DS #: 05349

APN: 137-23-210-001

PROJECT: Summerlin West Village 22. Kettle Ridge Drive (Street S)

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: September 15, 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 22 - Kettle Ridge Drive (Street J) (from Sunset Run Drive to Kindle Rise Way)**			**COPIES TO:** Atkins Global
Cross Streets:	Kettle Ridge Drive and Sunset Run Drive			Howard Hughes Company, LLC.
File Number:	F:\Depot\DSMemos\DS5349A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-210-001			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	8/27/2020	9/14/2020	See Comments Below	$400.00	$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. The subject street improvement of *Kettle Ridge Drive (Street J)* is premised on the existence of *Sunset Run Drive, Kindle Rise Way* and the associated storm drain facilities are in place for downstream flood perpetuation. The subject drainage study will not be approved prior to the posting of the construction bonds of the above stated street improvements projects.
2. The subject project is also premised on the existence of roadway networks to the west for flood protection. Roadways to the west such as *Scurry Bend Drive* and *Lake Mead Boulevard* are all non-existing relative to the subject *Kettle Ridge Drive (Street J)*. In the next submittal, address whether any interim berm/swales will be provided for flood protection.

   Provide a true existing/interim condition drainage map.

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. The project proposes to build temporary drainage facilities, ie, berms/swales along the sides of *Kettle Ridge Drive (Street J)* for interim flood protection. Prior to final plan approval the developer must complete a maintenance and liability agreement for the interim drainage improvements (berms or channels) 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 facility and an exhibit that adequately shows the location and limits of the drainage facility 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.

5. All storm drain inlets that are more than 10'-deep require a special structural detail and calculations. Submit structural design and calculations to *City Building & Safety Department* for review and approval prior to the final approval of the drainage study.

6. Provide elevations for the contours shown on *Figure 3: Hydrology Workmap*.

7. ST-3E, ST-3W, ST-4E, and ST-4W have inconsistent basin areas in the Interim and Ultimate Conditions. They are shown as the same basins in *Figure 3*, explain the discrepancy.

8. SDDI #7 is shown to intercept 2.0 cfs with 0.2 cfs of bypass. This does not add up to the 3 cfs calculated at the inlet. The table on *Figure 4* should show the 2.8 cfs of intercepted flow. Review and revise accordingly.

9. The swale and rip-rap calculations for *Flight Range Avenue* to *Kindle Rise Way* use 58 cfs this does not match *Figure 3* basin flows, explain the discrepancy.

10. **Sheet 8/26 & Sheet 9/26**: SDDI #1 appears to be at a local low point. Address in the next submittal during a worst case scenario that the inlet is totally clogged, what is the maximum ponding depth at the inlet before it overflows. Note that the maximum allowable ponding depth is six inches. Provide enough grade elevations in the plan & profile to verify that the criterion will be met.

11. **Sheet 20/26 & Sheet 21/26**: In general, the HGL shown on the profiles for the laterals do not match the calculations. For example: SDDI #2: Calculation shows a lower water surface while the profile shows a much higher water surface. SDDI #5: The HGL is even lower than the base of the inlet. Same for SDDI #10.

    Review and revise all the laterals and DIs calculations to match the plotted profiles on the plan in the next submittal.

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/23
AREA K-23

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SUMMERLIN®

Summerlin West Village 22

Kettle Ridge Drive (Street J): Sunest Run Drive to Kindle Rise Way

August 2020

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Kettle Ridge Drive: Sunset Run Drive to Kindle Rise Way Date: August 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Kindle Rise Way/Sunset Run Drive

East/West: Desert Foothills Drive/Scurry Bend Drive

b) Section: 23 and 14 Township: 20S Range: 59E

c) APN : 137-23-210-001

Name of Owner: Howard Hughes Company, LLC

Telephone No.: (702) 791-4000 Fax No.: (702) 791-4450 E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 West Charleston Blvd, Ste 300, Las Vegas, NV 89135

Contact Person-Name: Molly Anderson, PE **Telephone No.:** (702) 551-0330

* **E-Mail Address:** molly.anderson@atkinsglobal.com **Fax No.:** (702) 263-7200

Firm: Atkins

Address: 2270 Corporate Circle, Ste 200, Henderson, NV 89074

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 446 acres Being Developed/Disturbed:
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.): Public - Roadway Improvements
5. Approximate upstream land area which drains to the subject site: 0 acres
6. Has the site drainage been evaluated in the past? ✔ **YES** **NO** If yes, please identify documentation: Master Conceptual Drainage Study for Summerlin West Village 22 Update #2
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing CC-215 Western Beltway Channel
8. Briefly describe your proposed schedule for the subject project: ASAP

Engineer's Seal

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

***New Required Field**

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

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Kettle Ridge Drive: Sunset Run Drive to Kindle Rise Way	Map ID:
Firm Name: Atkins	Engineer: Molly Anderson, PE
Address: 2270 Corporate Circle, Ste 200 City: Henderson	State: NV Zip: 89074
Phone Number: (702) 551-0330	Fax Number: (702) 263-7200
Property Owner: Howard Hughes Company, LLC	
Address: 10801 West Charleston Blvd, Ste 300 City: Las Vegas	State: NV Zip: 89135

Reviewed By:	Date Received:	Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT

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

II. MAPS AND EXHIBITS

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

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

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

III. DRAINAGE PLAN

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

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

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

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
X		For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
X		Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.
X		Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
X		Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes	No	
x		Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
x		Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
x		Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
x		Use of correct precipitation values in and around the McCarran Airport rainfall area.
x		A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
x		A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.
x		Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
x		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
	N/A	Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
	N/A	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
x		Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. Q_{100} d x v $\leq$ 8. Q_{10} d x v $\leq$ 6 and 12 foot dry lane for rights-of-way $\geq$ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
x		A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
	N/A	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
	N/A	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
	N/A	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
	N/A	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
x		Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
x		Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
X		The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
	N/A	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

Engineer's Certification

Atkins certifies that the information contained herein has been prepared in accordance with generally accepted engineering principles and practices, and to the best of our knowledge, is true and correct.

This letter certifies that all items in the **Technical Drainage Study for Kettle Ridge Drive (Street J): Sunset Run Drive to Kindle Rise Way** electronic submittal matches the paper version bound into the study.

_____

Molly M. Anderson, PE (NV #24365)

Senior Engineer

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A.1. Summerlin West Village 22 Master Conceptual Drainage Study Reference
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B.1 Parameters
B.2 HEC-1 Model

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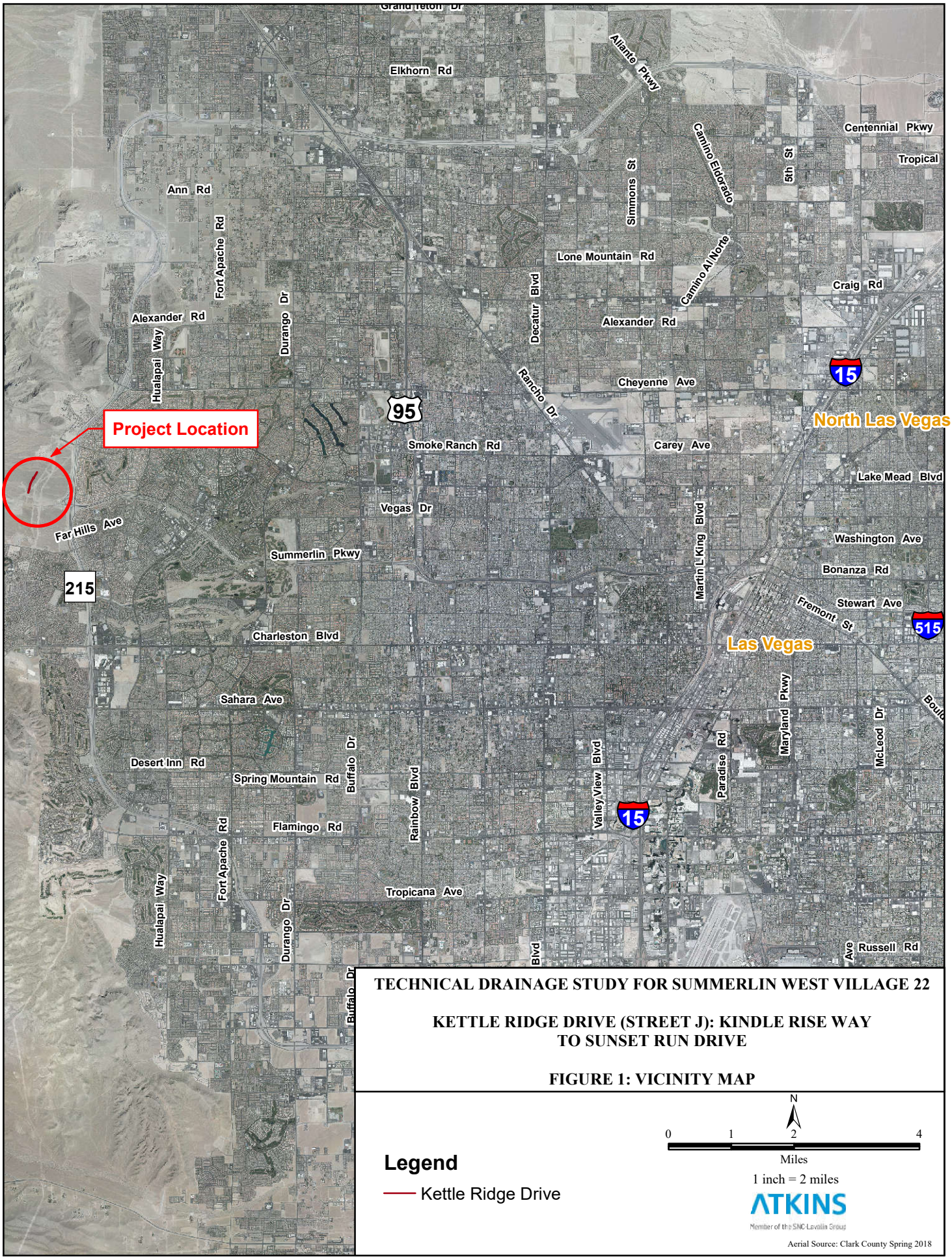
Executive Summary

