 25 *
****

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

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

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

                  COMPUTATION INTERVAL     .08 HOURS
```

TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00
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
					1.00
HYDROGRAPH AT					
+	J	.03	1	FLOW	69.
				TIME	3.50
HYDROGRAPH AT					
+	STM	.01	1	FLOW	20.
				TIME	3.50
2 COMBINED AT					
+	CJ	.03	1	FLOW	89.
				TIME	3.50
HYDROGRAPH AT					
+	DC-1	.01	1	FLOW	35.
				TIME	3.50
2 COMBINED AT					
+	CDC-1	.05	1	FLOW	124.
				TIME	3.50
HYDROGRAPH AT					
+	I	.02	1	FLOW	53.
				TIME	3.50
2 COMBINED AT					
+	CI	.07	1	FLOW	176.
				TIME	3.50
HYDROGRAPH AT					
+	SKY0	.01	1	FLOW	15.
				TIME	3.58
HYDROGRAPH AT					
+	V30-B	.03	1	FLOW	83.
				TIME	3.50
3 COMBINED AT					
+	CV30B	.11	1	FLOW	273.
				TIME	3.50
HYDROGRAPH AT					
+	V30-A	.03	1	FLOW	80.
				TIME	3.50
HYDROGRAPH AT					
+	STAB	.00	1	FLOW	3.
				TIME	3.50
2 COMBINED AT					
+	CV30-A	.03	1	FLOW	83.
				TIME	3.50
HYDROGRAPH AT					
+	STBE	.00	1	FLOW	8.
				TIME	3.50
3 COMBINED AT					
+	CSTBE	.14	1	FLOW	364.
				TIME	3.50
HYDROGRAPH AT					
+	V30-E	.02	1	FLOW	44.
				TIME	3.50

```
  2 COMBINED AT
+                 CV30-E       .16     1   FLOW         408.
                                              TIME        3.50

 HYDROGRAPH AT
+                   SKY1       .01     1   FLOW          16.
                                              TIME        3.50

 HYDROGRAPH AT
+                      H       .02     1   FLOW          48.
                                              TIME        3.50

  2 COMBINED AT
+                     CH       .02     1   FLOW          64.
                                              TIME        3.50

 ROUTED TO
+                    RCH       .02     1   FLOW          63.
                                              TIME        3.50

 HYDROGRAPH AT
+                   ES-1       .02     1   FLOW          42.
                                              TIME        3.50

  2 COMBINED AT
+                  CES-1       .04     1   FLOW         105.
                                              TIME        3.50

 ROUTED TO
+                 RCES-1       .04     1   FLOW         103.
                                              TIME        3.50

 HYDROGRAPH AT
+                   SKY2       .01     1   FLOW          17.
                                              TIME        3.50

 HYDROGRAPH AT
+                   NP-1       .00     1   FLOW           9.
                                              TIME        3.50

  3 COMBINED AT
+                  CNP-1       .05     1   FLOW         129.
                                              TIME        3.50

 HYDROGRAPH AT
+                   STL1       .01     1   FLOW          21.
                                              TIME        3.50

 HYDROGRAPH AT
+                      K       .04     1   FLOW         101.
                                              TIME        3.50

  2 COMBINED AT
+                     CK       .05     1   FLOW         123.
                                              TIME        3.50

 ROUTED TO
+                    RCK       .05     1   FLOW         120.
                                              TIME        3.50

 HYDROGRAPH AT
+                      L       .03     1   FLOW          68.
                                              TIME        3.50

 ROUTED TO
+                    RCL       .03     1   FLOW          67.
                                              TIME        3.50

  2 COMBINED AT
+                     CL       .07     1   FLOW         187.
                                              TIME        3.50

 HYDROGRAPH AT
+                   RES4       .00     1   FLOW           7.
                                              TIME        3.50

  2 COMBINED AT
+                  CRES4       .08     1   FLOW         194.
                                              TIME        3.50

 ROUTED TO
+                  CRES4       .08     1   FLOW         192.
                                              TIME        3.50

 HYDROGRAPH AT
+                   RES3       .00     1   FLOW           9.
                                              TIME        3.50

 HYDROGRAPH AT
+                      M       .02     1   FLOW          47.
```

```
                                        TIME        3.50

  3 COMBINED AT
+                 CRES3       .10    1  FLOW        248.
                                        TIME        3.50

 ROUTED TO
+                 RCRES3      .10    1  FLOW        246.
                                        TIME        3.50

 HYDROGRAPH AT
+                  STAA       .00    1  FLOW          2.
                                        TIME        3.50

  2 COMBINED AT
+                 CSTAA       .10    1  FLOW        248.
                                        TIME        3.50

  2 COMBINED AT
+                 DUMMY1      .15    1  FLOW        377.
                                        TIME        3.50

 HYDROGRAPH AT
+                     N       .02    1  FLOW         40.
                                        TIME        3.50

  2 COMBINED AT
+                 DUMMY2      .16    1  FLOW        418.
                                        TIME        3.50

 HYDROGRAPH AT
+                  CP-1       .15    1  FLOW        270.
                                        TIME        3.50

 HYDROGRAPH AT
+                  STL2       .00    1  FLOW          9.
                                        TIME        3.50

 HYDROGRAPH AT
+                  FOX1       .00    1  FLOW         12.
                                        TIME        3.50

 HYDROGRAPH AT
+                  FOX2       .00    1  FLOW          8.
                                        TIME        3.50

 HYDROGRAPH AT
+                  FOX3       .00    1  FLOW          7.
                                        TIME        3.50

  5 COMBINED AT
+                DUMMY2B      .16    1  FLOW        306.
                                        TIME        3.50

 HYDROGRAPH AT
+                  SUMM       .00    1  FLOW          7.
                                        TIME        3.50

 HYDROGRAPH AT
+                     G       .02    1  FLOW         45.
                                        TIME        3.50

  3 COMBINED AT
+                 DUMMY3      .18    1  FLOW        358.
                                        TIME        3.50

 HYDROGRAPH AT
+                     D       .04    1  FLOW        105.
                                        TIME        3.50

 HYDROGRAPH AT
+                  FOX5B      .00    1  FLOW         12.
                                        TIME        3.50

 HYDROGRAPH AT
+                  COS-1      .01    1  FLOW          9.
                                        TIME        3.58

  2 COMBINED AT
+                 CCOS-1      .01    1  FLOW         20.
                                        TIME        3.58

 HYDROGRAPH AT
+                  FOX5A      .00    1  FLOW         11.
                                        TIME        3.58

 HYDROGRAPH AT
+                     A       .03    1  FLOW         81.
                                        TIME        3.50

  3 COMBINED AT
```

REFERENCED BASINS

```
+                 CFOX5       .05     1   FLOW         111.
                                          TIME         3.50

  2 COMBINED AT
+               DUMMY3B       .09     1   FLOW         216.
                                          TIME         3.50

 HYDROGRAPH AT
+                    C        .04     1   FLOW          99.
                                          TIME         3.50

 HYDROGRAPH AT
+                  STA1       .00     1   FLOW          10.
                                          TIME         3.50

  2 COMBINED AT
+                   CC        .05     1   FLOW         109.
                                          TIME         3.50

 HYDROGRAPH AT
+                 COS-2       .00     1   FLOW           5.
                                          TIME         3.58

  2 COMBINED AT
+                CCOS-2       .05     1   FLOW         114.
                                          TIME         3.50

 HYDROGRAPH AT
+                  FOX4       .00     1   FLOW          14.
                                          TIME         3.50

 HYDROGRAPH AT
+                    F        .02     1   FLOW          43.
                                          TIME         3.50

 HYDROGRAPH AT
+                 COS-4       .01     1   FLOW          16.
                                          TIME         3.50

  3 COMBINED AT
+                CFOX4A       .03     1   FLOW          73.
                                          TIME         3.50

 HYDROGRAPH AT
+                    B        .03     1   FLOW          76.
                                          TIME         3.50

  3 COMBINED AT
+                CFOX4B       .11     1   FLOW         263.
                                          TIME         3.50

 HYDROGRAPH AT
+                  STA2       .00     1   FLOW          12.
                                          TIME         3.50

  2 COMBINED AT
+                 CSTA2       .11     1   FLOW         275.
                                          TIME         3.50

 HYDROGRAPH AT
+                 COS-3       .00     1   FLOW           8.
                                          TIME         3.50

 HYDROGRAPH AT
+                    E        .03     1   FLOW          65.
                                          TIME         3.50

  3 COMBINED AT
+                  CSTE       .14     1   FLOW         348.
                                          TIME         3.50

 HYDROGRAPH AT
+                 V27-G       .03     1   FLOW          71.
                                          TIME         3.50

 HYDROGRAPH AT
+                 V27-I       .02     1   FLOW          39.
                                          TIME         3.50

 HYDROGRAPH AT
+                  STO2       .00     1   FLOW           3.
                                          TIME         3.50

 HYDROGRAPH AT
+                   STQ       .01     1   FLOW          19.
                                          TIME         3.50

  4 COMBINED AT
+                  CSTQ       .05     1   FLOW         132.
                                          TIME         3.50
```

```
 HYDROGRAPH AT
+                  V27-K       .02     1   FLOW          49.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STO1       .00     1   FLOW           6.
                                           TIME         3.50

  2 COMBINED AT
+                  CSTO1       .02     1   FLOW          54.
                                           TIME         3.50

 HYDROGRAPH AT
+                     LM       .01     1   FLOW          21.
                                           TIME         3.50

 HYDROGRAPH AT
+                  V27-H       .02     1   FLOW          38.
                                           TIME         3.50

  4 COMBINED AT
+                 DUMMY4       .10     1   FLOW         245.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STQ1       .00     1   FLOW          11.
                                           TIME         3.50

 HYDROGRAPH AT
+                      O       .03     1   FLOW          46.
                                           TIME         3.58

 HYDROGRAPH AT
+                    STP       .00     1   FLOW           9.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STQ2       .00     1   FLOW          10.
                                           TIME         3.50

  5 COMBINED AT
+                 DUMMY5       .14     1   FLOW         320.
                                           TIME         3.50

 HYDROGRAPH AT
+                      P       .02     1   FLOW          42.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STO       .01     1   FLOW          17.
                                           TIME         3.50

  3 COMBINED AT
+                 DUMMY6       .16     1   FLOW         379.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STQ3       .01     1   FLOW          18.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STN       .01     1   FLOW          27.
                                           TIME         3.58

 HYDROGRAPH AT
+                  HS-1A       .02     1   FLOW          47.
                                           TIME         3.50

 HYDROGRAPH AT
+                  HS-1B       .08     1   FLOW         198.
                                           TIME         3.50

  3 COMBINED AT
+                   CSTN       .11     1   FLOW         269.
                                           TIME         3.50
1
                                       SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                           (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                 INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
               RCH  MANE          .58     63.39    210.36      2.97      5.00     62.71    210.00        2.97


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3960E+01 EXCESS= .0000E+00 OUTFLOW= .3960E+01 BASIN STORAGE= .5449E-04 PERCENT ERROR=    .0
```

```
          FOR PLAN = 1  RATIO=  .00
            RCES-1  MANE          .31    103.96    210.14      2.94      5.00    103.50    210.00        2.95


CONTINUITY SUMMARY (AC-FT) - INFLOW= .6424E+01 EXCESS= .0000E+00 OUTFLOW= .6424E+01 BASIN STORAGE= .3174E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCK  MANE          .60    121.94    210.79      2.98      5.00    120.24    210.00        2.99


CONTINUITY SUMMARY (AC-FT) - INFLOW= .7795E+01 EXCESS= .0000E+00 OUTFLOW= .7795E+01 BASIN STORAGE= .6238E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCL  MANE          .42     67.10    210.47      2.91      5.00     66.55    210.00        2.91


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3926E+01 EXCESS= .0000E+00 OUTFLOW= .3926E+01 BASIN STORAGE= .3668E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             CRES4  MANE          .22    193.27    210.30      2.97      5.00    192.47    210.00        2.97

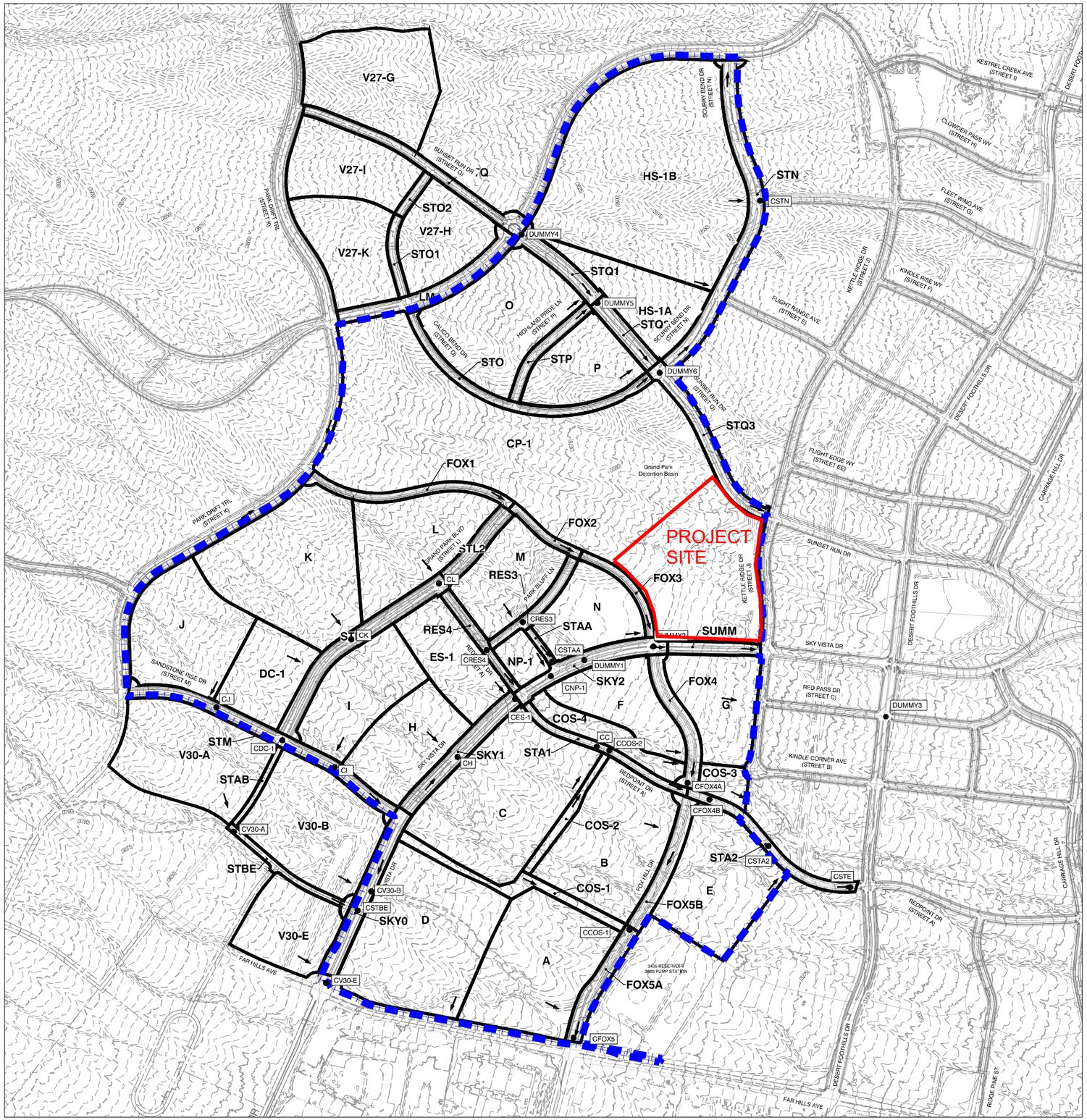

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1216E+02 EXCESS= .0000E+00 OUTFLOW= .1216E+02 BASIN STORAGE= .2537E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCRES3  MANE          .24    246.91    210.13      2.96      5.00    245.91    210.00        2.96


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1536E+02 EXCESS= .0000E+00 OUTFLOW= .1536E+02 BASIN STORAGE= .2944E-04 PERCENT ERROR=    .0



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



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

REVISION | BY | DATE | REV

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

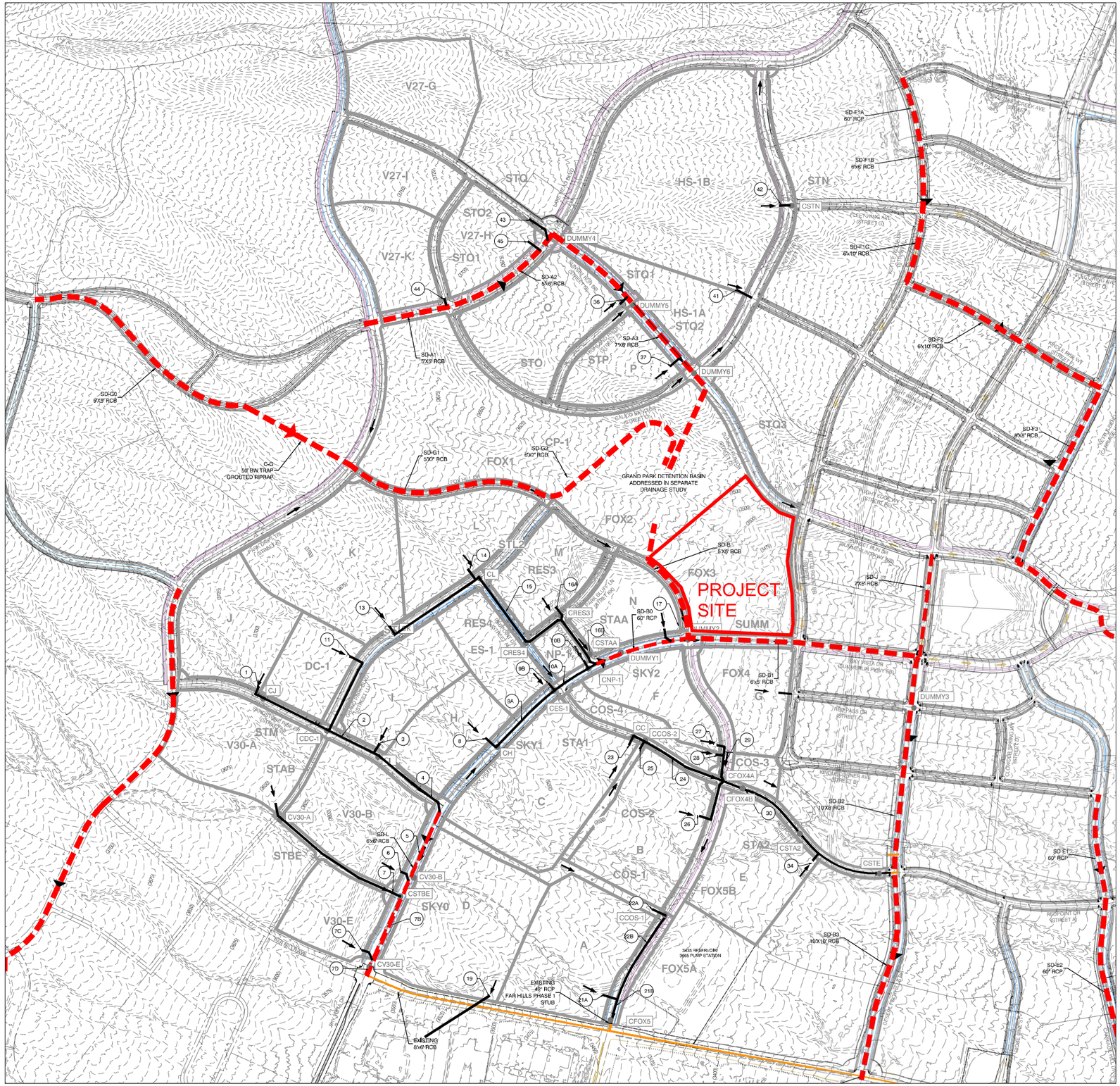
FIGURE 6
ULTIMATE CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 25

DRAWN BY: JYA — DECEMBER 2019
DESIGNED BY: JYA — DECEMBER 2019
CHECKED BY: JYA — DECEMBER 2019
PROJECT NO: 7319
SCALE: 1" = 400' HORIZ. N/A VERT.