This Technical Drainage Study (TDS), prepared on behalf of Howard Hughes Company, LLC represents the hydrologic and hydraulic analysis for the Kettle Ridge Drive (Sunset Run Drive to Kindle Rise Way) roadway improvements of the Summerlin West Village 22 development. Summerlin West Village 22 is located in the northwest Las Vegas Valley west of the CC-215 beltway and is bounded by Lake Mead Boulevard and Summerlin Parkway. A vicinity map is provided in Figure 1. Kettle Ridge Drive roadway improvements are located between Kindle Rise Way and Sunset Run Drive and are shown on the location map on Figure 2.

A Master Conceptual Drainage Study (MCDS) for Summerlin West Village 22 (W.O. 7861-3A) was approved November 28, 2018. Update #2 of the MCDS was approved January 23, 2020. Portions of the TDS are directly referenced from the MCDS and the relevant information is included in Appendix A.



TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (STREET J): KINDLE RISE WAY TO SUNSET RUN DRIVE

FIGURE 1: VICINITY MAP

Legend

Kettle Ridge Drive

N

0 1 2 4

Miles

1 inch = 2 miles

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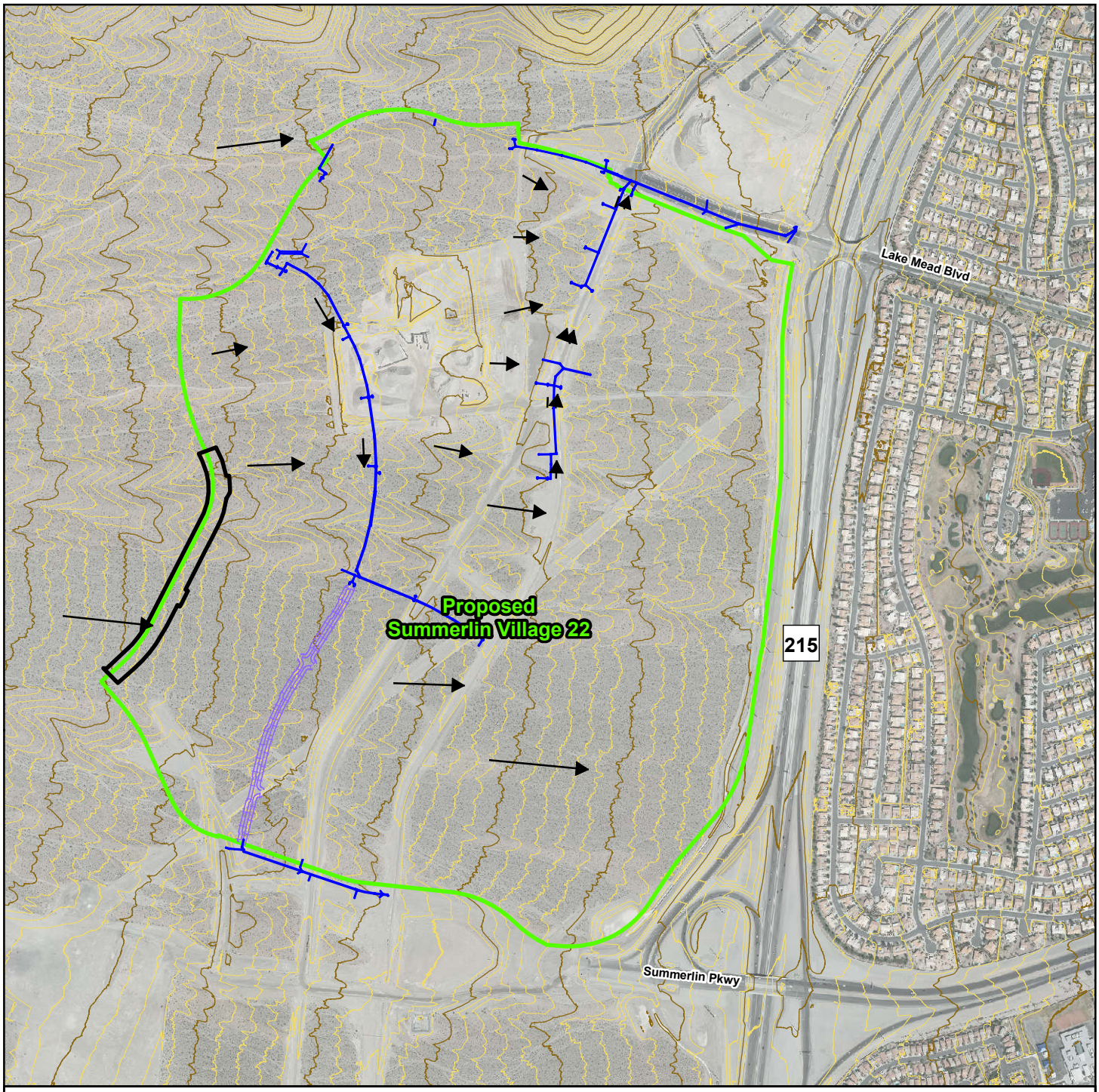
Aerial Source: Clark County Spring 2018



TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (STREET J)
KINDLE RISE WAY TO SUNSET RUN DRIVE

FIGURE 2: SITE MAP

Legend

- Existing Flow Direction
- Existing Storm Water Facilities
- Existing Scurry Bend Drive Rough Grade
- Summerlin Village 22 Boundary
- Existing 10-ft Contours
- Existing 50-ft Contours

N

0 500 1,000 2,000

Feet

1 inch = 1,000 feet

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Aerial Source: Clark County Spring 2018

1. Hydrologic Analysis

1.1. Existing Condition

The existing site condition is undeveloped desert land. As established in the Master Conceptual Drainage Study (MCDS), there is one existing downstream storm drain facility that collects runoff from the proposed street improvements and adjacent development. The Western Beltway Channel to the east of the project is fully developed and includes a 20-foot wide concrete channel that conveys flow north to the Village 26 Detention Basin.

In the existing condition, runoff generated by the project and the undeveloped areas west of the project drains east as sheet flow to the Western Beltway Channel. According to the 2002 Conceptual Drainage Study and Western Beltway Study, the existing channel has been designed to accept both the existing and ultimate condition flows from Village 22. The Village 22 site was included in the area previously analyzed in the Western Beltway Study. In addition, the allowable discharge flow rates for the project have been established in the 2017 Summerlin West Planning Area (SWPA) MPU study. Therefore, an additional existing condition hydrologic model was not required as part of this study.

1.2. Interim Condition

The proposed roadway is referred to as “Kettle Ridge Drive” in this study and on the plans. The MCDS refers to the proposed roadway by a letter name, “Street J”. Now that the roadways have been named, the plans and report refer to the roadways by name. Table 1 compares the roadway names to their letter name in the MCDS.

The proposed Kettle Ridge Drive improvements will be constructed prior to the development of adjacent onsite parcels (L-M, Y-Z, AA). As a result, an interim condition exists for the proposed improvements. Refer to Figure 3 to see the interim conditions in the hydrology workmap.

The proposed street improvements and interim grading have been designed to ensure that the existing drainage patterns are maintained in the interim condition and that none of the existing downstream facilities are adversely affected by the proposed improvements.