SHEET
OF SHEETS
DRAWING NO.
FIG 6

H:\7319\Drainage\3_UP1YA_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

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

REV	DATE	BY	REVISION

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

2727 SOUTH RAINBOW BOULEVARD
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PH: (702) 873-7550 FAX: (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

FIGURE 7
LOCAL STORM DRAIN FACILITIES MAP

SUMMERLIN WEST VILLAGE 25

DRAWN BY: JYA	DECEMBER 2019	SCALE:	1"=400' HORIZ. NA VERT.
DESIGNED BY: JYA	DECEMBER 2019		
CHECKED BY: JYA	DECEMBER 2019		
PROJECT NO: 7819			

SHEET

OF SHEETS

DRAWING NO.

H:\7819\Drainage\ds_UP11A_Figures\Figure 7 - Local Flood Control Facilities Map V29sREV.dwg

Update #3 to the Technical Drainage Study for

Summerlin West Village 21
Summerlin Parkway Extension

Las Vegas, Nevada

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: December 2, 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 V21 – Summerlin Parkway Extention Update #3**			**COPIES TO:** VTN Nevada, Inc.
Cross Streets:	Summerlin Parkway & I-215 Western Beltway			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5159G.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-410-001			CCRFCD
Zoning Action:	N/A			
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	7/18/2019	8/12/2019	Not Approved	$400.00	3494541: $400
2nd Submittal	10/3/2019	11/2/2019	Not Approved	$400.00	3597440: $400
3rd Submittal	11/27/2019 & 12/31/2019	1/2/2020	Conditional Approval	$400.00	3658793: $400
4th Submittal	3/5/2020	3/30/2020	Conditional Approval	$100.00	3770573: $100
5th Submittal	8/5/2020 (Paid on 8/7/2020)	8/25/2020	Conditional Approval	$100.00	3946890: $100
6th Submittal	9/16/2020	10/1/2020	Conditional Approval	$100.00	3991840: $100
CCRFCD	11/18/2020	12/2/2020	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	**$1,500.00**	----

REMARKS:

6th Submittal: Update #3 to address minor changes in improvement plans and to re-package the portion of 8'x8' RCB In Sunset Run Drive west of the Beltway Channel in the subject project to the Summerlin West V22 Kettle Bend Road (Sunset Run to Kestrel Creek) Project

5th Submittal: Update #2 for various minor revisions

4th Submittal: Update #1 to shorten the length of a 5'x5' RCB north of Kettle Ridge & Sunset Run

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 proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Kettle Ridge Drive* and *Desert Foothills 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.

2. The street and the associated storm drain facilities will eventually be transferred to the *City of Las Vegas*, the engineer/developer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval 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
ays

T/R/S: T20S/R59E/23
AREA K-23

REGIONAL FLOOD CONTROL DISTRICT

Steven C. Parrish, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

Lawrence L. Brown, III
Chair
Clark County

Mayor Debra March
Vice-Chair
City of Henderson

George Gault
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Clark County

Mayor Carolyn Goodman
City of Las Vegas

Mayor Pro Tem Stavros Anthony
City of Las Vegas

Isaac Barron
City of North Las Vegas

Mayor Kiernan McManus
City of Boulder City

December 10, 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: **UPDATE FOR SUMMERLIN WEST VILLAGE 21 SUMMERLIN PARKWAY EXTENSION (DS5159F) (RFCD No. 20-13692)**

Dear Mr. Kwon:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated March 5, 2020, Addendum No. 1 dated August 5, 2020, and Addendum No. 2 dated September 16, 2020 for above-mentioned project as submitted by VTN NEVADA. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Department of Public Works dated October 1, 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*.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by VTN NEVADA 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.

600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 685-0000 • FAX: (702) 685-0001
Website: http://www.regionalflood.org

STEVEN C. PARRISH, P.E.
General Manager/Chief Engineer

BY: Ching Wang (Dec 14, 2020 12:15 PST)
Ching C. Wang, P.E.
Senior Civil Engineer

CCW:jr

c: Aaron Yup, VTN Nevada

P:\Letters and Memos\Local Drainage\Land Development & Drainage\2020\L-20-13692as_built.doc

CURVE NUMBER CALCULATIONS

DEVELOPMENT: **Summerlin Parkway Extension**
W.O. # **7851-5.8** **CALCULATED BY:** **ACY/JYA**

Soil #152: Cave gravelly fine sandy loam, 0 to 4 percent slopes								
Soil	Percent	Group	Existing$_1$	Newly Graded$_2$	Impervious$_3$	Open Space$_4$	Commercial$_5$	Residential$_{(Apartments)6}$
Cave	100%	D	88	94	98	89	95	93
Total	**100%**		**88**	**94**	**98**	**89**	**95**	**93**

Soil #155: Cave gravelly sandy loam, 4 to 15 percent slopes								
Soil	Percent	Group	Existing$_1$	Newly Graded$_2$	Impervious$_3$	Open Space$_4$	Commercial$_5$	Residential$_{(Apartments)6}$
Arizo	100%	D	88	94	98	89	95	96
Total	**100%**		**88**	**94**	**98**	**89**	**95**	**96**

Soil #156: Vace-Wechech association								
Soil	Percent	Group	Existing$_1$	Newly Graded$_2$	Impervious$_3$	Open Space$_4$	Commercial$_5$	Residential$_{(Apartments)6}$
Vace	45%	D	88	94	98	89	95	93
Wechech	25%	D	88	94	98	89	95	93
Wechech,steep	15%	D	88	94	98	89	95	93
Weiser	8%	B	77	86	98	79	92	88
Irongold	4%	D	88	94	98	89	95	93
Commski	2%	B	77	86	98	79	92	88
Threelakes	1%	A	63	77	98	68	89	81
Total	**100%**		**87**	**94**	**98**	**88**	**95**	**93**

Soil #191: Dalian very cobbly fine sandy loam, 2 to 8 percent slopes								
Soil	Percent	Group	Existing$_1$	Newly Graded$_2$	Impervious$_3$	Open Space$_4$	Commercial$_5$	Residential$_{(Apartments)6}$
Dalian	100%	A	63	77	98	68	89	81
Total	**100%**		**63**	**77**	**98**	**68**	**89**	**81**

Soil #502: Canutio-Cave gravelly find sandy loams, 2 to 8 percent slopes								
Soil	Percent	Group	Existing$_1$	Newly Graded$_2$	Impervious$_3$	Open Space$_4$	Commercial$_5$	Residential$_{(Apartments)6}$
Canutio	55%	A	63	77	98	68	89	81
Cave	40%	D	88	94	98	89	95	93
Arizo	5%	A	63	77	98	68	89	81
Total	**100%**		**73**	**84**	**98**	**77**	**92**	**86**

Soil #731 Purob-Irongold association								
Soil	Percent	Group	Existing$_1$	Newly Graded$_2$	Impervious$_3$	Open Space$_4$	Commercial$_5$	Residential$_{(Apartments)6}$
Purob	60%	D	88	94	98	89	95	93
Irongold	25%	D	88	94	98	89	95	93
Typic torriorthents	5%	A	63	77	98	68	89	81
Purob	3%	D	88	94	98	89	95	93
Arizo	3%	A	63	77	98	68	89	81
Typic haplocalcids	2%	B	77	86	98	79	92	88
Aridic calcixerolls	1%	A	63	77	98	68	89	81
Xeric haplocambids	1%	A	63	77	98	68	89	81
Total	**100%**		**86**	**93**	**98**	**87**	**95**	**92**

1-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 4
2-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1
3-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1
4-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1
5-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1
6-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A

Curve Number calculations for basins

Basin	Cover Type	152	155	156	191	502	731	CN Value
Existing Condition Basins								
EX1	1	8%		92%				**87.1**
EX2	1			100%				**87.0**
OFF1	1			29%			71%	**86.3**
OFF2	1		28%	8%	6%	55%	3%	**78.1**
Interim/Ultimate Condition Basins								
INT1	1	3%		97%				**87.0**
INT2	1			100%				**87.0**
V	5			60%				**94.2**
	6			40%				
W	5			60%				**94.2**
	6			40%				
X	5	4%		56%				**94.2**
	6	2%		38%				
Y	5	8%		52%				**94.2**
	6	5%		35%				
Z	5			60%				**94.2**
	6			40%				
AA	5			60%				**94.2**
	6			40%				
FF	5			60%				**94.2**
	6			40%				
GG	5			60%				**94.2**
	6			40%				
NP-4	4			100%				**88.0**
NP-3	4			100%				**88.0**
SUMM1	3	10%		90%				**98.0**
SUMM2	3			100%				**98.0**
SUMM3	3			100%				**98.0**
SUMM4	3			100%				**98.0**
DES1	3			100%				**98.0**
PARK	4			100%				**88.0**
PARKU	4			100%				**88.0**

REFERENCED
PROJECT SITE
BASIN

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Summerlin Parkway Extension
W.O. # 7851-5.8 **CALCULATED BY:** ACY/JYA

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Non Urbanized:		Urbanized:	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
Existing Condition Basins								
EX1	1725	3475	3384	0.053	14.8	3.4	29.4	6.8
EX2	1240	3393	3283	0.089	14.8	4.4	29.4	8.8
OFF1	12693	4453	3444	0.079	14.8	4.2	29.4	8.3
OFF2	9772	4026	3386	0.065	14.8	3.8	29.4	7.5
Interim/Ultimate Condition Basins								
INT1	1120	3444	3394	0.045	14.8	3.1	29.4	6.2
INT2	1105	3389	3306	0.075	14.8	4.1	29.4	8.1
V	1020	3395	3315	0.078	20.2	5.7	30.6	8.6
W	1290	3383	3319	0.050	20.2	4.5	30.6	6.8
X	636	3408	3382	0.041	20.2	4.1	30.6	6.2
Y	721	3453	3409	0.061	20.2	5.0	30.6	7.6
Z	785	3470	3410	0.076	20.2	5.6	30.6	8.5
AA	462	3416	3387	0.063	20.2	5.1	30.6	7.7
FF	537	3452	3431	0.039	20.2	4.0	30.6	6.1
GG	392	3426	3392	0.087	20.2	5.9	30.6	9.0
NP-4	896	3443	3385	0.065	20.2	5.1	30.6	7.8
NP-3	750	3402	3389	0.017	20.2	2.7	30.6	4.0
SUMM1	2080	3445	3385	0.029	20.2	3.4	30.6	5.2
SUMM2	1370	3385	3300	0.062	20.2	5.0	30.6	7.6
SUMM3	1070	3452	3396	0.052	20.2	4.6	30.6	7.0
SUMM4	1545	3396	3288	0.070	20.2	5.3	30.6	8.1
DES1	775	3395	3385	0.013	20.2	2.3	30.6	3.5
PARK	2234	3530	3441	0.040	14.8	3.0	29.4	5.9
PARKU	1458	3540	3441	0.068	20.2	5.3	30.6	8.0

REFERENCED
PROJECT SITE
BASIN

STANDARD FORM 4

DEVELOPMENT: Summerlin Parkway Extension

W.O. # 7851-5.8 **CALCULATED BY:** ACY/JYA

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Non-Urbanized:		Urbanized	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39 \qquad T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
Existing Condition Basins																	
EX1	87.1	0.7595	27.73	0.0433	300	6.9	5.59	1725	5.3	3.4	6.8	5.48	2025	21.25	11.07	0.111	
EX2	87.0	0.7584	23.75	0.0371	300	5.1	6.19	1240	8.9	4.4	8.8	3.30	1540	18.56	9.49	0.100	
OFF1	86.3	0.7490	376.73	0.5886	500	13.1	5.99	12693	7.9	4.2	8.3	26.51	13193	83.29	32.50	0.325	
OFF2	78.1	0.6411	192.73	0.3011	500	6.8	9.74	9772	6.5	3.8	7.5	22.74	10272	67.07	32.48	0.325	
Interim/Ultimate Condition Basins																	
INT1	87.0	0.7588	18.62	0.0291	170	18.6	3.02	1120	4.5	3.1	6.2	4.33	1290	17.17	7.35	0.100	
INT2	87.0	0.7584	15.55	0.0243	100	8.5	3.01	1105	7.5	4.1	8.1	3.31	1205	16.69	6.32	0.100	
V	94.2	0.853	7.25	0.0113	100	1.0	4.44	1020	7.8	5.7	8.6	2.48	1120	16.22	6.92	0.069	
W	94.2	0.853	8.31	0.0130	100	1.0	4.44	1290	5.0	4.5	6.8	3.78	1390	17.72	8.22	0.082	
X	94.2	0.853	3.94	0.0062	100	1.0	4.44	636	4.1	4.1	6.2	2.41	736	14.09	6.84	0.068	
Y	94.2	0.853	3.98	0.0062	100	1.0	4.44	721	6.1	5.0	7.6	2.16	821	14.56	6.60	0.066	
Z	94.2	0.853	4.50	0.0070	100	1.0	4.44	785	7.6	5.6	8.5	2.05	885	14.92	6.49	0.065	
AA	94.2	0.853	4.02	0.0063	100	1.0	4.44	462	6.3	5.1	7.7	1.52	562	13.12	5.96	0.060	
FF	94.2	0.853	3.88	0.0061	100	1.0	4.44	537	3.9	4.0	6.1	2.19	637	13.54	6.63	0.066	
GG	94.2	0.853	4.98	0.0078	100	1.0	4.44	392	8.7	5.9	9.0	1.10	492	12.73	5.54	0.055	
NP-4	88.0	0.772	1.05	0.0016	100	1.0	5.91	896	6.5	5.1	7.8	2.47	996	15.53	8.38	0.084	
NP-3	88.0	0.772	1.14	0.0018	100	1.0	5.91	750	1.7	2.7	4.0	4.17	850	14.72	10.08	0.101	
SUMM1	98.0	0.904	5.05	0.0079	40	2.0	1.77	2080	2.9	3.4	5.2	7.50	2120	21.78	9.27	0.093	
SUMM2	98.0	0.904	3.63	0.0057	40	2.0	1.77	1370	6.2	5.0	7.6	3.56	1410	17.83	5.33	0.053	
SUMM3	98.0	0.904	2.85	0.0045	40	2.0	1.77	1070	5.2	4.6	7.0	3.16	1110	16.17	4.93	0.050	
SUMM4	98.0	0.904	4.87	0.0076	40	2.0	1.77	1545	7.0	5.3	8.1	3.71	1585	18.81	5.49	0.055	
DES1	98.0	0.904	1.80	0.0028	35	2.0	1.66	775	1.3	2.3	3.5	4.95	810	14.50	6.61	0.066	
PARK	88.0	0.772	34.10	0.0533	100	1.0	5.91	2234	4.0	3.0	5.9	7.75	2334	22.97	13.66	0.137	
PARKU	88.0	0.772	27.52	0.0430	100	1.0	5.91	1458	6.8	5.3	8.0	3.59	1558	18.66	9.50	0.095	

Tc Min (URB)= 5 min
Tc Min (NON-URB)= 10 min

REFERENCED PROJECT SITE BASIN

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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   20NOV19  TIME  14:57:21  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID    ULTIMATE CONDITION HYDROLOGIC MODEL
              2         ID    INPUT FILE DATE = MARCH 19, 2018
              3         ID    DESIGN STORM = 100-YEAR 6-HR STORM
              4         ID    STORM DISTRIBUTION = SDN #3
              5         ID    MODELED BY VTN (ACY)
              6         ID
              7         ID    ********************************************************
              8         ID    * SUMMERLIN WEST VILLAGE 21                            *
              9         ID    * SUMMERLIN PARKWAY EXTENSION                          *
             10         ID    ********************************************************
             11         ID
             12         ID
             13         ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
             14         ID
             15         ID  100-YEAR,  6-HOUR STORM,  SDN3
             16         ID
             17         IT       5       0       0     300
             18         IO       5       0       0
             19         IN       5       0       0
             20         JR    PREC    0.99
                        *

             21         KK   SUMM3
             22         KM   REFERENCE MASTER STUDY
             23         BA  0.0045
             24         PB    3.40
             25         PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
             26         PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
             27         PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
             28         PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
             29         PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
             30         PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
             31         PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
             32         PC   0.998   0.999       1
             33         LS       0      98
             34         UD   0.050
                        *

             35         KK       Z
             36         KM   REFERENCE MASTER STUDY
             37         BA  0.0070
             38         PB    3.41
             39         LS       0    94.2
             40         UD   0.065
                        *

             41         KK      AA
             42         KM   REFERENCE MASTER STUDY
             43         BA  0.0063
             44         PB    3.40
             45         LS       0    94.2
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  46          UD   0.060
              *
1                                        HEC-1 INPUT                                        PAGE  2

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


  47          KK      FF
  48          KM   VILLAGE 22 DEVELOPED BASIN
  49          BA  0.0061
  50          PB    3.41
  51          LS       0    94.2
  52          UD   0.066
              *

  53          KK      GG
  54          KM   VILLAGE 22 DEVELOPED BASIN
  55          BA  0.0078
  56          PB    3.41
  57          LS       0    94.2
  58          UD   0.055
              *

  59          KK     CAA
  60          KM   REFERENCE MASTER STUDY
  61          KM   COMBINES SUMM3, Z, AA, AND FF, GG
  62          HC       5
              *

  63          KK    NP-4
  64          KM   REFERENCE MASTER STUDY
  65          BA  0.0016
  66          PB    3.40
  67          LS       0    88.0
  68          UD   0.084
              *

  69          KK    NP-3
  70          KM   REFERENCE MASTER STUDY
  71          BA  0.0018
  72          PB    3.38
  73          LS       0    88.0
  74          UD   0.101
              *

  75          KK   CNP-3
  76          KM   REFERENCE MASTER STUDY
  77          KM   COMBINES NP-3 AND NP-4
  78          HC       2
              *

  79          KK   SUMM1
  80          KM   REFERENCE MASTER STUDY
  81          PB    3.40
  82          BA  0.0079
  83          LS       0      98
  84          UD   0.093
              *
1                                        HEC-1 INPUT                                        PAGE  3

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


  85          KK       Y
  86          KM   REFERENCE MASTER STUDY
  87          PB    3.40
  88          BA  0.0062
  89          LS       0    94.2
  90          UD   0.066
              *

  91          KK       X
  92          KM   REFERENCE MASTER STUDY
  93          PB    3.40
  94          BA  0.0061
  95          LS       0    94.2
  96          UD   0.068
              *

  97          KK    DES1
  98          KM   REFERENCE MASTER STUDY
  99          BA  0.0028
 100          PB    3.38
 101          LS       0      98
 102          UD   0.066
              *

 103          KK  CSUM1
 104          KM   REFERENCE MASTER STUDY
 105          KM   RFCD FACILITY IN DESERT FOOTHILLS DRIVE
 106          HC       6
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                     *

            107      KK       V
            108      KM   REFERENCE MASTER STUDY
            109      BA  0.0113
            110      PB    3.38
            111      LS       0    94.2
            112      UD   0.069
                     *

            113      KK   SUMM4
            114      KM   REFERENCE MASTER STUDY
            115      BA  0.0076
            116      PB    3.38
            117      LS       0      98
            118      UD   0.055
                     *

            119      KK  CSUMM4
            120      KM   REFERENCE MASTER STUDY
            121      KM   COMBINES IN EX BELTWAY CHANNEL
            122      HC       2
                     *
1                                          HEC-1 INPUT                                          PAGE  4

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


            123      KK       W
            124      KM   REFERENCE MASTER STUDY
            125      KM   ONSITE BASIN
            126      BA  0.0130
            127      PB    3.38
            128      LS       0    94.2
            129      UD   0.082
                     *