Construction of Kettle Ridge Drive between Lake Mead Boulevard and Kindle Rise Way is to be completed prior to the interim conditions of Kettle Ridge Drive portion presented here. The Summerlin Parkway extension (DS#5159) and storm water facilities to the south of Kettle Ridge Drive will also be completed prior. In the Interim condition, the Scurry Bend Rough Grading will be completed (DS#5253). There is a culvert crossing (Figure 3) on Scurry Bend Drive that will pass 22 cfs in the 100-yr event into the Kettle Ridge Drive interim subbasin INT-1. The flow from INT-1 and the culvert crossing will enter the interim Kettle Ridge Drive swale from the future Flight Range Avenue to Kindle Rise Way, where it will then enter the Kindle Rise Way storm drain system. The additional flow from the Scurry Bend Drive culvert crossing has been accounted for in the Kettle Ridge-Kindle Rise interim conditions Technical Drainage Study.

In the Ultimate condition, the headworks of the Kettle Ridge Drive (Sunset Run Drive to Flight Range Avenue) storm drain system will convey 115 cfs (referenced from the Village 22 MCDS Update #2, at point CSTE1, Facility #79).

The interim subbasins were modeled using HEC-1. The results are summarized in Table 2 and Figure 3.

The proposed Kettle Ridge Drive storm drain discharges south to the existing 5’x5’ RCB storm drain facility in Summerlin Parkway Extension (Sunset Run Drive). The tailwater elevation for the hydraulic model was taken from the hydraulic grade line (HGL) of SDMH#31 in the Summerlin Parkway Extension (conditionally approved on 03/31/2020) plans. The plan sheets that reference the HGL information is included in the reference information in Appendix A.

Table 1 – Village 22 MCDS and TDS Roadway Names

MCDS Street Name	TDS Street Name
Street E	Flight Range Avenue
Street EE	Flight Edge Way
Street F	Kindle Rise Way
Street FF	Hive Bluff Lane
Street G	Fleet Wing Avenue
Street H	Clowder Pass Way
Street I	Kestrel Creek Avenue
Street J	Kettle Ridge Drive
Street L	Bask Ridge Drive
Street N	Scurry Bend Drive
Summerlin Parkway WB/Street Q	Sunset Run Drive
Carriage Hill Drive	Kettle Bend Road

Table 2 – Interim Condition HEC-1 Model Results

Basin ID	Tributary Area (sq mi)	Tributary Area (ac)	100-year Flow (cfs)
*INT-1	0.02637	16.87	36
INT-2	0.01940	12.41	23
INT-3	0.00040	0.26	1
INT-4	0.00392	2.51	7
ST-1E	0.00094	0.60	2
ST-1W	0.00154	0.99	4
ST-2E	0.00060	0.38	1
ST-2W	0.00099	0.63	2
ST-3E	0.00033	0.21	1
ST-3W	0.00054	0.35	1
ST-4E	0.00025	0.16	1
ST-4W	0.00041	0.26	1
ST-5E	0.00066	0.42	2
ST-5W	0.00193	1.24	5

** INT-1 drains to Kindle Rise Way*

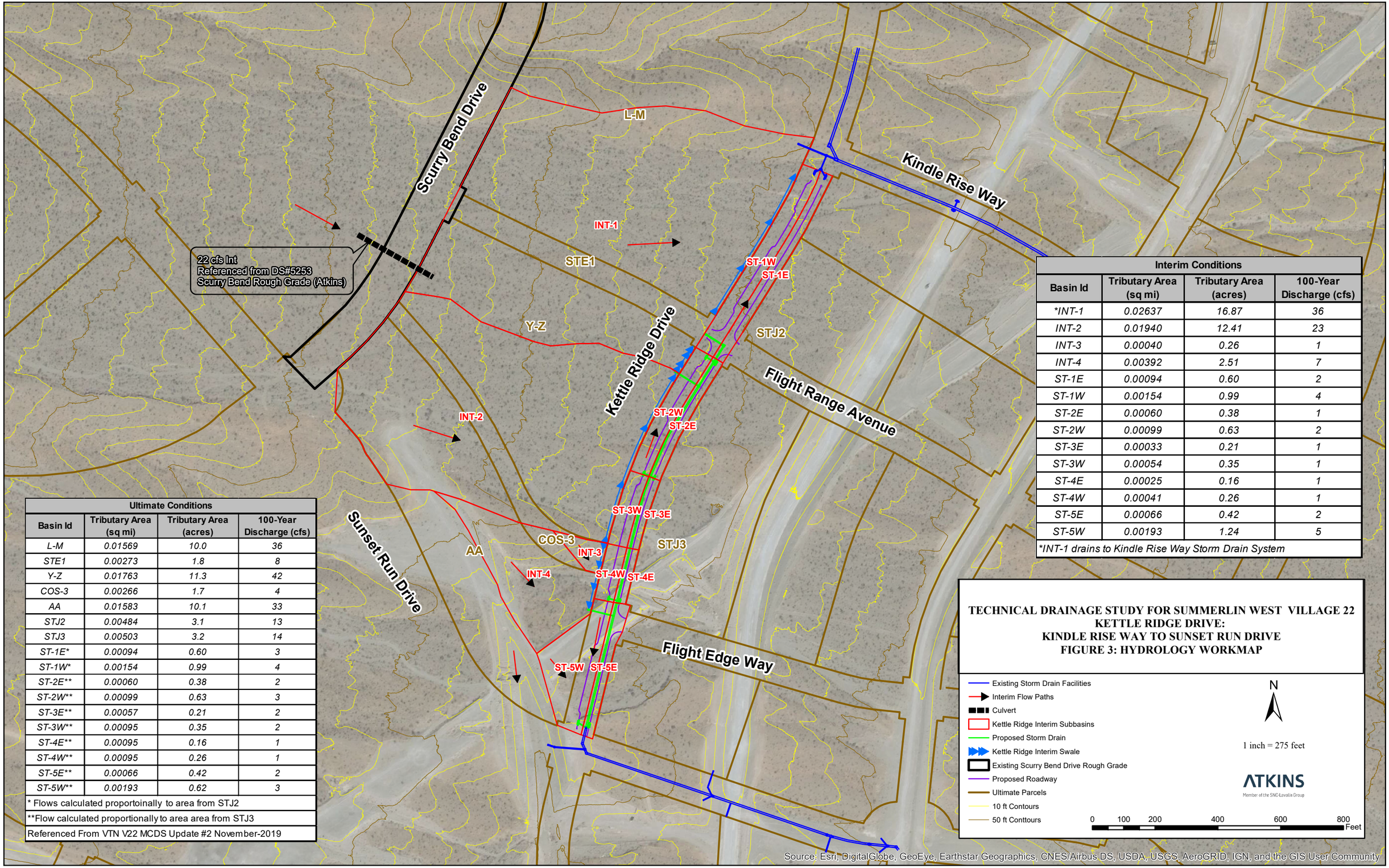
1.3. Ultimate Condition

The ultimate condition flows were directly referenced from the approved MCDS as shown in the HEC-1 output and in the Ultimate Condition Basin Map, Figure 6, of Appendix A. Table 3, below, summarizes the ultimate conditions results from the MCDS for the Kestrel Creek Avenue study. Ultimate conditions are also displayed on Figure 3.

Table 3 – Ultimate Condition MCDS Reference Information

Parcel ID	Tributary Area (sq mi)	Tributary Area (ac)	100-year Flow (cfs)
L-M	0.01569	10.0	36
L-M	0.01569	10.0	36
STE1	0.00273	1.8	8
Y-Z	0.01763	11.3	42
COS-3	0.00266	1.7	4
AA	0.01583	10.1	33
STJ2	0.00484	3.1	13
STJ3	0.00503	3.2	14
ST-1E*	0.00094	0.60	3
ST-1W*	0.00154	0.99	4
ST-2E**	0.00060	0.38	2
ST-2W**	0.00099	0.63	3
ST-3E**	0.00057	0.21	2
ST-3W**	0.00095	0.35	2
ST-4E**	0.00095	0.16	1
ST-4W**	0.00095	0.26	1
ST-5E**	0.00066	0.42	2
ST-5W**	0.00193	0.62	3

** Flows calculated proportionally to area from STJ2*
*** Flows calculated proportionally to area from STJ3*



Interim Conditions			
Basin Id	Tributary Area (sq mi)	Tributary Area (acres)	100-Year Discharge (cfs)
*INT-1	0.02637	16.87	36
INT-2	0.01940	12.41	23
INT-3	0.00040	0.26	1
INT-4	0.00392	2.51	7
ST-1E	0.00094	0.60	2
ST-1W	0.00154	0.99	4
ST-2E	0.00060	0.38	1
ST-2W	0.00099	0.63	2
ST-3E	0.00033	0.21	1
ST-3W	0.00054	0.35	1
ST-4E	0.00025	0.16	1
ST-4W	0.00041	0.26	1
ST-5E	0.00066	0.42	2
ST-5W	0.00193	1.24	5

*INT-1 drains to Kindle Rise Way Storm Drain System

Ultimate Conditions			
Basin Id	Tributary Area (sq mi)	Tributary Area (acres)	100-Year Discharge (cfs)
L-M	0.01569	10.0	36
STE1	0.00273	1.8	8
Y-Z	0.01763	11.3	42
COS-3	0.00266	1.7	4
AA	0.01583	10.1	33
STJ2	0.00484	3.1	13
STJ3	0.00503	3.2	14
ST-1E*	0.00094	0.60	3
ST-1W*	0.00154	0.99	4
ST-2E**	0.00060	0.38	2
ST-2W**	0.00099	0.63	3
ST-3E**	0.00057	0.21	2
ST-3W**	0.00095	0.35	2
ST-4E**	0.00095	0.16	1
ST-4W**	0.00095	0.26	1
ST-5E**	0.00066	0.42	2
ST-5W**	0.00193	0.62	3

* Flows calculated proportoinally to area from STJ2

**Flow calculated proportionally to area area from STJ3

Referenced From VTN V22 MCDS Update #2 November-2019

TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE:
KINDLE RISE WAY TO SUNSET RUN DRIVE
FIGURE 3: HYDROLOGY WORKMAP

- Existing Storm Drain Facilities
- Interim Flow Paths
- Culvert
- Kettle Ridge Interim Subbasins
- Proposed Storm Drain
- Kettle Ridge Interim Swale
- Existing Scurry Bend Drive Rough Grade
- Proposed Roadway
- Ultimate Parcels
- 10 ft Contours
- 50 ft Conttours

N

1 inch = 275 feet

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0 100 200 400 600 800 Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

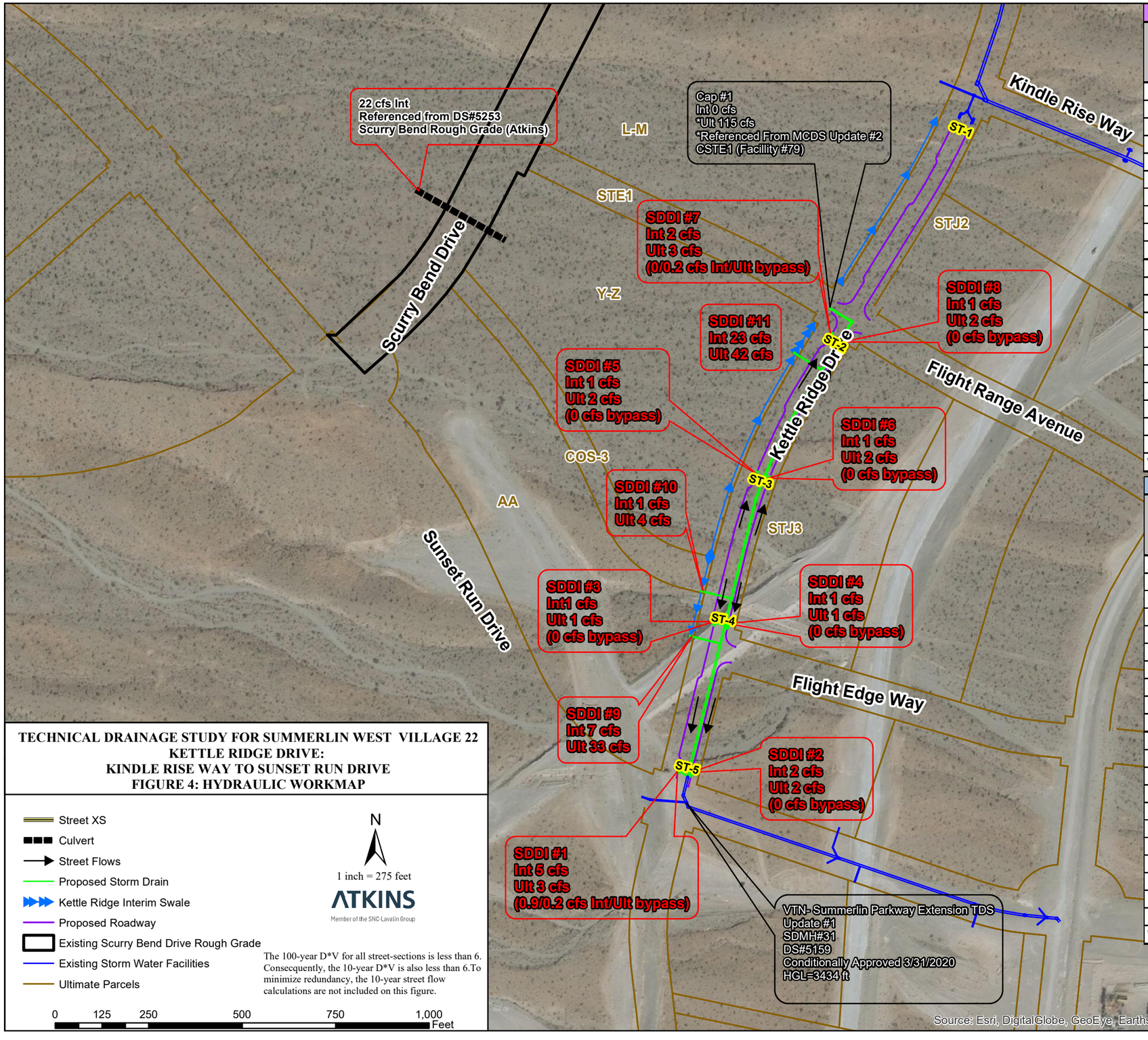
2. Hydraulic Analysis

2.1. Drop Inlet Calculations

The computer program Bentley FlowMaster V10.2 was utilized to perform calculations for the proposed drop inlets along Kettle Ridge Drive. The storm drain SDDI's #9, #10, and #11, are in the proposed interim swale to the west of Kettle Ridge Drive. The remaining proposed drop inlets capture runoff along Kettle Ridge Drive where the interim condition slightly less or equal to the ultimate conditions flows (except in SDDI #1). Drop inlet calculations are provided in Appendix C. Table 4 provides a summary of the drop inlet calculations. Drop inlet locations and calculations are shown on Figure 4.

Table 4 – Drop Inlet Calculations

ID	Total Flow (cfs)	Intercepted Flows (cfs)	Bypass Flow (cfs)
100-year Interim Conditions			
SDDI #1	5.0	4.1	0.9
SDDI #2	2.0	2.0	0.0
SDDI #3	1.0	1.0	0.0
SDDI #4	1.0	1.0	0.0
SDDI #5	1.0	1.0	0.0
SDDI #6	1.0	1.0	0.0
SDDI #7	2.0	2.0	0.0
SDDI #8	1.0	1.0	0.0
SDDI #9	7.0	7.0	0.0
SDDI #10	1.0	1.0	0.0
SDDI #11	23.0	23.0	0.0
100-year Ultimate Conditions			
SDDI #1	3.00	2.80	0.20
SDDI #2	2.00	2.00	0.00
SDDI #3	1.00	1.00	0.00
SDDI #4	1.00	1.00	0.00
SDDI #5	2.00	2.00	0.00
SDDI #6	2.00	2.00	0.00
SDDI #7	3.00	2.00	0.20
SDDI #8	2.00	2.00	0.00
SDDI #9	33.00	N/A	N/A
SDDI #10	4.00	N/A	N/A
SDDI #11	42.00	N/A	N/A



TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE:
KINDLE RISE WAY TO SUNSET RUN DRIVE
FIGURE 4: HYDRAULIC WORKMAP

- Street XS
- Culvert
- Street Flows
- Proposed Storm Drain
- Kettle Ridge Interim Swale
- Proposed Roadway
- Existing Scurry Bend Drive Rough Grade
- Existing Storm Water Facilities
- Ultimate Parcels

N

1 inch = 275 feet

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The 100-year D*V for all street-sections is less than 6. Consecquently, the 10-year D*V is also less than 6.To minimize redundancy, the 10-year street flow calculations are not included on this figure.

0 125 250 500 750 1,000 Feet

Interim Condition (100-Year) Street Flow and Drop Inlet Calculations Summary Table

XS/SD ID	Total Discharge (cfs)	Drop Inlet			Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 8)
		Intercepted Flow (cfs)	Bypass Flow (cfs)	Sump Depth (ft)			
ST-1E	2.0	N/A	N/A	N/A	0.2	4.2	0.9
ST-1W	4.2	N/A	N/A	N/A	0.3	5.0	1.3
ST-2E	1.0	N/A	N/A	N/A	0.2	1.5	0.4
ST-2W	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-3E	1.0	N/A	N/A	N/A	0.2	1.5	0.4
ST-3W	1.0	N/A	N/A	N/A	0.2	1.5	0.4
ST-4E	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-4W	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-5E	2.0	N/A	N/A	N/A	0.3	2.6	0.6
ST-5W	5.9	N/A	N/A	N/A	0.3	3.3	1.1
SDDI #1	5.0	4.1	0.9	N/A	N/A	N/A	N/A
SDDI #2	2.0	2.0	0.0	N/A	N/A	N/A	N/A
SDDI #3	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #4	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #5	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #6	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #7	2.0	2.0	0.0	N/A	N/A	N/A	N/A
SDDI #8	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #9	7.0	7.0	0.0	0.3	N/A	N/A	N/A
SDDI #10	1.0	1.0	0.0	0.1	N/A	N/A	N/A
SDDI #11	23.0	23.0	0.0	0.7	N/A	N/A	N/A

All street critera are met in 100-yr event, thus all 10-yr criteria are met as well.