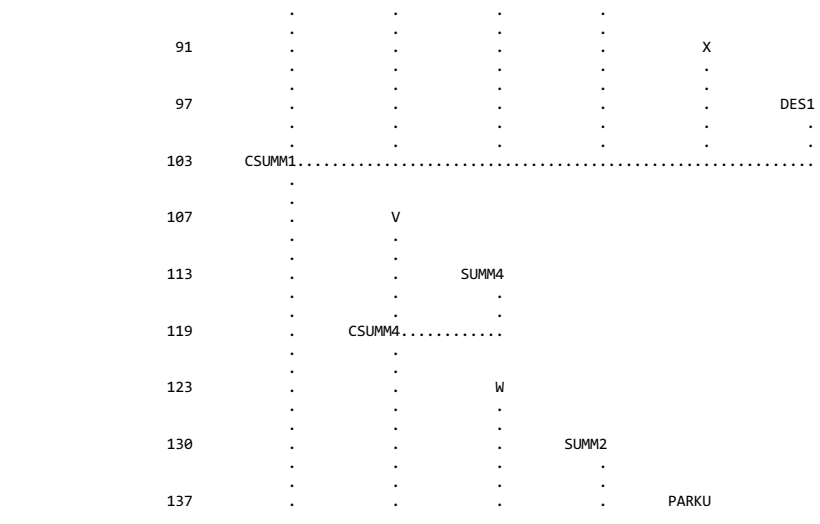
            130      KK   SUMM2
            131      KM   REFERENCE MASTER STUDY
            132      KM   ONSITE BASIN
            133      BA  0.0057
            134      PB    3.38
            135      LS       0      98
            136      UD   0.053
                     *

            137      KK   PARKU
            138      KM   PARK AREA WEST OF PROJECT SITE
            139      BA   .0430
            140      PB    3.46
            141      LS       0    88.0
            142      UD   0.095
            143      ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

    21       SUMM3
                .
                .
    35          .           Z
                .           .
                .           .
    41          .           .          AA
                .           .           .
                .           .           .
    47          .           .           .          FF
                .           .           .           .
                .           .           .           .
    53          .           .           .           .          GG
                .           .           .           .           .
                .           .           .           .           .
    59        CAA.....................................................
                .
                .
    63          .        NP-4
                .           .
                .           .
    69          .           .       NP-3
                .           .           .
                .           .           .
    75          .       CNP-3............
                .           .
                .           .
    79          .           .       SUMM1
                .           .           .
                .           .           .
    85          .           .           .          Y
```

REFERENCED PROJECT SITE BASIN



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
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   20NOV19  TIME  14:57:21  *                                    *          (916) 756-1104              *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************
```

ULTIMATE CONDITION HYDROLOGIC MODEL
INPUT FILE DATE = MARCH 19, 2018
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (ACY)

****
* SUMMERLIN WEST VILLAGE 21 *
* SUMMERLIN PARKWAY EXTENSION *
****

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

```
  18 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
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
HYDROGRAPH AT					
+	SUMM3	.00	1	FLOW	13.
				TIME	3.50
HYDROGRAPH AT					
+	Z	.01	1	FLOW	18.
				TIME	3.50
HYDROGRAPH AT					
+	AA	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	FF	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	GG	.01	1	FLOW	21.
				TIME	3.50
5 COMBINED AT					
+	CAA	.03	1	FLOW	83.
				TIME	3.50
HYDROGRAPH AT					
+	NP-4	.00	1	FLOW	3.
				TIME	3.50
HYDROGRAPH AT					
+	NP-3	.00	1	FLOW	3.
				TIME	3.50
2 COMBINED AT					
+	CNP-3	.00	1	FLOW	7.
				TIME	3.50
HYDROGRAPH AT					
+	SUMM1	.01	1	FLOW	20.
				TIME	3.50
HYDROGRAPH AT					
+	Y	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	X	.01	1	FLOW	15.
				TIME	3.50
HYDROGRAPH AT					
+	DES1	.00	1	FLOW	7.
				TIME	3.50
6 COMBINED AT					
+	CSUMM1	.06	1	FLOW	148.
				TIME	3.50
HYDROGRAPH AT					
+	V	.01	1	FLOW	28.
				TIME	3.50
HYDROGRAPH AT					
+	SUMM4	.01	1	FLOW	21.
				TIME	3.50
2 COMBINED AT					
+	CSUMM4	.02	1	FLOW	49.
				TIME	3.50
HYDROGRAPH AT					
+	W	.01	1	FLOW	31.
				TIME	3.50
HYDROGRAPH AT					
+	SUMM2	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	PARKU	.04	1	FLOW	86.
				TIME	3.50

REFERENCED PROJECT SITE BASIN

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

Worksheet for Section 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.70	%
Discharge	8.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2.10
0+10.00	1.90
0+15.00	1.80
0+37.00	1.36
0+37.50	1.36
0+37.50	0.86
0+39.00	0.99
0+39.00	1.03
0+60.50	0.60
0+82.00	0.17
0+82.00	0.13
0+83.50	0.00
0+83.50	0.50
0+84.00	0.50
0+89.00	0.60
0+94.00	0.70
1+04.00	0.90

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2.10)	(0+10.00, 1.90)	0.025
(0+10.00, 1.90)	(0+15.00, 1.80)	0.013
(0+15.00, 1.80)	(0+37.00, 1.36)	0.025
(0+37.00, 1.36)	(0+39.00, 0.99)	0.013

Worksheet for Section 1

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+39.00, 0.99)	(0+82.00, 0.13)	0.016
(0+82.00, 0.13)	(0+84.00, 0.50)	0.013
(0+84.00, 0.50)	(0+89.00, 0.60)	0.025
(0+89.00, 0.60)	(0+94.00, 0.70)	0.013
(0+94.00, 0.70)	(1+04.00, 0.90)	0.025

Options

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

Results

Normal Depth		0.43	ft
Elevation Range	0.00 to 2.10 ft		
Flow Area		2.28	ft²
Wetted Perimeter		15.13	ft
Hydraulic Radius		0.15	ft
Top Width		14.65	ft
Normal Depth		0.43	ft
Critical Depth		0.49	ft
Critical Slope		0.00652	ft/ft
Velocity		3.51	ft/s
Velocity Head		0.19	ft
Specific Energy		0.62	ft
Froude Number		1.57	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

Worksheet for Section 1

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.43	ft
Critical Depth	0.49	ft
Channel Slope	1.70	%
Critical Slope	0.00652	ft/ft

Cross Section for Section 1

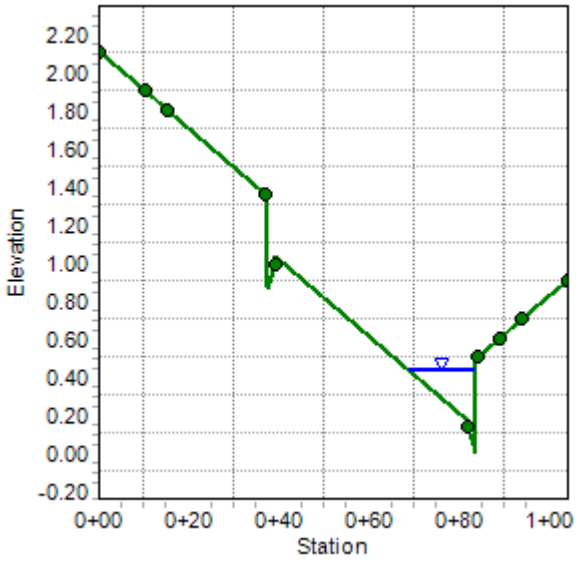
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.70	%
Normal Depth	0.43	ft
Discharge	8.00	ft³/s

Cross Section Image



42" STUB HYDRAULIC CALCULATION

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3433.36	3426.18	7.18	1.63	3.5	2.563301	3433.36	1.42	3434.78

*Reference WSPG Model: GPDB-SUMM

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Summerlin Parkway Extension
CALCULATED BY: ACY **WO#** 7851
STORM DRAIN SEGMENT: Facility 7
DESCRIPTION: 100- Year Ultimate Condition

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+40.75	3.5	3426.18	3433.31	40.8	9.62	0.00492	92.0	17.50	9.56	1.42	0.00835	0.00835	0.34						0.34	3435.12	3433.70	Yes	3438.23	3438.23	3436.81
2	SDDI	10+40.75	10+40.75	3.5	3433.31	3433.31	0.0	9.62	0.00492	92.0	N/A	9.56	1.42	0.00835	0.00835	0.00				0.71		0.71	3438.94	3437.52	Yes	3438.05	3438.94	3437.52
3	PIPE	10+40.75	10+85.92	3.5	3433.31	3434.10	45.2	9.62	0.00492	86.0	1.75	8.94	1.24	0.00730	0.00782	0.35						0.35	3439.29	3438.05	Yes	3438.84	3439.29	3438.05
4	INLET	10+85.92	10+85.92	3.5	3434.10	3434.10	0.0	9.62	0.00492	86.0	N/A	8.94	1.24	0.00730	0.00730	0.00						0.00	3439.29	3438.05				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	1.420	0.710
3																
4																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI	3443.1	5.6	Yes
PIPE			
INLET	3443.1	5.0	Yes

Box		Elliptical/ Other			
Span (ft)	Rise (ft)	Rise (ft)	Area (ft^2)	Hyd. Rad. (ft)	#
					1.00
					1.00
					1.00
					1.00