Ultimate Condition (100-Year) Street Flow and Drop Inlet Calculations Summary Table

XS/SD ID	Total Discharge (cfs)	Drop Inlet			Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 8)
		Intercepted Flow (cfs)	Bypass Flow (cfs)	Sump Depth (ft)			
ST-1E	3.0	N/A	N/A	N/A	0.2	4.7	1.1
ST-1W	4.2	N/A	N/A	N/A	0.3	5.0	1.3
ST-2E	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-2W	3.0	N/A	N/A	N/A	0.3	2.0	0.6
ST-3E	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-3W	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-4E	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-4W	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-5E	2.0	N/A	N/A	N/A	0.3	2.6	0.6
ST-5W	3.2	N/A	N/A	N/A	0.3	2.8	0.8
SDDI #1	3.00	2.80	0.20	N/A	N/A	N/A	N/A
SDDI #2	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #3	1.00	1.00	0.00	N/A	N/A	N/A	N/A
SDDI #4	1.00	1.00	0.00	N/A	N/A	N/A	N/A
SDDI #5	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #6	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #7	3.00	2.00	0.20	N/A	N/A	N/A	N/A
SDDI #8	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #9	33.00	N/A	N/A	N/A	N/A	N/A	N/A
SDDI #10	4.00	N/A	N/A	N/A	N/A	N/A	N/A
SDDI #11	42.00	N/A	N/A	N/A	N/A	N/A	N/A

All street critera are met in 100-yr event, thus all 10-yr criteria are met as well.

2.2. Normal Depth Calculations

The computer program Bentley FlowMaster V10.2 was utilized to perform normal depth calculations for the proposed roadway. These normal depth calculations were utilized to ensure that the proposed storm drain facility is adequately designed and that all local street flow criteria are met.

Half-street cross-sections were analyzed as roadway flow and storm drain capture were at times different on west and east sides of the street. The cross-section locations were specified based on the flow patterns and utilized the worst-case slope or roadway width when applicable for the calculations.

Table 5 summarizes the normal depth calculations for the 100-year storm events. Depth*Velocity must be less than 8 for the 100-year event and less than 6 for the 10-year event. The 100-year D*V for all street cross-sections is less than 6. Therefore, the 10-year D*V is also less than 6. To minimize redundancy, the 10-year calculations are not included. Print-outs of all normal depth calculations for the ultimate condition are provided in Appendix C. Cross-section locations and calculation summaries are shown on Figure 4.

Table 5 – Normal Depth Calculations

ID	Total Flow (cfs)	Slope (%)	Flow Depth (ft)	Velocity (ft/s)	D* V
100-year Interim Condition					
ST-1E	2.0	6.8	0.2	4.2	0.9
ST-1W	4.2	6.8	0.3	5.0	1.3
ST-2E	1.0	0.7	0.2	1.5	0.4
ST-2W	2.0	0.7	0.3	1.8	0.5
ST-3E	1.0	0.7	0.2	1.5	0.4
ST-3W	1.0	0.7	0.2	1.5	0.4
ST-4E	1.0	1.8	0.2	2.2	0.5
ST-4W	1.0	1.8	0.2	2.2	0.5
ST-5E	2.0	1.8	0.3	2.6	0.6
ST-5W	5.9	1.8	0.3	3.3	1.1
100-year Ultimate Condition					
ST-1E	3.0	6.8	0.2	4.7	1.1
ST-1W	4.2	6.8	0.3	5.0	1.3
ST-2E	2.0	0.7	0.3	1.8	0.5
ST-2W	3.0	0.7	0.3	2.0	0.6
ST-3E	2.0	0.7	0.3	1.8	0.5
ST-3W	2.0	0.7	0.3	1.8	0.5
ST-4E	1.0	1.8	0.2	2.2	0.5
ST-4W	1.0	1.8	0.2	2.2	0.5
ST-5E	2.0	1.8	0.3	2.6	0.6
ST-5W	3.2	1.8	0.3	2.8	0.8

2.3. Storm Drain System Modeling

The proposed storm drain systems were modeled using Water Surface Pressure Gradient for Windows (WSPG-W). A print-out of the WSPG-W models are provided in Appendix C. Because the ultimate condition flows are higher than or equal to the interim condition flows in all areas (except SDDI #1), only the ultimate conditions were analyzed in the WSPG-W models. The lateral for the SDDI#1 has also been modeled for the slightly higher interim condition to ensure that all hydraulic criteria are met. The Q_{100} and HGLs are shown on the improvement plans in Appendix D. Table 6 summarizes the WSPG-W model at the mainline manholes. All HGLs modeled including hydraulic jumps, are greater than 1 foot below existing and proposed surfaces.

Table 6 – WSPG-W Mainline Summary Table

SDMH#	WSPG-W Station	100-yr Ultimate Condition		
		Q_{100}	$\sum Q_{100}$	HGL (Ft)
Upstream	2000	115	115	3459.69
10	1930.90	0	115	3456.82
9	1870.39	5	120	3456.64
8	1778.88	42	162	3455.33
7	1593.14	0	162	3450.47
6	1452.5	4	166	3448.51
5	1392.17	0	166	3447.27
4	1115.63	4	170	3443.40
3	1041.71	2	172	3441.96
2	991.65	33	205	3441.52
1	631.74	5	210	3434.27
*VTN #31	555.75	0	210	3433.55

* Referenced from VTN-Summerlin Parkway Extensions TDS Update #1 – DS#5159

2.4. Riprap Calculations

Normal depth calculations determined that channel velocities for the roadside swale that drain south, and the swale that drains to the north between the future Flight Edge Way and the future Flight Range Avenue, do not exceed 5 ft/s and thus do not require the implementation of riprap. The interim roadside swale that drains to the north between Flight Range Avenue and Kindle Rise Way exceeds velocities of 5 ft/s and thus requires riprap to maintain channel stability and minimize erosion.

The riprap calculations were performed utilizing shear stress calculations based on HCDDM Section 705 using HEC-11 methodology. Shear stress calculations show that median riprap particle sizes (D50), of 12 inches is needed for northmost interim swale. Results are shown in Appendix C.

Appendices

Appendix A: Reference Studies

A.1.Summerlin West Village 22 Master Conceptual Drainage Study Reference

A.2. Summerlin Parkway Extension TDS

A.1. Summerlin West Village 22 Master Conceptual Drainage Study Reference

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin West Village 22 Date: November 13, 2019

Location of Development: a) Descriptive (Cross Streets) North/South: I-215 Western Beltway

East/West: Summerlin Parkway

b) Section: 23 and 14 Township: 20S Range: 59E

c) APN : 137-14-401-006, 137-23-101-002

Name of Owner: The Howard Hughes Company, LLC

Telephone No.: (702) 791-4336 Fax No.: (702) 791-4453 E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 W. Charleston Blvd. LV, NV, 89135

Contact Person-Name: Joanna Ayson **Telephone No.:** (702)-873-7550

* **E-Mail Address:** jayson@vtnnv.com **Fax No.:** (702)-362-2597

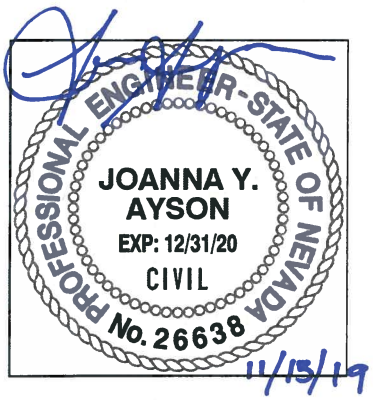
Firm: VTN Nevada

Address: 2727 S. Rainbow Blvd, LV, NV, 89146

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/-446 Acres Being Developed/Disturbed: +/-446 Acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☒ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ **Yes**** ☐ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Mixed-use master plan
5. Approximate upstream land area which drains to the subject site: +/- 61 acres
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: SWPA MPU (DS4926), Western Segment Las Vegas Beltway from Summerlin to Cheyenne (DS2610), Summerlin Lake Mead Blvd Improvements (DS4146)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing 66" RCP in Lake Mead Pkwy, Existing I-215 Western Beltway Channel, future SWPA CCRFCD storm drain facilities
8. Briefly describe your proposed schedule for the subject project: As soon as possible



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

Updated 05/01/2008

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

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

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

II. GRADING PLAN INFORMATION		
Yes	No	
N/A		Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
N/A		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
N/A		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
N/A		Back of lot elevations and lot drainage pattern for all lots including common lots.
N/A		Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
N/A		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
N/A		This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
N/A		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
N/A		Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
N/A		Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
N/A		The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
N/A		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
N/A		Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

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

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

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

PROVIDING QUALITY PROFESSIONAL
SERVICE SINCE 1960

November 13, 2019

Albert Sung, P.E.
Flood Control Division
Department of Public Works
CITY OF LAS VEGAS
333 N. Rancho Blvd, 7th Floor
Las Vegas, NV 89106

Subject: **Update #2 to the Master Conceptual Drainage Study for Summerlin West Village 22**

Mr. Sung:

This letter certifies that all items on the **Update #2 to the Master Conceptual Drainage Study for Summerlin West Village 22** electronic submittal matches the paper version bound into the study.

Respectfully submitted,

Joanna Ayson, P.E.

UPDATE #2 TO THE

MASTER CONCEPTUAL DRAINAGE STUDY

FOR

SUMMERLIN WEST VILLAGE 22

W.O. # 7861-3A

Prepared for:
HOWARD HUGHES COMPANY, LLC

Submitted to:
CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS

PROVIDING QUALITY PROFESSIONAL SERVICE SINCE 1960

November 5, 2019
W.O. #7861-3A

City of Las Vegas
Land Development Services
333 N. Rancho Drive, 7th Floor
Las Vegas, NV 89106

Attention: Albert Sung, P.E.
Flood Control Project Engineer

SUBJECT: UPDATE #2 TO THE MASTER CONCEPTUAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22

Mr. Sung:

This Update #2 to the approved *Master Conceptual Drainage Study for Summerlin West Village 22* (DS#5005) is being submitted to address revisions to the overall Summerlin West Planning Area land plan. Since the approval of the original study, the *Update #2 to the 2017 Summerlin West Planning Area Flood Control Master Plan Update* (hereinafter referred to as the Overall Master Plan Update study) was submitted to the City of Las Vegas on October 28, 2019. The Overall Master Plan Update study included revisions to the overall Summerlin West hydrology and proposed CCRFCD facilities in the area. This update reanalyzes Village 22 according to the revisions submitted in the Overall Master Plan Update study. In addition, this update reconfigures the conceptual storm drain alignment previously presented. The revisions addressed in this update are summarized below and are discussed in more detail throughout this document:

1. The alignment of Carriage Hill Drive has shifted slightly to the west. The areas of the adjacent parcels B, I, Q, R, V, W, W EE, HH, II have been revised as a result. In addition, the areas of the basins which represent Carriage Hill have been updated as a result.
2. Hive Bluff Lane (Street FF) has been removed. Parcels N, O, and P have been combined into a single parcel N-O-P.
3. Bask Ridge Drive (Street L) between Parcels L and M has been removed. Parcels L and M have been combined into a single parcel L-M as a result.
4. Bask Ridge Drive (Street L) between basins Y and Z, and Flight Edge Way between Parcels AA and Z have been removed. Parcels Y and Z have been combined into single parcel Y-Z and an open space area COS-3 has been added between Y-Z and AA as a result.
5. The boundary of Parcel COS-2 has changed and the corresponding basin boundary has been updated accordingly. The areas of Parcels A, C, and D were impacted as a result.
6. Landscaped areas previously considered portions of street basins within Fleet Wing Avenue (Street G) and Flight Edge Way (Street EE) at the intersections of Kettle Ridge Drive and Desert Foothills Drive are now considered portions of parcel basins. Roadway basin areas have decreased as a result, and the areas have been added to the adjacent parcels.
7. Parcel S and NP-3 have been combined into a single Parcel S.

8. The park NP-1 previously located southeast of the Clowder Pass Way and Desert Foothills Drive intersection has been relocated southwest of the Fleet Wing Ave and Desert Foothills Drive intersection.
9. Offsite parcels have been reconfigured. The boundaries of offsite basins have been updated accordingly, and the naming convention of the offsite basins have been updated to match the parcel designations.
10. The length of storm drain designated as Regional Facility SD-J has reduced to only include the portion of storm drain within Desert Foothills Drive. Storm drain tributary to SD-J has also been reconfigured.

The analysis presented in this update has been completed in accordance with the criteria established in the Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual*, hereinafter referred to as the Manual.

I. HYDROLOGY

As discussed previously, the Overall Master Plan Update study included changes to the land uses and parcel configurations throughout the SWPA and revisions to the proposed CCRFCD MPU facilities. The new parcel areas and land uses have been utilized in this drainage study to revise the curve numbers and hydrologic basins within Village 22. Revised hydrologic calculations and HEC-1 analysis for Village 22 have been included in Appendix B of this report. Updated basin boundaries and flow rates are depicted on *Figure 6: Ultimate Condition Basin Map* in Appendix A.

II. STORM DRAIN ANALYSIS

a. ONSITE LOCAL AND CCRFCD STORM DRAIN FACILITIES

As discussed in the approved study, flows generated by Village 22 are discharged to three CCRFCD Facility Locations: (1) the existing 215 Western Beltway Channel, (2) the proposed storm drain system SD-F, and (3) the storm drain system SD-J. The discharge locations shown in this update are consistent with those in the approved study. The following table compares the flows discharged in this Update #2 versus the approved Update #1. In general the discharge flow rates in this study are less than the approved study. The reduction of discharge flows are due to the removal of streets, the reduction of developed offsite tributary flows, and combining separate parcels into single parcels.

DISCHARGE FLOW COMPARISON TABLE

		New (Update #2)		Old (Update #1)	
Discharge Location	**Description**	**Basin/CP**	**Discharge Q100 (cfs)**	**Basin/CP**	**Discharge Q100 (cfs)**
1A	Existing Lake Mead Blvd SD	CP1	191	CP1	201
1B	Existing Beltway Channel	DUMMY1	1024	DUMMY1	1103
2	CCRFCD Facility SD-F	DUMMY2	708	DUMMY6	859
3	CCRFCD Facility SD-J	DUMMY4	282	DUMMY11	299

The SD-F system was re-evaluated in the Update #2 to the Overall MCDS. The facility map has been updated to reflect the latest Regional Facility sizes shown in the latest Update to the Overall MCDS.

Previously, a portion of the regional system SD-J was located in Flight Range Avenue between Kettle Ridge Drive and Desert Foothills Drive. The Update #2 to the Overall MCDS shortened the total length of SD-J so that only the segment of storm drain within Desert Foothills Drive would be considered a regional facility. This was done to more realistically coincide with where a majority of design flows would be conveyed by the system. This drainage study update for Village 22 provides a specific analysis of the local flows tributary to SD-J. In addition, the local storm drain facilities 77 to 82 previously discharging flows to SD-J at the intersection of Kettle Ridge Drive and Flight Range Ave have been re-routed south in Kettle Ridge Drive to discharge flow into the existing storm drain in Sunset Run Drive. The additional flow to be discharged at Sunset Run Drive was accounted for in the *Technical Drainage Study for Summerlin Parkway Extension,* therefore the storm drain re-routing will not adversely impact downstream facilities.

The following technical drainage studies within Village 22 have been submitted since Update #1 was approved:

1. *Technical Drainage Study for Summerlin West Village 22 Kestrel Creek Avenue (Street I): Desert Foothills Drive to Kettle Ridge Drive (Street J),* DS5171A
2. *Technical Drainage Study for Summerlin West Village 22 Kettle Ridge Drive (Street J) and Scurry Bend Drive (Street N) Street Improvements: Lake Mead Blvd to Fleet Wing Ave,* DS5156
3. *Technical Drainage Study for Summerlin West Village 22 Lake Mead Blvd Street Improvements from Desert Foothills Drive to Kettle Ridge Drive (Street J) – also Lake Mead Blvd Rough Grade from Kettle Ridge Drive to Scurry Bend Drive;* DS5155
4. *Technical Drainage Study for Village 22 Kettle Bend Road;* DS5204