```
T1 GRAND PARK DETENTION BASIN OUTLET
T2 FILE NAME: GPDB-OUT-SUMM.WSW
T3 SUMMERLIN PKWY EXTENSION - STREET J TO DESERT FOOTHILLS
SO   1000.00 3337.584  5      .015                3347.599
WX   1000.00 3337.584  3      .015
R    1101.69 3339.455  3      .015                                  5.17
JX   1243.28 3342.060  3 30   .015   30.00          3342.560        90.0
R    1243.28 3342.060  3      .015                                  0.00    0.00  0
JX   1667.25 3349.861  3 30   .015   15.00          3350.361        90.0
R    1667.25 3349.861  3      .015                                  0.00    0.00  0
R    1733.24 3351.076  3      .015                                  0.00    0.00  0
JX   1876.58 3353.713  3      .015   11.00          3354.213        90.0
R    1876.58 3353.713  3      .015                                  0.00    0.00  0
JX   2209.11 3359.832  3 36   .015   74.00          3360.331        90.0
R    2209.11 3359.832  3      .015                                  0.00    0.00  0
R    2352.95 3362.478  3      .015                                  0.00    0.00  0
JX   2419.04 3363.694  3 30   .015   25.00          3364.193        90.0
R    2419.04 3363.694  3      .015                                  3.39    0.00  0
R    2428.07 3363.860  3      .015                                  0.42
R    2501.30 3365.206  3      .015                                 -3.86
R    2601.04 3367.041  3      .015                                  0.00    0.00  0
R    2623.14 3367.097  3      .015                                  0.00    0.00  0
JX   2623.14 3367.097  3 1    .015   49.00          3367.097         0.0
WX   2623.14 3367.097  2      .015
R    2630.28 3367.197  2      .015                                  0.00  -45.25  2
R    2650.26 3367.477  2      .015                                  0.00  -44.78  0
R    2715.03 3368.384  2      .015                                  0.00    0.00  0
JX   2715.03 3368.384  2 36   .015   12.00          3369.000        90.0
R    2725.28 3368.527  2      .015                                  0.00    0.00  0
JX   2725.28 3368.527  2 24   .015    5.00          3369.569        -45.0
R    2820.60 3369.862  2      .015                                  0.00    0.00  0
JX   2820.60 3369.862  2 30   .015   15.00          3371.063        90.0
R    2840.92 3370.146  2      .015                                  0.00    0.00  0
R    3151.77 3391.975  2      .015                                  0.00    0.00  0
JX   3151.77 3391.975  2 30   .015   16.00          3392.475        90.0
R    3202.77 3395.556  2      .015                                  0.00    0.00  0
JX   3202.77 3395.556  2 24 24.015    0.01     0.01 3396.063396.06  -73.0 45.0
R    3551.96 3420.077  2      .015                                  0.00   -4.23  0
R    3565.29 3420.714  2      .015                                  0.00    0.00  0
JX   3565.29 3420.714  2 24   .015    6.00          3421.214        48.0
R    3651.23 3424.818  2      .015                                  0.00    4.23  0
JX   3669.12 3425.673  2 24 42.015    6.00    92.00 3426.173426.17  -90.0 90.0
R    3676.78 3426.025  2      .015                                  0.00   17.11  0
R    3745.38 3429.300  2      .015                                  0.00    0.00  0
SH   3745.39 3429.300  2
CD   1  3   0   0.00    5.00     5.00  0.00  0.00
CD   2  3   0   0.00    5.00     6.00  0.00  0.00
CD   3  3   0   0.00    8.00    10.00  0.00  0.00
CD   4  3   1   1.25    6.00    14.25  0.00  0.00
CD   5  3   0   0.00   10.00   10.00  0.00  0.00
CD  18  4   1   0.00    1.50     0.00  0.00  0.00
CD  24  4   1   0.00    2.00     0.00  0.00  0.00
CD  30  4   1   0.00    2.50     0.00  0.00  0.00
CD  36  4   1   0.00    3.00     0.00  0.00  0.00
CD  42  4   1   0.00    3.50     0.00  0.00  0.00
CD  48  4   1   0.00    4.00     0.00  0.00  0.00
CD  54  4   1   0.00    4.50     0.00  0.00  0.00
CD  60  4   1   0.00    5.00     0.00  0.00  0.00
Q           429.000   .0
```

PROJECT SITE
INFLOW LOCATION

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date:11-20-2019 Time: 4:48:28

GRAND PARK DETENTION BASIN OUTLET

FILE NAME: GPDB-OUT-SUMM.WSW

SUMMERLIN PKWY EXTENSION - STREET J TO DESERT FOOTHILLS

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
1000.000	3337.584	10.015	3347.599	785.02	7.85	.96	3348.56	.00	5.76	10.00	10.000	10.000	.00	0 .0
WALL	EXIT													
1000.000	3337.584	10.016	3347.600	785.02	9.81	1.50	3349.09	.00	5.76	10.00	8.000	10.000	.00	0 .0
101.690	.0184					.0034	.34	.00	.61	3.58	.015	.00	.00	BOX
1101.690	3339.455	8.560	3348.015	785.02	9.81	1.50	3349.51	.00	5.76	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0184							8.56	.61		.015	.00	.00	BOX
1243.280	3342.060	3.546	3345.606	755.02	21.29	7.04	3352.64	.00	5.62	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0184					.0166	7.05	3.55	1.99		.015	.00	.00	BOX
1667.250	3349.861	3.622	3353.483	740.02	20.43	6.48	3359.97	.00	5.54	10.00	8.000	10.000	.00	0 .0
65.990	.0184					.0153	1.01	3.62	1.89	3.43	.015	.00	.00	BOX
1733.240	3351.076	3.704	3354.780	740.02	19.98	6.20	3360.98	.00	5.54	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0184					.0140	2.00	3.70	1.83		.015	.00	.00	BOX
1876.580	3353.713	3.836	3357.549	729.02	19.00	5.61	3363.16	.00	5.49	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0184					.0151	5.03	3.84	1.71		.015	.00	.00	BOX
2209.110	3359.832	3.223	3363.055	655.02	20.32	6.41	3369.47	.00	5.11	10.00	8.000	10.000	.00	0 .0
143.840	.0184					.0165	2.37	3.22	1.99	3.14	.015	.00	.00	BOX
2352.950	3362.478	3.323	3365.801	655.02	19.71	6.03	3371.83	.00	5.11	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0184					.0174	1.15	3.32	1.91		.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date:11-20-2019 Time: 4:48:28

GRAND PARK DETENTION BASIN OUTLET

FILE NAME: GPDB-OUT-SUMM.WSW

SUMMERLIN PKWY EXTENSION - STREET J TO DESERT FOOTHILLS

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
2419.040	3363.694	3.016	3366.710	630.02	20.89	6.77	3373.48	.11	4.98	10.00	8.000	10.000	.00	0 .0
9.030	.0184					.0192	.17	3.13	2.12	3.06	.015	.00	.00	BOX
2428.070	3363.860	3.014	3366.874	630.02	20.90	6.78	3373.66	.12	4.98	10.00	8.000	10.000	.00	0 .0
73.230	.0184					.0194	1.42	3.14	2.12	3.06	.015	.00	.00	BOX
2501.300	3365.206	2.994	3368.199	630.02	21.05	6.88	3375.08	.00	4.98	10.00	8.000	10.000	.00	0 .0
99.740	.0184					.0200	1.99	2.99	2.14	3.06	.015	.00	.00	BOX
2601.040	3367.041	2.951	3369.992	630.02	21.35	7.08	3377.07	.00	4.98	10.00	8.000	10.000	.00	0 .0
22.100	.0025					.0214	.47	2.95	2.19	6.36	.015	.00	.00	BOX
2623.140	3367.097	2.848	3369.945	630.02	22.12	7.60	3377.54	.00	4.98	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0000					.0272	.00	2.85	2.31		.015	.00	.00	BOX
2623.140	3367.097	2.388	3369.484	581.02	24.34	9.20	3378.68	.00	4.72	10.00	8.000	10.000	.00	0 .0
WALL	EXIT													
2623.140	3367.097	4.190	3371.287	581.02	23.11	8.30	3379.58	.00	5.00	6.00	5.000	6.000	.00	0 .0
7.140	.0140					.0261	.19	4.19	1.99	5.00	.015	.00	.00	BOX
2630.280	3367.197	4.160	3371.357	581.02	23.28	8.41	3379.77	.00	5.00	6.00	5.000	6.000	.00	0 .0

| | | |

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
48.696	.0702					.0481	2.34	3.02	2.99	2.68	.015	.00	.00	BOX
3455.523	3413.305	3.166	3416.471	533.00	28.06	12.23	3428.70	.00	5.00	6.00	5.000	6.000	.00	0 .0
34.433	.0702					.0424	1.46	3.17	2.78	2.68	.015	.00	.00	BOX
3489.956	3415.723	3.320	3419.043	533.00	26.75	11.11	3430.16	.00	5.00	6.00	5.000	6.000	.00	0 .0
25.868	.0702					.0374	.97	3.32	2.59	2.68	.015	.00	.00	BOX
3515.824	3417.540	3.482	3421.022	533.00	25.51	10.10	3431.13	.00	5.00	6.00	5.000	6.000	.00	0 .0
20.132	.0702					.0330	.67	3.48	2.41	2.68	.015	.00	.00	BOX
3535.955	3418.953	3.652	3422.605	533.00	24.32	9.19	3431.79	.00	5.00	6.00	5.000	6.000	.00	0 .0
16.005	.0702					.0292	.47	3.65	2.24	2.68	.015	.00	.00	BOX
3551.960	3420.077	3.831	3423.907	533.00	23.19	8.35	3432.26	.00	5.00	6.00	5.000	6.000	.00	0 .0
13.330	.0478					.0266	.35	3.83	2.09	3.10	.015	.00	.00	BOX
3565.290	3420.714	3.919	3424.633	533.00	22.67	7.98	3432.61	.00	5.00	6.00	5.000	6.000	.00	0 .0
JUNCT STR	.0000					.0265	.00	3.92	2.02		.015	.00	.00	BOX
3565.290	3420.714	3.807	3424.522	527.00	23.07	8.26	3432.79	.00	5.00	6.00	5.000	6.000	.00	0 .0
19.091	.0478					.0261	.50	3.81	2.08	3.07	.015	.00	.00	BOX
3584.381	3421.626	3.939	3425.565	527.00	22.30	7.72	3433.29	.00	5.00	6.00	5.000	6.000	.00	0 .0
20.988	.0478					.0235	.49	3.94	1.98	3.07	.015	.00	.00	BOX
3605.369	3422.628	4.131	3426.760	527.00	21.26	7.02	3433.78	.00	5.00	6.00	5.000	6.000	.00	0 .0
16.176	.0478					.0208	.34	4.13	1.84	3.07	.015	.00	.00	BOX
3621.545	3423.401	4.333	3427.734	527.00	20.27	6.38	3434.11	.00	5.00	6.00	5.000	6.000	.00	0 .0
12.556	.0478					.0184	.23	4.33	1.72	3.07	.015	.00	.00	BOX
3634.101	3424.000	4.545	3428.545	527.00	19.33	5.80	3434.35	.00	5.00	6.00	5.000	6.000	.00	0 .0
9.716	.0478					.0163	.16	4.54	1.60	3.07	.015	.00	.00	BOX

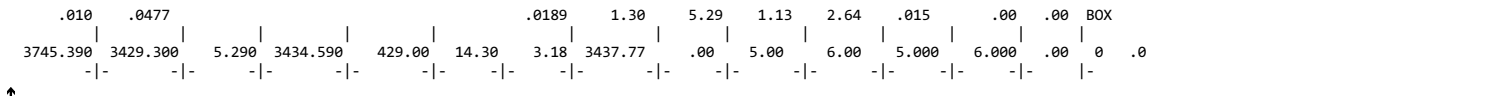
---------- WARNING - Flow depth near top of box conduit ----------

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
3643.817	3424.464	4.766	3429.230	527.00	18.43	5.27	3434.50	.00	5.00	6.00	5.000	6.000	.00	0 .0
7.413	.0478					.0181	.13	4.77	1.49	3.07	.015	.00	.00	BOX

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

3651.230	3424.818	5.000	3429.818	527.00	17.57	4.79	3434.61	.00	5.00	6.00	5.000	6.000	.00	0 .0
JUNCT STR	.0478					.0138	.25	5.00	1.38		.015	.00	.00	BOX
3669.120	3425.673	7.687	3433.360	429.00	14.30	3.18	3436.54	.00	5.00	6.00	5.000	6.000	.00	0 .0
7.660	.0459					.0138	.11	7.69	1.13	2.67	.015	.00	.00	BOX
3676.780	3426.025	7.620	3433.645	429.00	14.30	3.18	3436.82	.00	5.00	6.00	5.000	6.000	.00	0 .0
68.600	.0477					.0138	.95	7.62	1.13	2.64	.015	.00	.00	BOX
3745.380	3429.300	5.290	3434.590	429.00	14.30	3.18	3437.77	.00	5.00	6.00	5.000	6.000	.00	0 .0




.010 .0477 .0189 1.30 5.29 1.13 2.64 .015 .00 .00 BOX
3745.390 3429.300 5.290 3434.590 429.00 14.30 3.18 3437.77 .00 5.00 6.00 5.000 6.000 .00 0 .0

GRAND PARK DETENTION BASIN

PROJECT SITE

PARKU

REFERENCED BASIN

REFERENCED ADJACENT STREET SECTION

KETTLE RIDGE DRIVE

FLIGHT RANGE AVENUE

FLIGHT EDGE WAY

SUNSET RUN DRIVE

DESERT FOOTHILLS DRIVE

KETTLE BEND DRIVE

SKY VISTA DRIVE

RED PASS DRIVE

KINDLE CORNER AVENUE

CARRIAGE HILL DRIVE

CLOWDER SPRING WAY

SUMMERLIN PKWY

(3475) (3450) (3425) (3400) (3375) (3350) (3325) (3300)

FF GG Z NP-4 AA NP-3 DES1 V V-A Y X W W-A V-B W-B

SUMM1A SUMM1B SUMM1C SUMM1 SUMM2A SUMM2 SUMM2B SUMM3 SUMM4A SUMM4 SUMM4B SUMM4C

CAA CNP-3 CSUMM1 CSUMM4

1 2 3 4 5 6 7

GRAPHIC SCALE

150 0 75 150 300

1" = 150'

NORTH

Ultimate Condition HEC-1 Summary Table

Basin ID	Area (a.c.)	Q100 (cfs)
SUMM3	2.85	13
Z	4.50	18
AA	4.02	16
FF	3.88	16
GG	4.98	21
CAA	-	83
NP-4	1.05	3
NP-3	1.14	3
CNP-3	-	7
SUMM1	5.05	20
Y	3.98	16
X	3.94	15
DES1	1.80	7
CSUMM1	-	148
V	7.25	28
SUMM4	4.87	21
CSUMM4	-	49
W	8.31	31
SUMM2	3.63	16
PARKU	27.52	86

PRORATED SUBBASIN SUMMARY ULTIMATE CONDITION

BASIN	BASIN AREA		Q100
SUMM1	5.05		20
SUMM2	3.63		16
SUMM4	4.87		21
V	7.25		28
W	8.31		31
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
SUMM1A	2.08	41.2%	8
SUMM1B	2.43	48.1%	10
SUMM1C	0.54	10.7%	2
TOTAL	**5.05**	**100.0%**	**20**
SUMM2A	1.69	46.6%	7
SUMM2B	1.94	53.4%	9
TOTAL	**3.63**	**100.0%**	**16**
SUMM4A	1.52	31.2%	7
SUMM4B	1.45	29.8%	6
SUMM4C	1.90	39.0%	8
TOTAL	**4.87**	**100.0%**	**21**
V-A	6.78	93.5%	26
V-B	0.47	6.5%	2
TOTAL	**7.25**	**100.0%**	**28**
W-A	7.7	92.7%	29
W-B	0.61	7.3%	2
TOTAL	**8.31**	**100.0%**	**31**

ULTIMATE CONDITION STREET FLOW ANALYSIS SUMMARY

Section	Q100 (cfs)	Slope	Velocity (ft/s)	Depth (ft)	V x D	Tributary Basins
1	8	1.70%	3.51	0.43	1.51	SUMM1A
2 (Max)	10	7.47%	6.52	0.38	2.48	SUMM1B
2 (Min)	10	3.55%	4.89	0.42	2.05	
3 (Max)	7	7.20%	5.94	0.34	2.02	SUMM2A
3 (Min)	7	6.85%	5.82	0.35	2.04	
4 (Max)	7	1.91%	3.57	0.41	1.46	DES1
4 (Min)	7	1.40%	3.16	0.43	1.36	
5 (Max)	13	6.70%	6.65	0.41	2.73	SUMM3
5 (Min)	13	5.30%	6.07	0.42	2.55	
6 (Max)	7	8.10%	6.22	0.34	2.11	SUMM4A
6 (Min)	7	6.70%	5.77	0.35	2.02	
7	6	8.70%	6.19	0.32	1.98	SUMM4B

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- SUMM1 BASIN DESIGNATION
- SUMM1A SUBBASIN DESIGNATION
- FLOW ARROW
- CROSS SECTION

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS NEVADA, 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

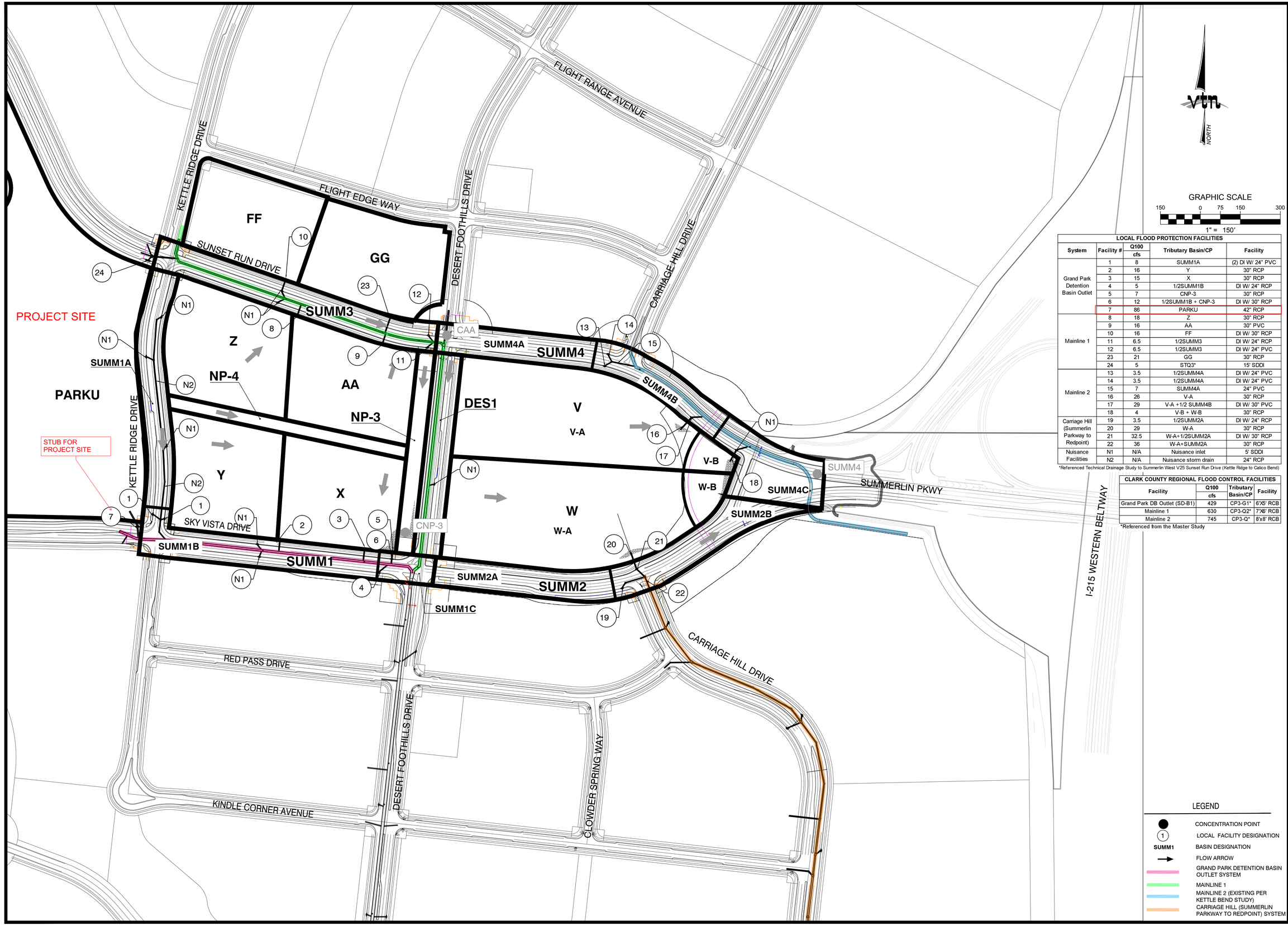
FIGURE 8
ULTIMATE CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

DRAWN BY: AHACY
DESIGNED BY: JYA
CHECKED BY:
PROJECT NO: 7851
SCALE: HORIZ. VERT.
11/19

SHEET
FIG 8
OF SHEETS
DRAWING NO.

H:\7851\Summerlin Parkway Extension\Drainage\3_ADD\A Figures\Figure 8 - Ultimate Map.dwg



LOCAL FLOOD PROTECTION FACILITIES

System	Facility #	Q100 cfs	Tributary Basin/CP	Facility
Grand Park Detention Basin Outlet	1	8	SUMM1A	(2) DI W/ 24" PVC
	2	16	Y	30" RCP
	3	15	X	30" RCP
	4	5	1/2SUMM1B	DI W/ 24" RCP
	5	7	CNP-3	30" RCP
	6	12	1/2SUMM1B + CNP-3	DI W/ 30" RCP
Mainline 1	7	86	PARKU	42" RCP
	8	18	Z	30" RCP
	9	16	AA	30" PVC
	10	16	FF	DI W/ 30" RCP
	11	6.5	1/2SUMM3	DI W/ 24" RCP
	12	6.5	1/2SUMM3	DI W/ 24" PVC
	23	21	GG	30" RCP
	24	5	STQ3*	15' SDDI
Mainline 2	13	3.5	1/2SUMM4A	DI W/ 24" PVC
	14	3.5	1/2SUMM4A	DI W/ 24" PVC
	15	7	SUMM4A	24" PVC
	16	26	V-A	30" RCP
	17	29	V-A +1/2 SUMM4B	DI W/ 30" PVC
	18	4	V-B + W-B	30" RCP
Carriage Hill (Summerlin Parkway to Redpoint)	19	3.5	1/2SUMM2A	DI W/ 24" RCP
	20	29	W-A	30" RCP
	21	32.5	W-A+1/2SUMM2A	DI W/ 30" RCP
	22	36	W-A+SUMM2A	30" RCP
Nuisance Facilities	N1	N/A	Nuisance inlet	5' SDDI
	N2	N/A	Nuisance storm drain	24" RCP

*Referenced Technical Drainage Study to Summerlin West V25 Sunset Run Drive (Kettle Ridge to Calico Bend)

CLARK COUNTY REGIONAL FLOOD CONTROL FACILITIES

Facility	Q100 cfs	Tributary Basin/CP	Facility
Grand Park DB Outlet (SD-B1)	429	CP3-G1*	6'X5' RCB
Mainline 1	630	CP3-Q2*	7'X6' RCB
Mainline 2	745	CP3-Q*	8'x8' RCB

*Referenced from the Master Study

LEGEND

- CONCENTRATION POINT
- 1 LOCAL FACILITY DESIGNATION
- SUMM1 BASIN DESIGNATION
- FLOW ARROW
- GRAND PARK DETENTION BASIN OUTLET SYSTEM
- MAINLINE 1
- MAINLINE 2 (EXISTING PER KETTLE BEND STUDY)
- CARRIAGE HILL (SUMMERLIN PARKWAY TO REDPOINT) SYSTEM

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS NEVADA, 89135

VTN NEVADA
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

FIGURE 9 - LOCAL FLOOD CONTROL FACILITIES MAP

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

DRAWN BY: AHACY
DESIGNED BY:
CHECKED BY:
09/20
SCALE: 1"=150' HORIZ. #### VERT.
PROJECT NO: 7851-5.8

SHEET
OF SHEETS
DRAWING NO.

H:\7851\Summerlin Parkway Extension\Drainage\7_UPSA Figures\Figure 9 - Facility Map.dwg

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

APN: 137-23-411-001, 137-23-499-001

CITY OF LAS VEGAS

STATE OF NEVADA

DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC

10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION	STATION
1	CV	COVER SHEET	
2	NT	NOTE SHEET	
3	G	GENERAL SHEET	
4	D1	DEMOLITION SHEET	
5	HC1	HORIZONTAL CONTROL PLAN 1	
6	HC2	HORIZONTAL CONTROL PLAN 2	
7	HC3	HORIZONTAL CONTROL PLAN 3	
8	HC4	HORIZONTAL CONTROL PLAN 4	
9	HC5	HORIZONTAL CONTROL PLAN 5	
10	HC6	HORIZONTAL CONTROL PLAN 6	
11	HC7	HORIZONTAL CONTROL PLAN 7	
12	HC8	HORIZONTAL CONTROL PLAN 8	
13	HC9	HORIZONTAL CONTROL PLAN 9	
14	HC10	HORIZONTAL CONTROL PLAN 10	
15	MUTSS	MASTER UTILITY SANITARY SEWER	
16	MUTSD	MASTER UTILITY STORM DRAIN	
17	MUTW	MASTER UTILITY WATER	
18	MGRD	MASTER GRADING	
19	GR1	GRADING DRAINAGE PLAN 1	
20	GR2	GRADING DRAINAGE PLAN 2	
21	GR3	GRADING DRAINAGE PLAN 3	
22	GR4	GRADING DRAINAGE PLAN 4	
23	GR5	GRADING DRAINAGE PLAN 5	
24	GR6	GRADING DRAINAGE PLAN 6	
25	GR7	GRADING DRAINAGE PLAN 7	
26	GR8	GRADING DRAINAGE PLAN 8	
27	GR9	GRADING DRAINAGE PLAN 9	
28	GR10	GRADING DRAINAGE PLAN 10	
29	GR11	GRADING DRAINAGE PLAN 11	
30	GR12	GRADING DRAINAGE PLAN 12	
31	GR13	GRADING DRAINAGE PLAN 13	
32	GR14	GRADING DRAINAGE PLAN 14	
33	GR15	GRADING DRAINAGE PLAN 15	
34	GR16	GRADING DRAINAGE PLAN 16	
35	GR17	GRADING DRAINAGE PLAN 17	
36	GR18	GRADING DRAINAGE PLAN 18	
37	GR19	GRADING DRAINAGE PLAN 19	
38	DT1	DETAIL SHEET 1	
39	DT2	DETAIL SHEET 2	
40	DT3	DETAIL SHEET 3	
41	DT4	DETAIL SHEET 4	
42	DT5	DETAIL SHEET 5	
43	DT6	DETAIL SHEET 6	
44	UT1	UTILITY PLAN & PROFILE 1	60+00 TO 64+50
45	UT2	UTILITY PLAN & PROFILE 2	64+50 TO 69+00
46	UT3	UTILITY PLAN & PROFILE 3	69+00 TO 73+00
47	UT4	UTILITY PLAN & PROFILE 4	73+00 TO 77+50
48	UT5	UTILITY PLAN & PROFILE 5	77+50 TO 82+00
49	UT6	UTILITY PLAN & PROFILE 6	82+00 TO 86+50
50	UT7	UTILITY PLAN & PROFILE 7	9+75 TO 13+50
51	UT8	UTILITY PLAN & PROFILE 8	86+50 TO 90+35
52	UT9	UTILITY PLAN & PROFILE 9	162+50 TO 166+50
53	UT10	UTILITY PLAN & PROFILE 10	166+50 TO 171+00
54	UT11	UTILITY PLAN & PROFILE 11	171+00 TO 176+20
55	UT12	UTILITY PLAN & PROFILE 12	176+20 TO 180+50
56	UT13	UTILITY PLAN & PROFILE 13	180+50 TO 185+00
57	UT14	UTILITY PLAN & PROFILE 14	10+00 TO 13+65
58	UT15	UTILITY PLAN & PROFILE 15	185+00 TO 189+00
59	UT16	UTILITY PLAN & PROFILE 16	189+00 TO 192+00
60	UT17	UTILITY PLAN & PROFILE 17	19+00 TO 23+50
61	UT18	UTILITY PLAN & PROFILE 18	23+50 TO 28+25
62	UT19	UTILITY PLAN & PROFILE 19	28+25 TO 31+00
63	UT20	UTILITY PLAN & PROFILE 20	44+55 TO 49+50
64	UT21	UTILITY PLAN & PROFILE 21	49+50 TO 54+75
65	UT22	UTILITY PLAN & PROFILE 22 SEWER & WATER LATERAL	
66	UT23	UTILITY PLAN & PROFILE 23 SEWER LATERAL	
67	UT24	UTILITY PLAN & PROFILE 24 WATER LATERAL	
68	UT25	UTILITY PLAN & PROFILE 25 SEWER LATERAL	
69	UT26	UTILITY PLAN & PROFILE 26 SEWER & WATER LATERAL	
70	UT27	UTILITY PLAN & PROFILE 27 SEWER LATERAL	
71	UT28	UTILITY PLAN & PROFILE 28 WATER LATERAL	
72	UT29	UTILITY PLAN & PROFILE 29 SEWER LATERAL	
73	UT30	UTILITY PLAN & PROFILE 30 SEWER LATERAL	
74	UT31	UTILITY PLAN & PROFILE 31 SEWER & WATER LATERAL	
75	UT32	UTILITY PLAN & PROFILE 32 SEWER & WATER LATERAL	
76	UT33	UTILITY PLAN & PROFILE 33 WATER LATERAL	
77	UT34	UTILITY PLAN & PROFILE 34 WATER LATERAL	
78	UT35	UTILITY PLAN & PROFILE 35 WATER LATERAL	
79	UT36	UTILITY PLAN & PROFILE 36 WATER LATERAL	
80	UT37	UTILITY PLAN & PROFILE 37 STORM DRAIN LATERAL	
81	UT38	UTILITY PLAN & PROFILE 38 STORM DRAIN LATERAL	
82	UT39	UTILITY PLAN & PROFILE 39 STORM DRAIN LATERAL	
83	UT40	UTILITY PLAN & PROFILE 40 STORM DRAIN LATERAL	
84	UT41	UTILITY PLAN & PROFILE 41 STORM DRAIN LATERAL	
85	UT42	UTILITY PLAN & PROFILE 42 STORM DRAIN LATERAL	
86	UT43	UTILITY PLAN & PROFILE 44 STORM DRAIN LATERAL	
87	UT44	UTILITY PLAN & PROFILE 45 STORM DRAIN LATERAL	
88	UT45	UTILITY PLAN & PROFILE 46 STORM DRAIN LATERAL	
89	UT46	UTILITY PLAN & PROFILE 47 STORM DRAIN LATERAL	
90	UT47	UTILITY PLAN & PROFILE 48 STORM DRAIN LATERAL	
91	UT48	UTILITY PLAN & PROFILE 49 STORM DRAIN LATERAL	
92	UT49	UTILITY PLAN & PROFILE 50 STORM DRAIN LATERAL	
93	UT50	UTILITY PLAN & PROFILE 51 STORM DRAIN LATERAL	
94	UT51	UTILITY PLAN & PROFILE 52 STORM DRAIN LATERAL	
95	UT52	UTILITY PLAN & PROFILE 53 STORM DRAIN LATERAL	
96	UT53	UTILITY PLAN & PROFILE 54 STORM DRAIN LATERAL	
97	UT54	UTILITY PLAN & PROFILE 55 STORM DRAIN LATERAL	
98	UT55	UTILITY PLAN & PROFILE 56 STORM DRAIN LATERAL	
99	UT56	UTILITY PLAN & PROFILE 57 STORM DRAIN LATERAL	
100	UT57	UTILITY PLAN & PROFILE 58 STORM DRAIN LATERAL	
101	UT58	UTILITY PLAN & PROFILE 59 STORM DRAIN LATERAL	
102	UT59	UTILITY PLAN & PROFILE 60 STORM DRAIN LATERAL	
103	FH1	FIRE HYDRANT LATERAL PROFILE 1	
104	FH2	FIRE HYDRANT LATERAL PROFILE 2	
105	FH3	FIRE HYDRANT LATERAL PROFILE 3	
106	FH4	FIRE HYDRANT LATERAL PROFILE 4	
107	TR1	TRAFFIC SIGNAGE AND STRIPING PLAN 1	
108	TR2	TRAFFIC SIGNAGE AND STRIPING PLAN 2	
109	TR3	TRAFFIC SIGNAGE AND STRIPING PLAN 3	
110	TR4	TRAFFIC SIGNAGE AND STRIPING PLAN 4	
111	TR5	TRAFFIC SIGNAGE AND STRIPING PLAN 5	
112	TR6	TRAFFIC SIGNAGE AND STRIPING PLAN 6	
113	TR7	TRAFFIC SIGNAGE AND STRIPING PLAN 7	
114	TR8	TRAFFIC SIGNAGE AND STRIPING PLAN 8	
115	TR9	TRAFFIC SIGNAGE AND STRIPING PLAN 9	
116	TR10	TRAFFIC SIGNAGE AND STRIPING PLAN 10	
117	SL1	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 1	
118	SL2	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 2	
119	SL3	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS AN - 3	
120	SL4	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 4	
121	SL5	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 5	
122	SL6	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 6	
123	SL7	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 7	
124	SL8	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 8	
125	SL9	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 9	
126	SL10	STREETLIGHTING & TRAFFIC SIGNAL UNDERGROUNDS PLAN - 10	
127	S1	STORM SEWER JUNCTION @53+60.73	
128	S2	MODIFIED TYPE C INLET	
129	S3	MODIFIED TYPE A INLET	
130	S4	PC RCB HEADWALL CONNECTION	

OWNER
HOWARD HUGHES COMPANY, LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

ENGINEERING FIRM
VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5146
PH. (702) 873-7550
FAX (702) 362-2597

BENCHMARK
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D388 (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

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 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.

FIRE DEPARTMENT APPROVAL
APPROVAL BY THE FIRE DEPARTMENT HAVING JURISDICTION IS REQUIRED PRIOR TO OBTAINING FINAL APPROVAL FROM THE LVVWD.

APPROVALS

LAS VEGAS FIRE & RESCUE DATE

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK DATE

"THE AFFIXED CENTURY LINK NEVADA 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

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NVENERGY 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.

COX COMMUNICATIONS LAS VEGAS, INC. DATE

---- ---- ----
SOUTHWEST GAS CORPORATION UID DATE

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT PLANNING AND ENGINEERING SERVICES

PROJECT:137706 FIRST APPROVED DATE:

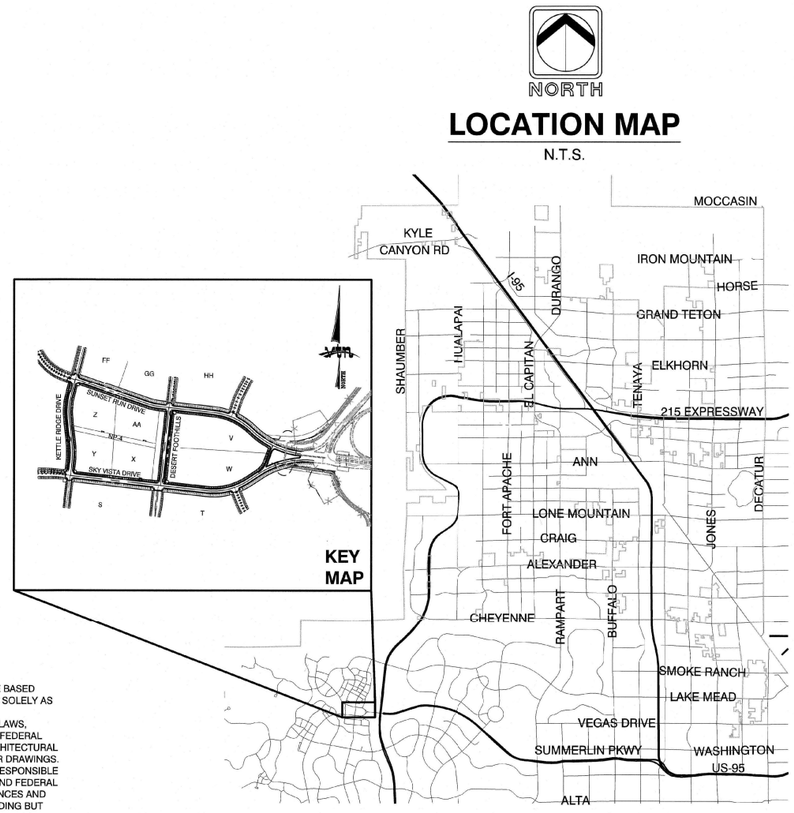
LVVWD APPROVED FIRE FLOW: TOTAL 1,500 GPM / ONSITE N/A GPM
SHEETS: 1, 2, 14-16, 45-111

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
Exp: 12/31/21
CIVIL
No. 15745
9/18/20

NORTH

LOCATION MAP

N.T.S.



THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER AND INTENDED SOLELY AS A GENERAL GUIDELINE FOR CONSTRUCTION. ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS AND ORDINANCES, INCLUDING BUT NOT LIMITED TO THE FEDERAL FAIR HOUSING AMENDMENTS ACT, AMERICANS WITH DISABILITIES ACT, THE ARCHITECTURAL BARRIERS ACT AND ANY APPLICABLE UNIFORM STANDARDS, SPECIFICATIONS OR DRAWINGS. THE PERSON OR ENTITY PERFORMING THE CONSTRUCTION SHALL BE SOLELY RESPONSIBLE TO MAKE SURE CONSTRUCTION IS IN CONFORMANCE WITH ALL LOCAL, STATE AND FEDERAL STATUES, LAWS, CODES, REGULATIONS, STANDARDS, GUIDELINES AND ORDINANCES AND FURTHER, IS IN CONFORMANCE WITH ANY APPLICABLE DESIGN CRITERIA, INCLUDING BUT NOT LIMITED TO SOILS REPORTS, TRAFFIC STUDIES, GEOTECHNICAL REPORTS, ARCHITECTURAL PLANS AND SPECIFICATIONS, DRAINAGE PLANS OR STUDIES AND ANY OTHER CRITERIA, STANDARDS OR REQUIREMENTS LISTED IN THE PLANS OR THE GENERAL NOTES RELATED TO THESE PLANS OR PROVIDED BY ANYONE IN REFERENCE TO THIS PROJECT.



REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE - SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

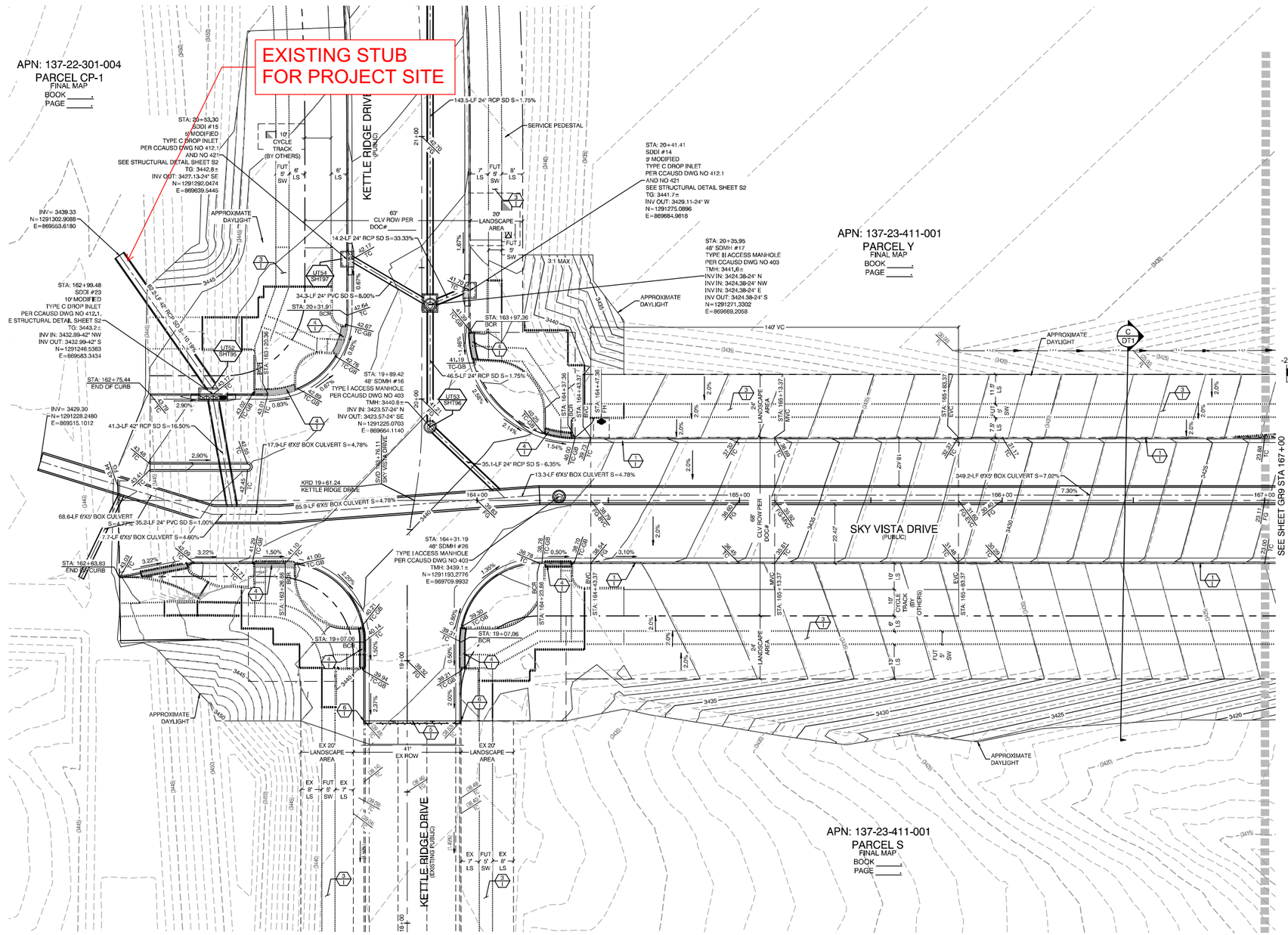
DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
BCC	DS1	WJM	7851		N/A
07/15/2020	07/15/2020	07/15/2020			VERT.

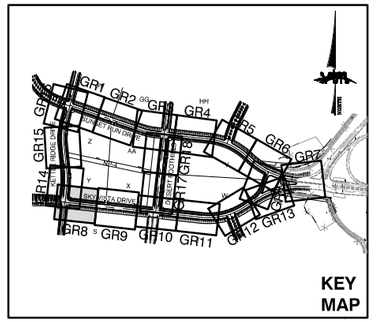
PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2020-09-14

SHEET
CV
1 OF 131 SHEETS

DRAWING NO.
PW20-17228
107V8463, L20-01569

H:\7851\Summerlin Parkway Extension\Sheet Set\7851 CV.dwg,8/1/2020 3:33 PM,trevor





BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 980.574 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

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 ORGIN):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 (984,250.00000 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.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER SUMMERLIN STD. DWG. S-47.
2. CONSTRUCT TYPE "A" CURB PER SUMMERLIN STD. DWG. S-50.
3. FUTURE SIDEWALK
4. FUTURE HANDICAP RAMP PER DETAILS ON DT SHEETS
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500-5 & #503
6. FIELD VERIFY AND MATCH EXISTING

CONSTRUCTION NOTE

UT # / SHT # — UTILITY PROFILE REFERENCE LABEL
UT #= SHEET INDEX
SHT# = SHEET NUMBER

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #GI-19-003, DATED AUGUST 9, 2019

SIGHT VISIBILITY ZONES:

NO STRUCTURE, WALLS, VEGETATION, OR OBJECT OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

FLOOD NOTE

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS,DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND TO BE MAINTAINED BY THE HOWARD HUGHES COMPANY.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS5159

WILLIAM J MEYER , P.E. No. 15745 DATE

Call before you Underground
1-702-455-7544
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5000
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

AVOID HITTING OVERHEAD POWER LINES, IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-642-2444
AND
1-702-455-7544
CLARK COUNTY TRAFFIC OPERATIONS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7540 FAX: (702) 362-2267 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

GRADING DRAINAGE PLAN 8

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

DRAWN BY: BCC — 07/15/2020
DESIGNED BY: DEH — 07/15/2020
CHECKED BY: WJM — 07/15/2020
PROJECT NO: 7951 — SCALE: 1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER — STATE OF NEVADA — WILLIAM J. MEYER — No. 15745 — EXP: 12/31/21 — CIVIL
2020-09-14

SHEET
GR8
26 OF 131 SHEETS

DRAWING NO.
107V8463
L20-01569

H:\7951\Summerlin Parkway Extension\Sheet Set\7951 GRD-2.dwg 9/26/2020 8:48 AM kcampbell

SEE UT17 FOR CONTINUATION

EXISTING STUB FOR PROJECT SITE

62.2-LF 42" RCP SD S=10.19% N28°44'56"W

INV= 3439.33 N=1291302.9088 E=869553.6180 CAP & STUB FUT. CONNECTION

34.3-LF 24" C900 PVC SD S=8.00% S53°19'54"E

INSTALL IRRIGATION SLEEVES SEE SHEET DT2

EX. 115.27-LF 30" M.CP WTR S=1.14% (C1554) (PZ 3665)

STA: 162+99.48 SDDI #23 10' MODIFIED TYPE C DROP INLET PER CCAUSD DWG NO 412.1 SEE STRUCTURAL DETAIL SHEET S2 TG: 3443.2± INV IN: 3432.99-42" NW INV OUT: 3432.99-42" S N=1291246.5363 E=869983.3434

STA: 163+82.11 48" SDMH #16 TYPE I ACCESS MANHOLE PER CCAUSD DWG NO 403 TMH: 3440.8± INV IN: 3423.57-24" N INV OUT: 3423.57-24" SE N=1291225.0703 E=869664.1140

INV= 3429.30 N=1291228.2480 E=869515.1012 CAP & STUB FOR FUTURE CONTINUATION

41.3-LF 42" RCP SD S=16.50% S3°43'55"E

EX. 45.00-LF 30" M.CP WTR S=1.14% (C1554) (PZ 3665)

68.60-LF 6'X5' BOX CULVERT S=4.77% N66°36'20"W

17.89-LF 6'X5' BOX CULVERT S=4.78% N83°43'07"W

85.94-LF 6'X5' BOX CULVERT S=4.78% S87°57'11"E

INV= 3428.22 N=1291212.3229 E=869544.3560 CAP & STUB FOR FUT. CONNECTION

7.66-LF 6'X5' BOX CULVERT S=4.60% S83°43'07"E

EX. 77.10-LF 30" M.CP WTR S=1.14% (C1554) (PZ 3665)

EX. 175.80-LF 30" M.CP WTR S=1.14% (C1554) (PZ 3665)

35.2-LF 24" PVC SD S=1.00% N32°02'32"E

45.4-LF 12" C-900 WTR (PZ 3550)

KETTLE RIDGE DRIVE (PUBLIC)

POC

143.5-LF 24" RCP SD S=1.75% N6°16'53"E

14.2-LF 24" RCP SD S=33.33% N73°37'36"E

46.5-LF 24" RCP SD S=1.75% N6°16'53"E

35.1-LF 24" RCP SD S=6.35% N40°07'23"W

STA: 163+82.11 48" SDMH #17 TYPE III ACCESS MANHOLE PER CCAUSD DWG NO 403 TMH: 3441.6± INV IN: 3424.38-24" N INV IN: 3424.38-24" NW INV IN: 3424.38-24" E INV OUT: 3424.38-24" S N=1291271.3302 E=869669.2058

33.1-LF 12" C-900 WTR (PZ 3550)

7.9' X 6' LVVWD EASEMENT PER

14.7-LF 6" DIP WTR (PZ 3550)

454.9-LF 12" C-900 WTR (PZ 3550)

FIRE HYDRANT 164+47.36

69.2-LF 12" C-900 WTR (PZ 3550)

STA: 164+31.19 48" SDMH #26 TYPE I ACCESS MANHOLE PER CCAUSD DWG NO 403 TMH: 3439.1± INV: 3425.69 N=1291193.2776 E=869709.9932

13.33-LF 6'X5' BOX CULVERT S=4.78% S87°57'11"E

APN: 137-23-411-001 PARCEL Y FINAL MAP BOOK ____ PAGE ____

CE LOT

SKY VISTA DRIVE (PUBLIC)

INSTALL IRRIGATION SLEEVES SEE SHEET DT2

349.19-LF 6'X5' BOX CULVERT S=7.02% S83°43'08"E

APN: 137-23-411-001 PARCEL S FINAL MAP BOOK ____ PAGE ____

CE LOT

10' CYCLE TRACK (BY OTHERS)

CLV ROW PER DOC#

MATCHLINE - STA 166+50 SEE SHEET UT10

UT54 SHT97 | UT53 SHT96 | UT52 SHT95 | UT32 SHT75 | FH4 SHT106

KEY MAP

GRAPHIC SCALE -20 0 10 20 40 1" = 20'

CONSTRUCTION NOTES

WATER

1W FIRE HYDRANT ASSEMBLY: INCLUDING 12"X6", 16"X6", 24"X6", OR 30"X6" TEE WITH 6" G.V. (PER UDACS PLATE NO. 39 & 40)
2W 12" GATE VALVE (PER UDACS PLATE 39)
3W 16" GATE VALVE (PER UDACS PLATE 39)
4W 12" CAP & BLOW OFF (PER UDACS PLATE 36)
5W 16" CAP & BLOW OFF (PER UDACS PLATE 36)
6W 12"X12" TEE (PER UDACS PLATE 31)
7W 16"X12" TEE (PER UDACS PLATE 31)
8W 24"X12" TAPPING SLEEVE WITH 12" TAPPING VALVE (PER UDACS PLATE 30, 34, AND 39)
9W 24"X16" TAPPING SLEEVE WITH 16" TAPPING VALVE (PER UDACS PLATE 30, 34, AND 39)
10W VERTICAL BEND (PER UDACS PLATE 31); SEE PROFILE FOR TYPE
11W 12" 5° BEND (PER UDACS PLATE 31)
12W 12" 45° BEND (PER UDACS PLATE 31)
13W 16" 5° BEND (PER UDACS PLATE 31)
14W 12"X16" REDUCER (PER UDACS PLATE 31)
15W 1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8
6" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17
12" C-900 AND DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17
16" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17
POC WATER POINT OF CONNECTION

CONSTRUCTION NOTES

SEWER

STANDARD MANHOLE W/ WATER TIGHT JOINTS & 24" MANHOLE COVER PER SD-1, SD-2, SD-3 SD-4 & SD-5
8" AND 12" C-900-16 SANITARY SEWER MAIN
16" C-900-16 SANITARY SEWER MAIN
SEWER CAP (PER STD 4.6 & 4.11)
POC SEWER POINT OF CONNECTION

RESTRAINTS NOTE:

ALL 6" AND 16" DIP FITTINGS AND JOINT TO BE RESTRAINED.

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS PER UDACS PLATE No. 15 AND 19.

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE: LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE: LOCATE MARKER 18' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

WATER MAIN JOINT DEFLECTION, PER UDACS 2.07.01 AND 2,07,03.

LVVWD ACCESS NOTE

TO ENSURE LVVWD ACCESS WITHIN EASEMENT, ALL ABOVE GROUND OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO, LANDSCAPE BOULDER, FENCES/WALLS (TO INCLUDE NO FOOTINGS), AND SIGNS ARE STRICTLY PROHIBITED WITHIN EASEMENT

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

Call before you Underground 1-702-455-7544 CLARK COUNTY TRAFFIC OPERATIONS AND 1-702-434-5000 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

AVOID ELECTRIC UNDERGROUND FACILITIES BY 10' HORIZONTALLY AT ALL TIMES

Call before you Dig Avoid cutting underground utility lines. It's costly. CALL 811 OR 1-800-642-2444 AND 1-702-455-7544 CLARK COUNTY TRAFFIC OPERATIONS

AVOID ELECTRIC OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DIG OVERHEAD 1-702-227-2929

WATER PRESSURE ZONE:

WATER SERVICES LOCATED IN THE 3435, 3550, AND 3665 PRESSURE ZONES.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT PLANNING AND ENGINEERING SERVICES

PROJECT:137706 FIRST APPROVED DATE:_____

SKY VISTA DRIVE (PUBLIC)

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'

NOTE:

PROVIDE 1" SACRIFICIAL CONCRETE FROM STA:164+23.75 TO STA:173+25.41

3445 3440 3435 3430 3425 3420 3415 3410 3405 3403

GB STA = 162+47.48 ELEV = 3442.14

-2.00%

7.66-LF 6'X5' BOX CULVERT S=4.60% S83°43'07"E

17.89-LF 6'X5' BOX CULVERT S=4.78% N83°43'07"W Q100=527 CFS V100=17.57 FPS

68.60-LF 6'X5' BOX CULVERT S=4.77% N66°36'20"W Q100=422 CFS V100=14.30 FPS

HGL

STA: 162+33.65 INV = 3429.30 CAP & STUB FOR FUTURE CONTINUATION

STA: 162+99.21 INV = 3426.03

STA: 163+06.86 INV = 3426.17

STA: 163+06.86 INV = 3425.67 FOR 42" SD LATERAL SEE SHEET UT55

24" RCP SD

STA: 163+24.75 INV = 3425.62

85.94-LF 6'X5' BOX CULVERT S=4.78% S87°57'11"E Q100=527 CFS V100=17.57 FPS

24" RCP SD

STA: 164+06.29 INV = 3421.32

STA: 164+10.45 INV = 3420.71

13.33-LF 6'X5' BOX CULVERT S=4.78% S87°57'11"E Q100=533 CFS V100=22.67 FPS

STA: 164+23.75 INV = 3420.08

GB STA = 164+13.37 ELEV = 3439.01

STA: 164+31.19 48" SDMH #26 TYPE I ACCESS MANHOLE PER CCAUSD DWG NO 403 TMH: 3439.1± INV: 3425.69 N=1291193.2776 E=869709.9932

STA: 164+43.37 BVC ELEV = 3438.74 FG

-2.90%

APPROXIMATE EXISTING GROUND @ CENTER LINE

FINISH GRADE @ CENTER LINE

7.1'

4' MIN 9' MAX

33.1-LF 12" C-900 WTR (PZ 3550)

12W STA: 164+14.29 INV = 3434.57

EX. 30" MLCP WTR (PZ 3665) (C1554)

18' MIN

INV = 3433.85 STA: 164+47.36 2W 1W

140.00' V.C. PVI STA= 165+13.37 PVI ELEV= 3436.71 K= 31.89 A.D. = 4.39%

STA: 165+83.37 EVC ELEV = 3431.61 FG

-7.09%

4' MIN 9' MAX

454.9-LF 12" C-900 WTR (PZ 3550)

349.19-LF 6'X5' BOX CULVERT S=7.02% S83°43'08"E Q100=533 CFS V100=23.19 FPS

HGL

STA: 166+50.00 INV = 3421.49

STA: 166+50.00 INV = 3404.19

3443.10 EG | 3442.83 EG | 3441.43 EG | 3441.88 FG | 3439.90 EG | 3440.88 FG | 3438.48 EG | 3439.88 FG | 3437.06 EG | 3438.34 FG | 3435.68 EG | 3436.80 FG | 3434.24 EG | 3435.84 FG | 3429.46 EG | 3430.40 FG | 3425.69 EG | 3426.75 FG

162+25 | 163+00 | 164+00 | 165+00 | 166+00 | 166+50

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7540 FAX (702) 362-2267 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● LANDERS ● AND SURVEYORS

UTILITY PLAN & PROFILE 9
162+50 TO 166+50

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

REV	DATE	BY	REVISION

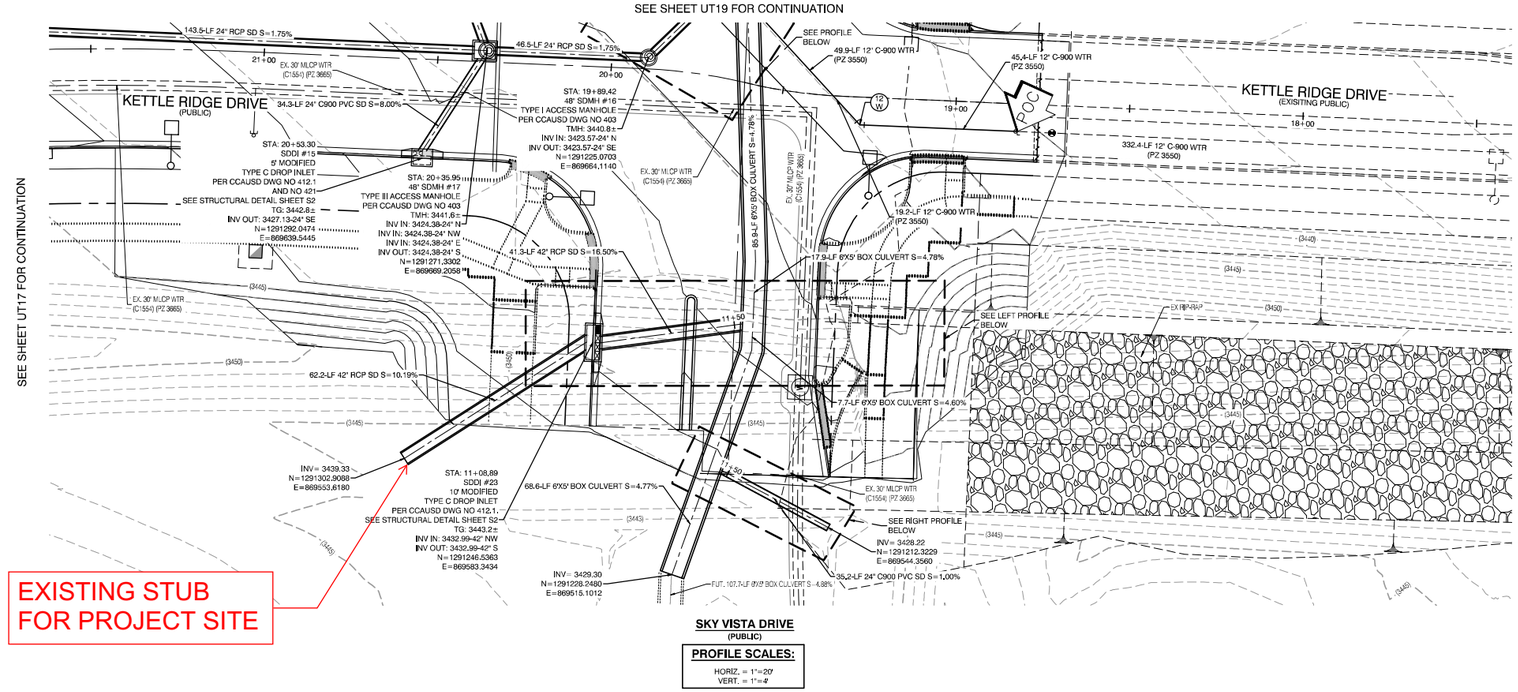
DRAWN BY: KTC/TJR
DESIGNED BY: CP
CHECKED BY: WJM
PROJECT NO: 7851
DATE: 07/15/2020 | 07/15/2020 | 07/15/2020
SCALE: HORIZ: 1"=20' VERT: 1"=4'

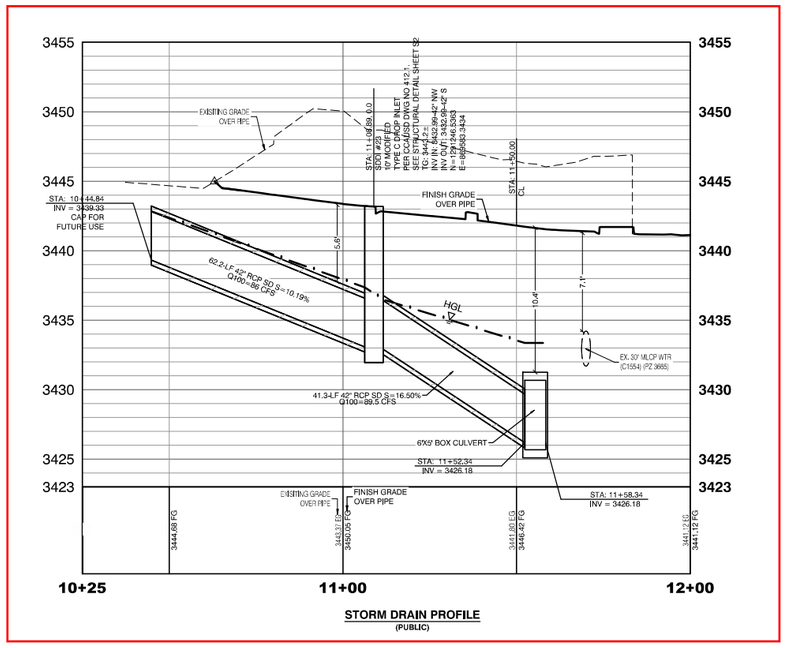
PROFESSIONAL ENGINEER STATE OF NEVADA WILLIAM J. MEYER EXP: 12/31/21 CIVIL NO. 15745
2020-09-14

SHEET UT9
52 OF 131 SHEETS

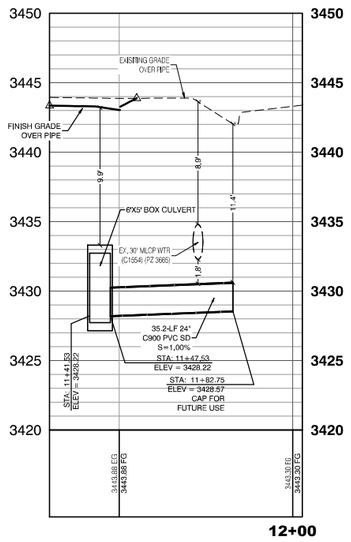
DRAWING NO. 107V8463 L20-01569

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STORM DRAIN PROFILE
(PUBLIC)



STORM DRAIN PROFILE
(PUBLIC)

CONSTRUCTION NOTES

SEWER

- STANDARD MANHOLE W/ WATER TIGHT JOINTS & 24" MANHOLE COVER PER SD-1, SD-2, SD-3 SD-4 & SD-5
- 8" AND 12" C-900-16 SANITARY SEWER MAIN
- 16" C-900-16 SANITARY SEWER MAIN
- SEWER CAP (PER STD 4,6 & 4,11)
- SEWER POINT OF CONNECTION

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS PER UDACS PLATE No, 15 AND 19.

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

WATER MAIN JOINT DEFLECTION, PER UDACS 2.07.01 AND 2.07.03.

LVVWD ACCESS NOTE

TO ENSURE LVVWD ACCESS WITHIN EASEMENT: ALL ABOVE GROUND OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO, LANDSCAPE BOULDER, FENCES/WALLS (TO INCLUDE NO FOOTINGS), AND SIGNS ARE STRICTLY PROHIBITED WITHIN EASEMENT

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

Call before you Underground
1-702-455-7544
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5000
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
AND
1-702-455-7544
CLARK COUNTY TRAFFIC OPERATIONS

AVOID LIFTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DIG OVERHEAD
1-702-227-2929

CONSTRUCTION NOTES

WATER

- FIRE HYDRANT ASSEMBLY; INCLUDING 12"X6", 16"X6", 24"X6", OR 30"X6" TEE WITH 6" G.V. (PER UDACS PLATE NO. 39 & 40)
- 12" GATE VALVE (PER UDACS PLATE 39)
- 16" GATE VALVE (PER UDACS PLATE 39)
- 12" CAP & BLOW OFF (PER UDACS PLATE 36)
- 16" CAP & BLOW OFF (PER UDACS PLATE 36)
- 12"X12" TEE (PER UDACS PLATE 31)
- 16"X12" TEE (PER UDACS PLATE 31)
- 24"X12" TAPPING SLEEVE WITH 12" TAPPING VALVE (PER UDACS PLATE 30, 34, AND 39)
- 24"X16" TAPPING SLEEVE WITH 16" TAPPING VALVE (PER UDACS PLATE 30, 34, AND 39)
- VERTICAL BEND (PER UDACS PLATE 31). SEE PROFILE FOR TYPE
- 12" 5° BEND (PER UDACS PLATE 31)
- 12" 45° BEND (PER UDACS PLATE 31)
- 16" 5° BEND (PER UDACS PLATE 31)
- 12"X16" REDUCER (PER UDACS PLATE 31)
- 1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8
- 6" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17
- 12" C-900 AND DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17
- 16" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17
- WATER POINT OF CONNECTION

FLOOD NOTE

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND TO BE MAINTAINED BY THE HOWARD HUGHES COMPANY.

WATER PRESSURE ZONE:

WATER SERVICES LOCATED IN THE 3435, 3550, AND 3665 PRESSURE ZONES.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT PLANNING AND ENGINEERING SERVICES

PROJECT:137706 FIRST APPROVED DATE:_____

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NV 89135
702-791-4000

CITY OF LAS VEGAS

2127 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7540 FAX (702) 362-2267 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 53
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
KTC/TJR	CP	WJM	7861	1"=20' 1"=4'	VERT.
07/15/2020	07/15/2020	07/15/2020			

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2020-09-14

SHEET
UT52
95 OF 131 SHEETS

DRAWING NO.
107V8463
L20-01569

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UPDATE #1 TO THE
TECHNICAL DRAINAGE STUDY FOR
SUMMERLIN VILLAGE 25 FOX HILL DRIVE IMPROVEMENTS

62025-210

August 2020

Prepared for:

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