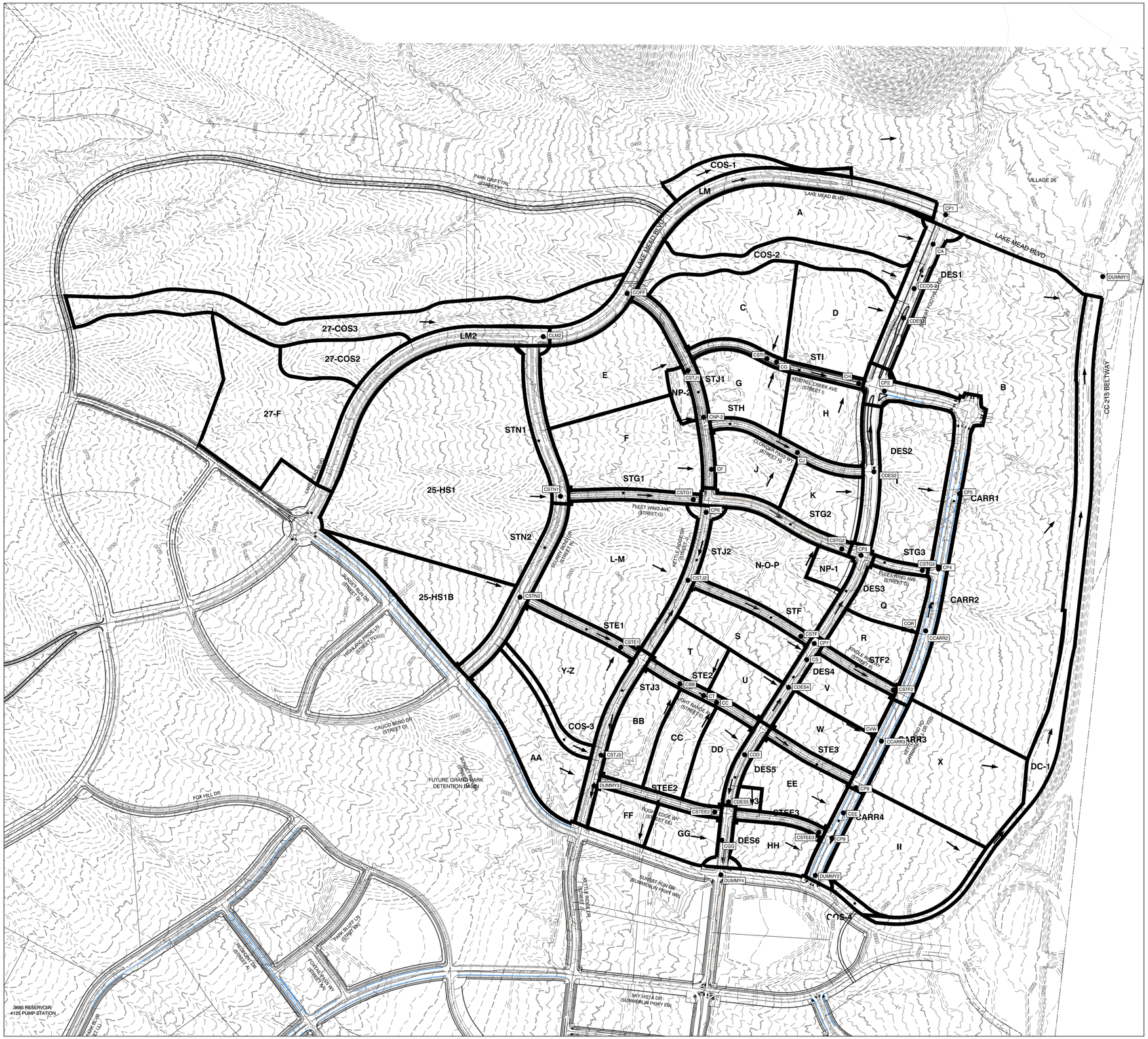
This facilities shown in this update match those presented in the referenced Village 22 technical studies. The updated local and CCRFCD facilities have been depicted on *Figure 7: Local Flood Control Facilities Map*. Normal depth calculations have been included in Appendix C. Pertinent reference material has been included in Appendix D.

I hope this addresses your concerns regarding this project. If there are any questions or any additional information is required, please contact this office.

Respectfully Submitted,

VTN Consulting

Joanna Ayson, P.E.



NORTH

GRAPHIC SCALE

350 0 175 350 700

1" = 350'

LEGEND

- BASIN BOUNDARY
- A — BASIN DESIGNATION
- CONCENTRATION POINT
- FLOW ARROW

ULTIMATE CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)	BASIN ID	AREA (ac)	Q100 (CFS)
LM	10.04	36	STN1	3.61	13
D	11.96	50	CSTN1	-	244
DES1	4.46	20	STG1	1.85	8
CDES1	-	70	CSTG1	-	229
COS-2	7.51	22	CP6	-	532
CCOS-2	-	89	L-M	21.14	81
A	17.39	68	STJ2	3.10	13
CA	-	156	CSTJ2	-	612
CP1	-	191	STF	1.84	8
STI	2.42	11	CSTF	-	610
C	12.05	51	U	3.49	11
CSTI	-	62	DES4	1.77	8
G	7.05	30	CDES4	-	19
CG	-	92	S	3.01	10
H	7.64	33	CS	-	29
CH	-	124	CP7	-	639
STH	2.29	10	STF2	1.21	5
J	5.93	24	CSTF2	-	637
CJ	-	34	V	5.01	17
K	5.28	22	W	5.28	19
DES2	3.09	13	CVW	-	36
CDES2	-	68	CARR3	2.14	8
CP2	-	189	CCARR3	-	667
CARR1	6.95	29	STE3	1.36	6
I	13.44	38	CP8	-	673
N-O-P	14.52	49	EE	6.80	25
NP-1	1.73	6	CEE	-	689
STG2	2.86	13	NP3	0.70	2
CSTG2	-	68	STEE3	1.23	5
DES3	2.00	9	CSTEE3	-	7
CP3	-	77	CP9	-	205
STG3	0.72	3	HH	4.85	20
CSTG3	-	79	CARR4		10
Q	4.58	17	25-HS1B		48
R	4.97	20	STN2		19
CQR	-	37	CSTN2	-	67
CARR2	3.58	15	Y-Z	11.28	42
CCARR2	-	52	STE1	1.75	8
CP4	-	131	CSTE1	-	115
CP5	-	379	COS-3	1.70	4
II	16.03	61	STJ3	3.22	14
X	17.45	60	CSTJ3	-	126
B	80.77	304	AA	10.13	33
DC-1	12.59	36	STE2		8
COS-4	0.57	2	BB	6.29	23
COS-1	2.87	6	CBB	-	31
V27-F	19.13	83	T	4.02	13
V27-COS2	5.25	20	CT	-	44
LM2	7.23	28	CC	5.34	19
CLM2	-	132	CCC	-	63
27-COS3	17.46	53	DD	4.76	17
COFF	-	185	CDD	-	77
E	13.91	58	DES5	1.57	7
STJ1	3.52	15	CDES5	-	81
CSTJ1	-	255	STEE2	1.79	8
NP-2	1.34	5	CSTEE2	-	88
CNP-2	-	255	GG	4.98	21
F	14.22	59	CGG	-	109
CF	-	309	FF	3.49	15
25-HS1	49.49	211			

REVISION

BY

DATE

REV

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FIGURE 6
ULTIMATE CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 22

DRAWN BY: JTA

DESIGNED BY:

CHECKED BY:

OCT 2019

SCALE: 1" = 350' HORIZ. N/A VERT.