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: August 20, 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 Village 25 - Fox Hill Drive Improvements (Sky Vista Drive to Grand Park Boulevard) – Update #1**			**COPIES TO:** GCW Inc.
Cross Streets:	Fox Hill Drive and Sky Vista Drive		Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5218D.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 **X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	11/19/2019	12/12/2019	Not Approved	$400.00	3651171: $400
2nd submittal	1/6/2020	1/28/2020	Conditional Approval	$400.00	3696440: $400
CCRFCD	4/20/2020	5/18/2020	Concurrence Recv'd	N/C	N/C
3rd Submittal	8/6/2020	8/20/2020	See Comments Below	$100.00	3945663: $100
			TOTAL FEES (LDDRS):	**$900.00**	**----**

REMARKS:

3rd Submittal: Update #1 to revise the geometry of the intersection at Fox Hill Drive and Sky Vista Drive

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 project proposed to construct temporary drainage facilities including drainage berms/ditches along the south side of *Fox Hill Drive, Ditch 1* at the northwest corner of the intersection of *Fox Hill Drive* and *Sky Vista Drive* and *Ditch 2* at the intersection of *Fox Hill Drive* and *Grand Park Boulevard*. 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.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale 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
HDR/AYS

T/R/S: T20S/R59E/22
AREA K-22

SHOWN AS SECTION 3 ON PROPOSED FIGURE

Worksheet for Section 2 - Interim Condition Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.45000	%
Discharge	17.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.58	0.00
0+02.00	0.13
0+02.00	0.17
0+20.50	0.54
0+39.00	0.17
0+39.00	0.13
0+40.42	0.00
0+40.50	0.50
0+41.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+41.00, 0.50)	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	0.45	ft
Elevation Range	0.00 to 0.54 ft	

Worksheet for Section 2 - Interim Condition Q100

Results

Flow Area		5.16	ft²
Wetted Perimeter		32.23	ft
Hydraulic Radius		0.16	ft
Top Width		31.36	ft
Normal Depth		0.45	ft
Critical Depth		0.51	ft
Critical Slope		0.67711	%
Velocity		3.29	ft/s
Velocity Head		0.17	ft
Specific Energy		0.62	ft
Froude Number		1.43	
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	0.45	ft
Critical Depth	0.51	ft
Channel Slope	1.45000	%
Critical Slope	0.67711	%

Cross Section for Section 2 - Interim Condition Q100

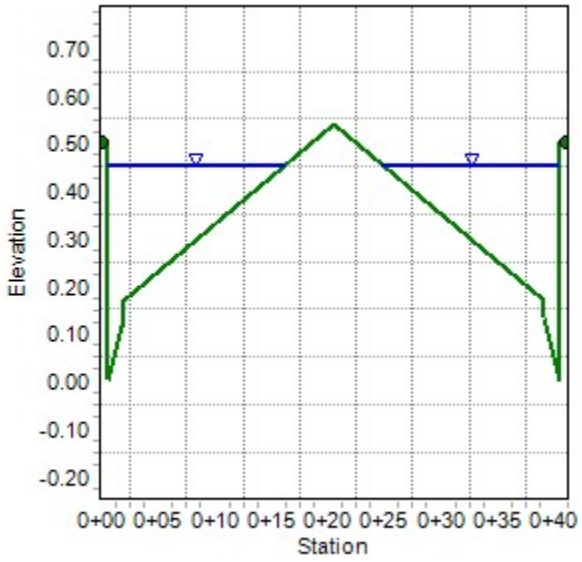
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.45000	%
Normal Depth	0.45	ft
Discharge	17.00	ft³/s

Cross Section Image



Interim Condition Draiange Basin Flow Rate		
Basin ID	Area (ac)	100-Year Flow Rate (cfs)
^FOX1	3.39	14
^FOX2	1.06	5
^FOX3	1.51	7
^RES3	1.97	9
^N	9.91	40

Note: "^" Refers to reference material from the Master Conceptual Drainage Study for Summerlin West Village 25

100-YEAR FLOW CHARACTERISTICS INTERIM CONDITION					
Cross Section	Slope (%)	Q_{100} (cfs)	Depth (ft)	Velocity (ft/s)	D*V
1	4.50	10	0.34	4.47	1.52
2	1.45	17	0.45	3.29	1.48
3	1.45	17	0.55	3.86	2.12

Inteirm Condition 100-YEAR Ditch Characteristics						
Ditch	Slope (%)	Q_{100} (cfs)	Depth of flow (ft)	Velocity (ft/s)	Bottom Width (ft)	Reqd d_{50} (in)
Ditch 1	1.70	40	1.06	4.60	5	6
Ditch 2	2.15	14	1.08	3.99	0	6

REFERENCED ADJACENT STREET SECTION

INLETS CUT OFF ALL UPSTREAM FLOW SEE UPSTREAM FOX HILL STUDY

PROJECT SITE

5 cfs per Triple Roadway Study, 4 cfs collected by inlets in Park Bluff Lane

NORTH

135 0 135 Feet

1 in = 100 ft

13722 Section 22 Township 20 Range 59

^FOX1 ^FOX2 ^FOX3 ^RES3 ^RES4 ^STAA ^N

*OFF1-1 *OFF1-2 *OFF1-3 *OFF1-4 *OFF1-5 *OFF1-6 *OFF2-1 *OFF2-2

PARCEL K PARCEL L PARCEL M PARCEL N PARCEL NP-1 PARCEL ES-1 PARCEL I PARCEL H

Fox Hill Dr (Proposed) Fox Hill Dr (Existing) Redpoint Dr (Existing) Grand Park Blvd (Existing) Park Bluff Ln (Existing) Foxtail Pass Way (Existing) Sky Vista (Existing) Acc W Lake Mead Blvd

Existing Ditch Ditch 1 Ditch 2

EX 36" RCP EX 42" RCP CAPPED EX 54" RCP EX 60" RCP EX 42" RCP

APDF0125

14 cfs 10 cfs 5 cfs

INT 19 cfs INT 65 cfs ULT 53 cfs INT 46 cfs DC-1 + K + STL (ULT 176 cfs) (ULT 223 cfs) INT 16 cfs INT 18 cfs ULT 48 cfs (ULT 225 cfs) (ULT 239 cfs) (ULT 276 cfs) (DES 287 cfs) INT 3 cfs INT 68 cfs ULT 42 cfs (ULT 172 cfs) (ULT 149 cfs)

Legend

Flow Dircetion
Cross Section
Interim Basins

Ditch

Existing
Proposed
Referenced Basins

Existing SD
Proposed SD
Future Storm Drain Facility
V25 Land Plan
Ultimate Parcel Boundary
5 ft_Contour

*Clark County Department of Comprehensive Planning, GISMO

DATE: _____

REV.	DATE	DESCRIPTION	DATE	AGEN APPL	DATE	GCW APPL

PROJECT NO. 62025-210

DESIGN: _____
DRAWN: _____
CHECK: _____
PLOT DATE: 01/06/2020
PLOT TIME: 11:32:34 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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check

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 FOX HILL DRIVE IMPROVEMENTS
SKY VISTA DRIVE TO GRAND PARK BOULEVARD

INTERIM CONDITION DRAINAGE MAP

DRAWING
FIG5
1 OF 1 SHTS

GCW
ENGINEERS \ SURVEYORS

2nd Response to Comments for the Technical Drainage Study for Village 25 Fox Hill Drive

Grand Park Boulevard to Park Drift Trail

62025-212

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.

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: July 28, 2021
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 Village 25 - Fox Hill Drive Improvements (Grand Park Boulevard to Park Drift Trail)**		**COPIES TO:** GCW Inc.
Cross Streets:	Fox Hill Drive and Grand Park Boulevard		Howard Hughes Company, LLC.
File Number:	F:\Depot\DSMemos\DS5383D.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-22-301-006		CCRFCD
Zoning Action:	N/A		
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	11/6/2020	11/18/2020 & 11/30/2020	Not Approved	$400.00	4061100: $400
2nd Submittal	12/23/2020	1/7/2021	Not Approved	$400.00	4110804: $400
3rd Submittal	1/27/2021	2/17/2021	Conditional Approval	$400.00	4145134: $400
CCRFCD	7/15/2021	7/28/2021	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	**$1,200.00**	**----**

REMARKS:

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

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

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
HDR/AYS

T/R/S: T20S/R59E/22
AREA K-22

CALCULATION REFERENCED TO SHOW INLETS UPSTREAM OF THE PROJECT SITE IN FOX HILL INTERCEPT ALL FLOW

Worksheet for Section 1 - Q100 ^FOX1 - Inlet Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	9.26000	%
Discharge	14.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.13
0+02	0.17
0+21	0.54
0+39	0.17
0+39	0.13
0+40	0.00
0+41	0.50
0+41	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+41, 0.50)	0.016

Options

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

Results

Normal Depth	0.34	ft
Elevation Range	0.00 to 0.54 ft	

Worksheet for Section 1 - Q100 ^FOX1 - Inlet Slope

Results

Flow Area		2.19	ft²
Wetted Perimeter		20.32	ft
Hydraulic Radius		0.11	ft
Top Width		19.65	ft
Normal Depth		0.34	ft
Critical Depth		0.48	ft
Critical Slope		0.69063	%
Velocity		6.40	ft/s
Velocity Head		0.64	ft
Specific Energy		0.97	ft
Froude Number		3.39	
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	0.34	ft
Critical Depth	0.48	ft
Channel Slope	9.26000	%
Critical Slope	0.69063	%

Cross Section for Section 1 - Q100 ^FOX1 - Inlet Slope

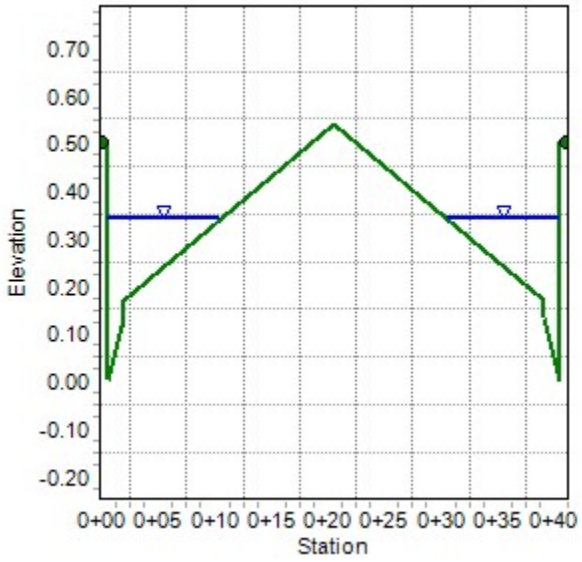
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	9.26000	%
Normal Depth	0.34	ft
Discharge	14.00	ft³/s

Cross Section Image



CALCULATION REFERENCED TO SHOW INLETS UPSTREAM OF THE PROJECT SITE IN FOX HILL INTERCEPT ALL FLOW

GCW ENGINEERS \ SURVEYORS

Drop Inlet Sizing Calculation

Project Name: Village 25 Fox Hill Drive Improvements (Grand Park Blvs. To Drift Trail)
By: CB
Date: 12/12/2019

Drop Inlet Sizing on a Continuous Grade

15' Type DM2

DI #1.1 & DI 1.2 - Q= ^FOX1

Known:

Q_s=	Street Flow	7.00	cfs
S_o=	Longitudinal Slope	0.0926	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	6.40	fps
D=	Flow Depth	0.34	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	12.5	ft
L_c=	Length of Curb Opening	15.0	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†	11.01	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.41	
	Q_w= Frontal flow=A_w*V_s	2.86	cfs
	Q_x= Side flow = Q_s-Q_w	4.14	cfs
R_s=	Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/(S_x*(L_g*(1-C_{fg}/100))$^{2.3}$))	0.24	
Q_{ig}=	Flow intercepted = [R_f*E_o+R_s*(1-E_o)]*Q_s	3.9	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	0.137	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)$^{0.6}$	26.24	ft
Q_{ic}=	Flow intercepted = (1-(1-(L_c*(1-C_{fc}/100))/L_t)$^{1.8}$)*Q_s	3.2	cfs

Total Inlet Calculations

Q_{ti}=	**Total flow intercepted = Q_{ig}+Q_{ic}**	**7.0**	**cfs**
Q_{tq}=	**Flow bypass = Q_s-Q_{ti}**	**0.0**	**cfs**
q=	Interception per unit ratio = Q_{ti}/L_g	0.47	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Basin ID	Area (ac)	100-Year Flow Rate (cfs)
^FOX1	3.39	14
^FOX2	1.06	5
*OFF1-1	14.90	19
*OFF1-2	1.70	2
*OFF1-3	12.60	16
*OFF1-4	2.20	3
*OFF1-5	18.00	23
*OFF1-6	6.40	8
*OFF2-1	13.50	23
*OFF2-2	13.50	23
^STAA	0.44	2
^RES3	1.97	9
^RES4	1.60	7

100-YEAR FLOW CHARACTERISTICS
INTERIM & ULTIMATE CONDITION

Cross Section	Slope (%)	Q_{100} (cfs)	Depth (ft)	Velocity (ft/s)	D*V
1 Max. Slope	9.56	14	0.34	6.48	2.20
1 Min. Slope	4.50	14	0.37	4.84	1.79
1 Inlet Slope	9.26	14	0.34	6.40	2.18

NORTH
135 0 135 Feet
1 in = 100 ft

Park Drift Trail (Street K)
Existing Ditch
^FOX1
Fox Hill Dr (Proposed)
14 cfs
1
DI #1.1 & DI #1.2
PARCEL CP-1
APDF0125
INLETS INTERCEPT ALL UPSTREAM FLOW
*OFF1-1
PARCEL L
^FOX2
Fox Hill Dr (Existing)
*OFF1-5
*OFF2-1
PARCEL K
INT 46 cfs
INT 69 cfs
ULT 93 cfs
INT 19 cfs
Existing Ditch
EX 36" RCP
PARCEL M
*OFF1-3
5 cfs
DC-1 K + STL
(ULT 170 cfs)
EX 42" RCP CAPPED
(ULT 223 cfs)
Redpoint Dr (Existing)
INT 16 cfs
INT 18 cfs
ULT 46 cfs
Park Bluff Ln (Existing)
*OFF1-6
*OFF1-2
^RES3
Grand Park Blvd (Existing)
^RES4
EX 54" RCP
PARCEL ES-1
EX 36" RCP
(ULT 230 cfs)
(ULT 225 cfs)
(ULT 228 cfs)
^N
PARCEL N
Foxtail Pass Way (Existing)
PARCEL NP-1
^STAA
*OFF1-4
INT 3 cfs
(DES 237 cfs)
PARCEL J
PARCEL DC-1
*OFF2-2
PARCEL I
INT 68 cfs
ULT 42 cfs
(INT 77 cfs)
(ULT 149 cfs)
Ex 60" RCP
EX 42" RCP
EX 36" RCP
PARCEL H

Legend
- Flow Dircetion
- Cross Section
- Interim Basins

Ditch
- Existing
- Proposed
- Referenced Basins
- V25 Land Plan
- Ultimate Parcel Boundary
- Existing SD Facility
- 5 ft_Contour

CCRFCD Basins
- COM
- CON
- PRO
- TN1
- TN2

DATE:
GCW APP'D
DATE
AGEN APP'D
DATE
DESCRIPTION
REV
DATE

PROJECT NO.
62025-212
DESIGN
DRAWN:
CHECK:
PLOT DATE: 12/21/2020
PLOT TIME: 3:04:58 PM

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\8000\62025-212\Division\Fdd\Figures\GIS-FIG5.mxd
CBeck

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 FOX HILL DRIVE IMPROVEMENTS
GRAND PARK BOULEVARD TO PARK DRIFT TRAIL

INTERIM CONDITION DRAINAGE MAP

DRAWING
FIG5
1 OF 1 SHTS

GCW
ENGINEERS \ SURVEYORS

UPDATE #2 TO THE TECHNICAL DRAINAGE STUDY FOR

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS (REDPOINT DRIVE TO KETTLE RIDGE DRIVE)

62025-206

May 2021

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: September 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 Village 25 - Sky Vista Drive Improvements (Redpoint Drive to Kettle Ridge Drive) - Update**			**COPIES TO:** GCW, Inc.
Cross Streets:	Sky Vista Drive and Redpoint Drive		April Chapman Director, Residential Engineering Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5187F.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-26-301-001		CCRFCD
Zoning Action:	N/A		
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	9/3/2019	9/23/2019	Not Approved	$400.00	3553608: $400
2nd Submittal	11/13/2019	12/9/2019	Not Approved	$400.00	3643003: $400
3rd Submittal	12/31/2019	1/22/2020	Not Approved	$400.00	3690620: $400
4th Submittal & Supplement	2/4/2020 & 2/27/2020	2/24/2020 & 3/2/2020	Conditional Approval	$400.00	3733577: $400
CCRFCD	4/13/2020	5/5/2020	Concurrence Recv'd	N/C	N/C
5th Submittal & Supplement	8/5/2020 & 9/9/2020	9/10/2020	See Comments Below	$100.00	3945926: $100
			TOTAL FEES (LDDRS):	**$1,700.00**	**----**

REMARKS:

5th Submittal & Supplement: Update

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:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
X	is conditionally approved subject to the following conditions:

1. The subject drainage study is premised on the existence of storm drains downstream, ie, the continuation of the outlet storm drains until *Desert Foothills Boulevard* as proposed in the *Summerlin West Village 21 Summerlin Parkway Extension* project.

   The subject drainage study will not be finally approved prior to the final approval of the *Summerlin West Village 21 Summerlin Parkway Extension Technical Drainage Study.*

2. The project proposed to construct temporary drainage facilities including drainage berms/ditches primarily along the north side of the proposed segment of *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* 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.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.

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/AYS

T/R/S: T20S/R59E/22
AREA K-22

SHOWN AS SECTION 4 ON PROPOSED FIGURE

Worksheet for Section - 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.00	%
Discharge	3.50	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+45.67	1.04

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+45.67, 1.04)	0.016

Options

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

Results

Normal Depth	0.34	ft
Elevation Range	0.00 to 1.04 ft	
Flow Area	1.16	ft²
Wetted Perimeter	10.54	ft
Hydraulic Radius	0.11	ft
Top Width	10.15	ft
Normal Depth	0.34	ft

Worksheet for Section - 3

Results

Critical Depth		0.39	ft
Critical Slope		0.00761	ft/ft
Velocity		3.01	ft/s
Velocity Head		0.14	ft
Specific Energy		0.48	ft
Froude Number		1.57	
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	0.34	ft
Critical Depth	0.39	ft
Channel Slope	2.00	%
Critical Slope	0.00761	ft/ft

Cross Section for Section - 3

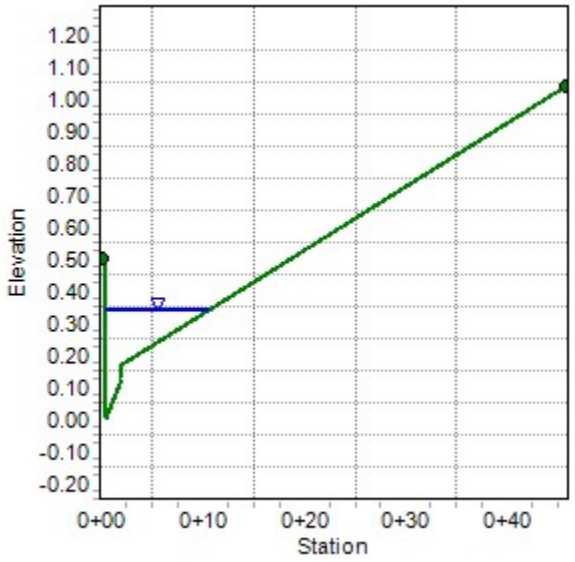
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.00	%
Normal Depth	0.34	ft
Discharge	3.50	ft³/s

Cross Section Image



NORTH

160 0 160 320 Feet

1 in = 160 ft

APDF0128

APDF0125

APDF0127

OFF1*

OFF1-2

OFF1-1

OFF2*

OFF2-1

GPDB

PROJECT SITE

CPF

CPSK

CPSK2

CPT

CSTAA

CNP-1

EX Channel

APDF0123 FUTURE 6'X3' RCB

APDF0123 PROP. 6'X3' RCB

Sky Vista Dr (Proposed)

Future Sky Vista Dr (Future) Design Grades TBD

Future Sky Vista Dr (Future)

Ex Sky Vista Dr (Existing)

Ex Sky Vista Dr (Existing)

Future Sky Vista Dr (Future)

Ex Sky Vista Dr (Existing)

Ex Sky Vista Dr (Existing)

Future Sky Vista Dr (Future)

Ex Sky Vista Dr (Existing)

Ex Sky Vista Dr (Existing)

Ex Sky Vista Dr (Existing)

Ex Sky Vista Dr (Existing)

Future Sky Vista Dr (Future)

Ex Sky Vista Dr (Existing)

Future Sky Vista Dr (Future)

By Others

By Others

Ex Sky Vista Dr (Existing)

Ex Sky Vista Dr (Existing)

Future Sky Vista Dr (Future

GCW

ENGINEERS \ SURVEYORS

Update #2 to the Technical Drainage Study for

Village 25 Sunset Run Drive Improvements (Kettle Ridge Drive to Scurry Bend Drive)

62025-218

April 2022

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

Prepared by GCW, Inc.

1555 South Rainbow Blvd
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CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: April 28, 2022
TO: **Land Development Services** Department of Building & Safety				**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:			**COPIES TO:**
Summerlin West Village 25 - Sunset Run Drive – Update #2 (Kettle Ridge Dr. to Scurry Bend Dr.)				GCW, Inc.
Cross Streets:	Kettle Ridge Dr. and Sunset Run Dr.			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5406E.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-210-001, 137-22-301-006			CCRFCD
Zoning Action:	N/A			
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	1/11/2021	1/25/2021	Not Approved	$400.00	4127335: $400
2nd Submittal	2/25/2021	3/16/2021	Approved	$400.00	4180489: $400
3rd Submittal	5/11/2021	6/1/2021	Not Approved	$100.00	4286848: $100
4th Submittal	6/7/2021	6/21/2021	Approved	N/C	N/C
5th Submittal	4/12/2022	4/28/2022	See Comments Below	$100.00	4736394: $100
			TOTAL FEES (LDDRS):	**$1,000.00**	**----**

REMARKS:

5th Submittal: Update #2 to add a driveway entrance with a turn lane from the median

3rd & 4th Submittals: Update and Supplement for minor revision of upstream basins and addition of one drop inlet

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 project proposes to build temporary drainage facilities including drainage berms/swales along the both sides of the proposed *Sunset Run 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
HDR/AYS

T/R/S: T20S/R59E/22
AREA K-22

CURVE NUMBERS FOR SOILS

Soil # 156 Vace - Wechech association				
Soil	Percent	Group	Existing$_1$	Open Space$_3$
Vace and Similar	45%	D	88	89
Wechech and Similar	25%	D	88	89
Wechech, steep, and similar	15%	D	88	89
Weiser	8%	B	77	79
Irongold	4%	D	88	89
Commski	2%	B	77	79
Threelakes	1%	A	63	68
Total	**100%**		**86.7**	**87.8**

Notes:

1- Referenced from Table 602 (4 of 4) Desert Shrub Poor Condition
2- Referenced from Table 602 (1 of 4), Open space (Poor Condition)

Curve Number Calculations for Basins

Basin	Type	Soil	Existing$_1$	Open Space$_2$	CN Value
UNDEVELOPED BASINS					
OFF1	156	100%	100%		**86.7**
OFF2	156	100%		100%	**87.8**

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Sunset Run Drive (KRD to SBD)
W.O. # 7919-MISC-9 **CALCULATED BY:** FH

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Non-urban		Urbanized	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
UNDEVELOPED BASINS								
OFF1	1015	3529	3465	0.063	14.8	3.7	29.4	7.4
OFF2	1301	3547	3460	0.067	14.8	3.8	29.4	7.6

STANDARD FORM 4

DEVELOPMENT: Sunset Run Drive (KRD to SBD)

CONDITION: Interim

W.O. # 7919-MISC-9 **CALCULATED BY:** FH

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Non-Urban:		Urban	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39 \qquad T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
UNDEVELOPED BASINS																	
OFF1	86.7	0.754	3.63	0.0057	87	10.3	2.68	1015	6.3	3.7	7.4	3.40	1102	16.12	6.08	0.061	Tlag= 0.1 Min NON-URB
OFF2	87.8	0.769	13.24	0.0207	77	3.3	3.51	1301	6.7	3.8	7.6	3.93	1378	17.66	7.45	0.074	Tlag= 0.1 Min NON-URB

```
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   12FEB20  TIME  16:06:52*                                  *          (916) 756-1104            *
 *                                    *                                  *                                    *
 **************************************                                  **************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID    INTERIM CONDITION HYDROLOGIC MODEL
              2         ID    INPUT FILE DATE = JANUARY 28, 2020
              3         ID    DESIGN STORM = 100-YEAR 6-HR STORM
              4         ID    STORM DISTRIBUTION = SDN #3
              5         ID    MODELED BY VTN (FH)
              6         ID
              7         ID    ******************************************************
              8         ID    * SUMMERLIN WEST VILLAGE 25                          *
              9         ID    * SUNSET RUN DRIVE                                   *
             10         ID    ******************************************************
             11         ID
             12         ID
             13         ID
             14         ID   10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
             15         IT       5       0       0     300
             16         IN       5       0       0
             17         IO       5       0       0
             18         JR    PREC    1.00
                        *

             19         KK    OFF1
             20         KM   OFFSITE BASIN
             21         BA  0.0057
             22         PB    3.44
             23         PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
             24         PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
             25         PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
             26         PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
             27         PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
             28         PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
             29         PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
             30         PC   0.998   0.999       1
             31         LS       0    86.7
             32         UD    0.10
                        *

             33         KK    OFF2
             34         KM   OFFSITE BASIN
             35         BA  0.0207
             36         PB    3.44
             37         LS       0    87.8
             38         UD    0.10
                        *

             39         KK   COFF1
             40         KM   COMBINE OFF1 AND OFF2
             41         HC       2
                        *
             42         ZZ
1
                  SCHEMATIC DIAGRAM OF STREAM NETWORK
```

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

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

   19        OFF1
                .
                .
   33           .        OFF2
                .          .
                .          .
   39       COFF1.............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
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   12FEB20  TIME  16:06:52  *                                  *           (916) 756-1104             *
 *                                      *                                  *                                      *
 ****************************************                                  ****************************************



                          INTERIM CONDITION HYDROLOGIC MODEL
                          INPUT FILE DATE = JANUARY 28, 2020
                          DESIGN STORM = 100-YEAR 6-HR STORM
                          STORM DISTRIBUTION = SDN #3
                          MODELED BY VTN (FH)

                          ******************************************************
                          * SUMMERLIN WEST VILLAGE 25                          *
                          * SUNSET RUN DRIVE                                   *
                          ******************************************************



                        10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

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

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

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE   24.92 HOURS

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

      JP          MULTI-PLAN OPTION
                        NPLAN          1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00
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


                                                                RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                        1.00

 HYDROGRAPH AT
+                  OFF1       .01     1   FLOW          11.
                                           TIME         3.50

 HYDROGRAPH AT
```

```
+                   OFF2       .02     1   FLOW          40.
                                           TIME         3.50

  2 COMBINED AT
+                  COFF1       .03     1   FLOW          51.
                                           TIME         3.50


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

Worksheet for Section 2 Min Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.87 %
Discharge	13.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.16
0+00.00	0.66
0+24.67	0.17
0+24.67	0.13
0+26.17	0.00
0+26.17	0.50
0+26.67	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.16)	(0+26.67, 0.50)	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	0.49 ft
Roughness Coefficient	0.016
Elevation	0.49 ft
Elevation Range	0.00 to 1.16 ft
Flow Area	3.2 ft²
Wetted Perimeter	18.21 ft
Hydraulic Radius	0.18 ft
Top Width	17.67 ft
Normal Depth	0.49 ft
Critical Depth	0.57 ft
Critical Slope	0.64 %
Velocity	4.02 ft/s
Velocity Head	0.25 ft
Specific Energy	0.74 ft

Worksheet for Section 2 Min Slope

Results	
Froude Number	1.655
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	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.49 ft
Critical Depth	0.57 ft
Channel Slope	1.87 %
Critical Slope	0.64 %

Cross Section for Section 2 Min Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.87 %
Normal Depth	0.49 ft
Discharge	13.00 cfs

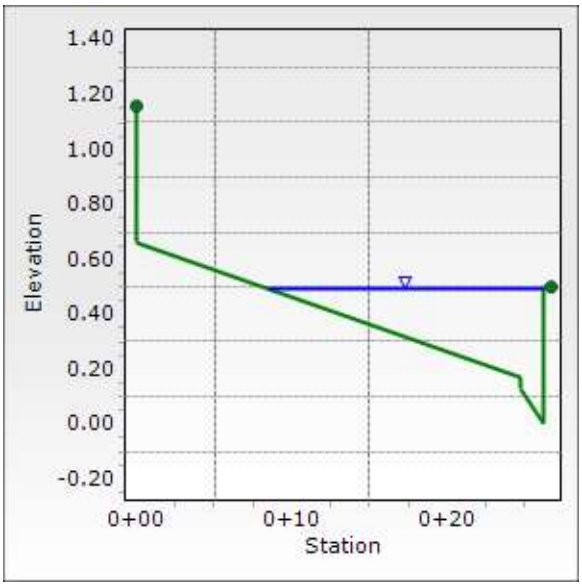
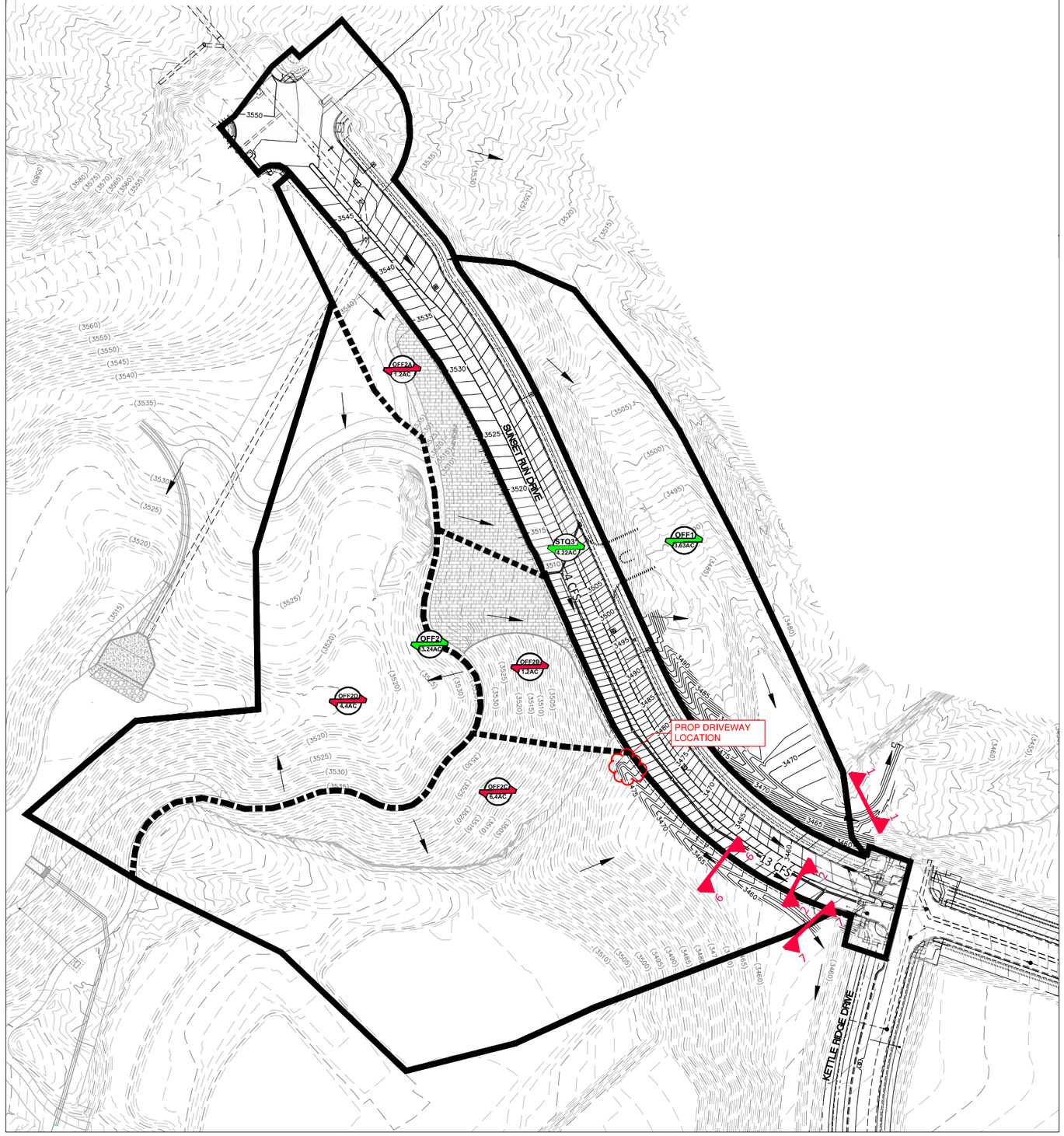


FIGURE FROM PREVIOUSLY APPROVED STUDY WITH PROPOSED DRIVEWAY LOCATION ANNOTATED



LEGEND

- SUBBASIN (ID / AC.)
- PROATE SUBBASIN (ID / AC.)
- BASIN BOUNDARY
- PRORATE BOUNDARY
- DITCH SECTION
- FLOW DIRECTION

NORTH

80' 0' 40' 80' 160'

SCALE: 1" = 80'

INTERIM CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
OFF1	3.63	11
OFF2	13.24	40
STQ3*	4.22	18

*Referenced from Summerlin West V25 MCDS

INTERIM CONDITION OFFSITE PRORATED SUBBASINS

SUBASIN ID	AREA (ac)	Q100 (CFS)	CFS/AC
OFF2	13.2	40	3.02
PRORATE SUBBASIN ID	**AREA (ac)**	**Q100 (CFS)**	**CFS/AC**
OFF2A	1.2	4	3.02
OFF2B	1.2	4	3.02
OFF2C	6.4	19	3.02
OFF2D	4.4	13	3.02
Total	**13.2**	**40**	**3.02**

INTERIM CONDITION SWALE SUMMARY TABLE

Ditch Section	Q 100 (CFS)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
Section 1	11	1.10	0.50	3.38	Trap. Channel 5' Bottom Width 3:1 Side Slopes
Section 6 (Max Slope)	19	7.86%	0.51	5.70	Trap. Channel 5' Bottom Width 3:1 Side Slopes with 12" Riprap
Section 6 (Min Slope)	19	5.40%	0.57	5.01	Trap. Channel 5' Bottom Width 3:1 Side Slopes with 12" Riprap
Section 7 (Min Slope)	40	0.53%	1.21	3.81	Trap. Channel 5' Bottom Width 3:1 Side Slopes

STREET FLOW SUMMARY TABLE

SECTION ID	Q 100 (CFS)	Slope	Normal Depth (ft)	Velocity (ft/s)	D*V
Section 2 Max Slope	13	10.50	0.39	7.73	3.01
Section 2 Min Slope	13	1.87	0.49	4.02	1.97

REFERENCED ADJACENT STREET SECTION

DATE:

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP

PROJECT NO. 62025-218

DESIGN: NB
DRAWN: NB
CHECK: SJ
PLOT DATE: 05-03-21
PLOT TIME: 10:58:58

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\PROJECTS\600\62025-218\DIVISION\FCTL\FIGURES\UP\INTERMUP.DWG
NELSON BAGGS

HOWARD HUGHES COMPANY, LLC

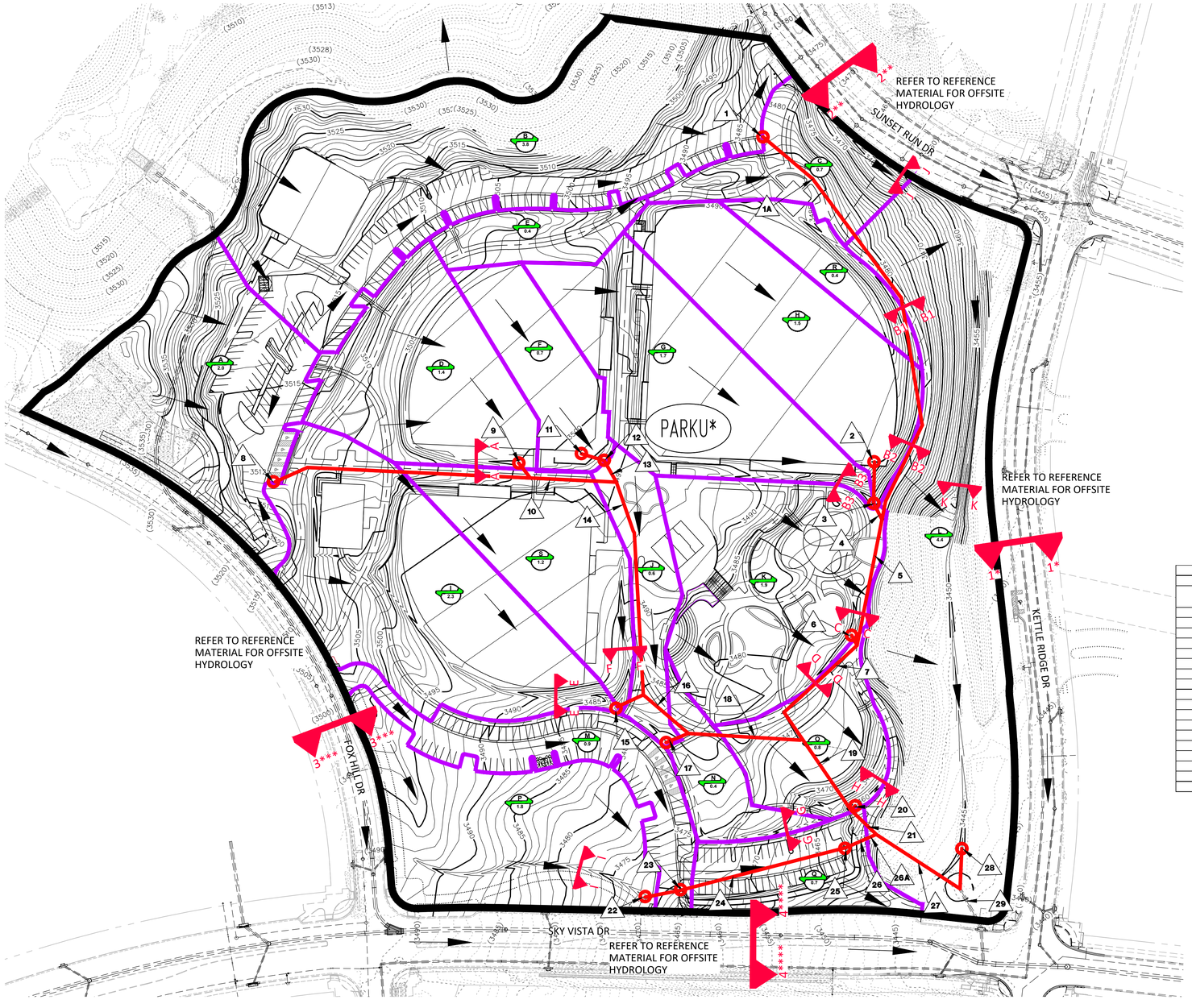
VILLAGE 25 SUNSET RUN DRIVE IMPROVEMENTS
KETTLE RIDGE DRIVE TO SCURRY BEND DRIVE

INTERIM CONDITION DRAINAGE MAP

DRAWING
FIG6
1 OF 1 SHTS

APPENDIX C

Figures



LEGEND:

- SUBBASIN ID
- PRORATE ID
- SUBBASIN BOUNDARY
- PRORATE BOUNDARY
- PROPOSED STORM DRAIN
- CROSS SECTION
- FLOW DIRECTION

NORTH

SCALE 80 0 80 160 FEET

PROPOSED CONDITION 100-YR FLOW SUMMARY

Subbasin	Q_{100} (cfs)	Area (acres)	cfs/acre
PARKU*	86	27.5	3.13
Prorate Subbasin	Q_{100} (cfs)	Area (acres)	cfs/acre
A	6	2	3.13
B	12	3.8	3.13
C	2	0.7	3.13
D	4	1.4	3.13
E	1	0.3	3.13
F	2	0.7	3.13
G	5	1.7	3.13
H	5	1.5	3.13
I	7	2.3	3.13
J	2	0.6	3.13
K	6	1.9	3.13
L	14	4.4	3.13
M	3	0.9	3.13
N	1	0.4	3.13
O	3	0.8	3.13
P	6	1.8	3.13
Q	2	0.7	3.13
R	1	0.4	3.13
S	4	1.2	3.13
Total	86	27.5	3.13

* Referenced from the Summerlin Parkway Extension Study

Proposed Condition
100-Year Ditch Summary

Section ID	Tributary Sources	Slope (%)	Q_{100} (cfs)	Depth (ft)	Velocity (fps)
A (MAX SLOPE)	D	2.62	4	0.57	4.0
A (MIN SLOPE)	D	0.50	4	0.78	2.2
B1 (MAX SLOPE	R	5.44	1	0.30	3.8
B1 (MIN SLOPE)	R	3.40	1	0.33	3.2
B2 (MAX SLOPE)	H+R	0.61	6	0.88	2.6
B2 (MIN SLOPE)	H+R	0.50	6	0.91	2.4
B3	G	9.2	5	0.57	5.1
C	1/2 K	4.31	3	0.47	4.54
D	1/2 K	3.97	3	0.48	4.4
E	I	6.7	7	0.69	4.93
F	S	3.4	4	0.55	4.46
G	N	9.44	1	0.27	4.63
H	1/2 O	5.06	1.5	0.35	4.05
I (MAX SLOPE)	P	7.88	6	0.63	5.04
I (MIN SLOPE)	P	5.75	6	0.67	4.47
J	C	8.08	2	0.41	4.03
K (MAX SLOPE)	C+L	1.59	16	1.06	4.74
K (MIN SLOPE)	C+L	0.91	16	1.18	3.84

DRAINAGE FACILITY SUMMARY

Facility ID	Q_{100} (cfs)	Contributing Source	Facility Description
1	13	PRORATE B + PRORATE E	7.5' TYPE CMD INLET WITH 24" RCP
1A	13	PRORATE B + PRORATE E	STORMCEPTOR
2	-	NUISANCE	12"X12" GRATE INLET WITH 12" RCP
3	11	PRORATE G + PRORATE H + PRORATE R	24"X36" GRATE INLET
4	11	FAC 3	24" RCP
5	24	FAC 1 + FAC 4	30" RCP
6	6	PRORATE K	24"X24" GRATE INLET WITH 18" RCP
7	30	FAC 5 + FAC 6	30" RCP
8	6	PRORATE A	5' TYPE CMD INLET WITH 18" RCP
9	4	PRORATE D	18"X18" GRATE INLET WITH 18" RCP
10	10	FAC 8 + FAC 9	18" RCP
11	-	NUISANCE	12"X12" GRATE INLET WITH 12" RCP
12	2	PRORATE F	18"X18" GRATE INLET
13	2	FAC 12	18" RCP
14	12	FAC10 + FAC13	18" RCP
15	11	PRORATE I + PRORATE S	24"X36" GRATE INLET WITH 24" RCP
16	23	FAC 14 + FAC 15	24" RCP
17	2	PRORATE J	18"X18" GRATE INLET WITH 18" RCP
18	25	FAC 16 + FAC 17	24" RCP
19	55	FAC 7 + FAC 18	30" RCP
20	4	PRORATE N + PRORATE O	24"X24" GRATE INLET WITH 18" RCP
21	59	FAC 19 + FAC 20	30" RCP
22	6	PRORATE P	24"X24" GRATE INLET WITH 18" RCP
23	3	PRORATE M	7.5' TYPE CMD DROP INLET
24	9	FAC 22 + FAC 23	18" RCP
25	2	PRORATE Q	5' TYPE CMD INLET
26	11	FAC 24 + FAC 25	24" RCP
26A	11	FAC 26	STORMCEPTOR
27	70	FAC 21 + FAC 26	30" RCP
28	16	PRORATE C + PRORATE L	24"X36" GRATE INLET WITH 24" RCP
29	86	FAC 27 + FAC 28	EX. 42" RCP

100-Year Street Flow Summary

Section ID	Tributary Sources	Slope (%)	Q_{100} (cfs)	Depth (ft)	Velocity (fps)	DxV
DRIVE AISLE (MAX SLOPE)	PRORATE B + PRORATE E	9.42	13	0.37	8.99	3.33
DRIVE AISLE (1.97% SLOPE)	PRORATE B + PRORATE E	1.97	13	0.50	4.99	2.50
DRIVE AISLE (MIN SLOPE)	PRORATE A	1.11	6	0.41	3.32	1.36
1*	SEE REFERENCE MATERIAL	1.70	8	0.43	3.51	1.51
2**	SEE REFERENCE MATERIAL	1.87	13	0.49	4.02	1.97
3***	SEE REFERENCE MATERIAL	1.45	17	0.45	3.29	1.48
4****	SEE REFERENCE MATERIAL	2.00	3.5	0.34	3.00	1.02

NOTE ALL DRIVE AISLE CALCULATIONS CONSERVATIVELY USE THE STEEPEST CROSS SLOPE IN THE PARKING LOT AREAS. THE DRIVE AISLE MIN SLOPE SECTION CONSERVATIVELY USES THE FLOW RATE FROM PRORATE BASIN A SINCE THIS IS THE HIGHEST FLOW RATE ANTICIPATED FOR SLOPES LE

* REFERENCED FROM THE SUMMERLIN PARKWAY EXTENSION STUDY
** REFERENCED FROM THE SUNSET RUN DRIVE STUDY
*** REFERENCED FROM THE FOX HILL DRIVE STUDY
**** REFERENCED FROM THE SKY VISTA DRIVE STUDY

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP	DATE

PROJECT NO. 62025-660-1
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 11-17-22
PLOT TIME: 11:31:04

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\PROJECTS\600\62025-660-1\DIVISION\7CTL\FIGURES\DRAINAGE MAP1.DWG
NELSON BAGGS

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 25 SUMMERLIN COUNCIL PARK AT GRAND PARK

PROPOSED CONDITION DRAINAGE MAP

DRAWING
FIG 5
1 OF 1 SHTS