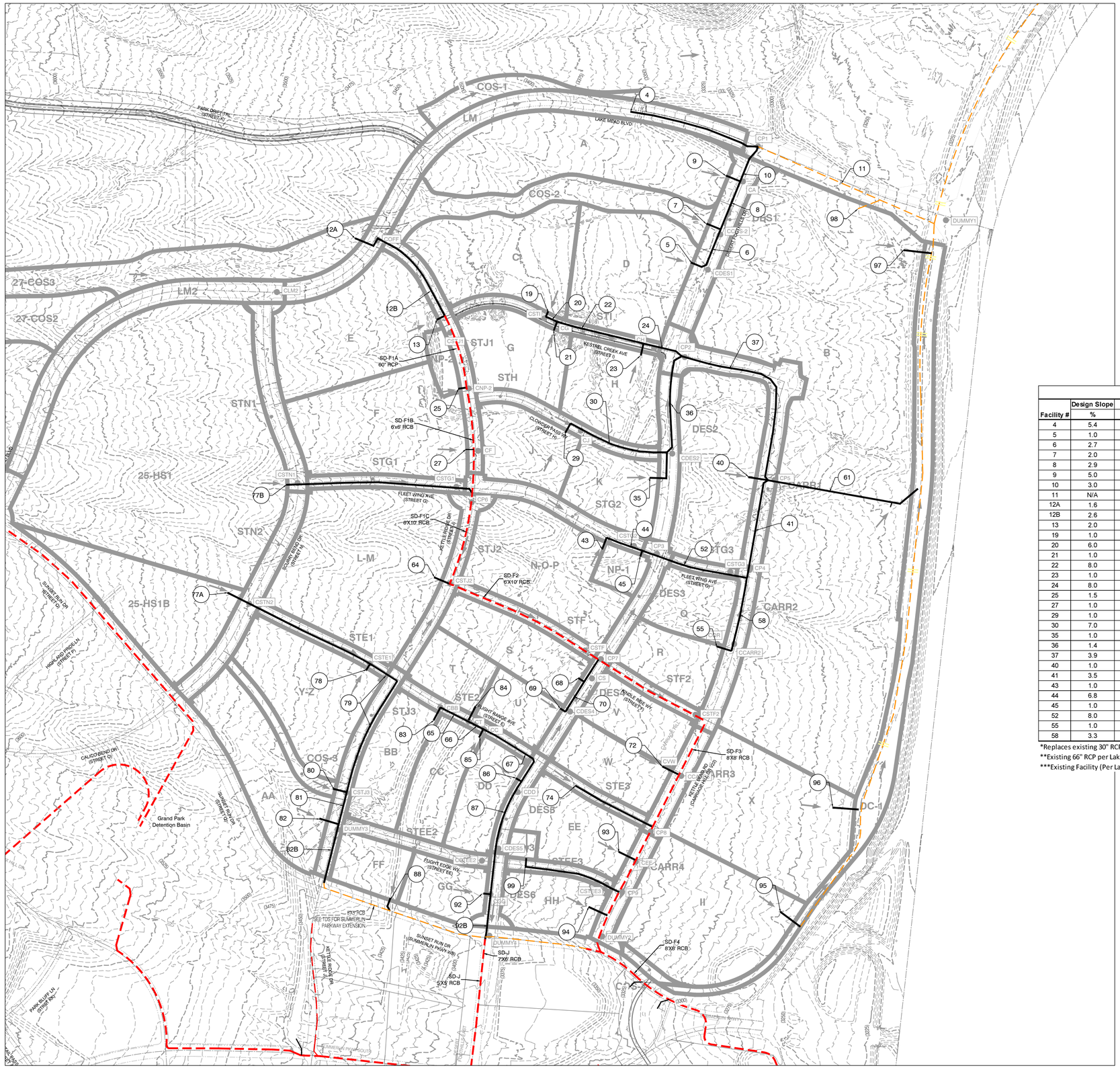
PROJECT NO: 7861

SHEET

OF SHEETS

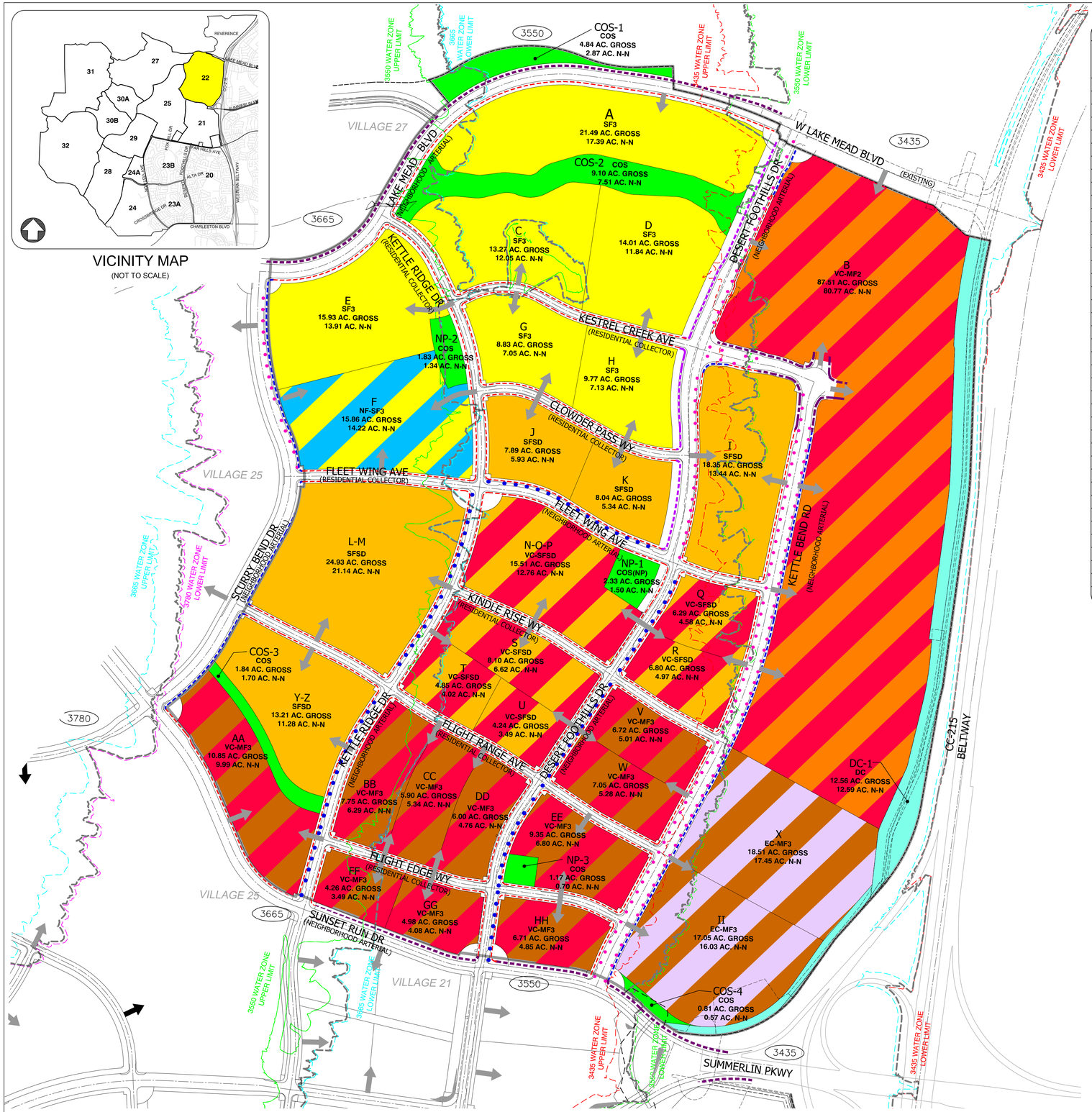
DRAWING NO.

H:\7861\Village 22 Master\Drainage\5_LIP2\A_Figures\Figure 6 - Village 22 Drainage Basin Map.dwg


COS-1
LM
A
COS-2
B
C
D
CDES1
CDES2
CDES3
CDES4
CDES5
CDES6
CARR1
CARR2
CARR3
CARR4
CCARR2
DES1
DES2
DES3
DES5
DES6
LM2
27-COS3
27-COS2
25-HS1
25-HS1B
E
STJ1
STI
STH
F
STG1
STN1
STN2
L-M
STJ2
N-O-P
NP-1
STG2
STG3
STF
STF1
STF2
STE1
STE2
STE3
STEE2
STEE3
G
H
J
K
Q
R
S
T
U
V
W
X
Y-Z
AA
BB
CC
DD
EE
FF
GG
HH
II
COS-3
DC-1
Grand Park Detention Basin
LAKE MEAD BLVD (STREET A)
PARK DRIVE TRL (STREET N)
KESTREL CREEK AVE (STREET I)
CLOVERDALE PASS DR (STREET H)
FLEET WING AVE (STREET G)
SCURRY BEND DR (STREET M)
HIGHLAND RIDGE LN (STREET P)
SUNSET RUN DR (STREET O)
PARK SLOPE LN (STREET R)
CALICO BEND DR (STREET Q)
SUNSET RUN DR (SUMMERLIN PKWY WB)
SUNSET RUN DR (SUMMERLIN PKWY EB)
SUMMERLIN PKWY (SOUTH)
DESERT FOOT AVE
SD-F1A 60" RCP
SD-F1B 6'x6' RCB
SD-F1C 6'X10' RCB
SD-F2 6'X10' RCB
SD-F3/ 8'X8' RCB
SD-F4 8'X8' RCB
SD-J 7'X6' RCB
SD-J 5'X5' RCB
6'X7' RCB
SEE TOS FOR SUMMERLIN PARKWAY EXTENSION

VICINITY MAP

(NOT TO SCALE)



VILLAGE 22 LAND USE TABULATION

PARCEL DESIGNATION	LAND USE	MAXIMUM DENSITY UNITS / ACRES	ACRES (GROSS)	MAXIMUM ALLOWABLE RESIDENTIAL UNITS	MIXED USE RESIDENTIAL PERCENTAGE
A	SF3	10	21.49	214	1
B	VC-MF2	21	87.51	735	0.4
C	SF3	10	13.27	132	1
D	SF3	10	14.01	140	1
E	SF3	10	15.93	159	1
F	NF-SF3	10	15.86	158	1
G	SF3	10	8.83	88	1
H	SF3	10	9.77	97	1
I	SFSD	18	18.35	330	1
J	SFSD	18	7.89	142	1
K	SFSD	18	8.04	144	1
L-M	SFSD	18	24.93	448	1
N-O-P	VC-SFSD	18	15.51	265	0.95
Q	VC-SFSD	18	6.29	107	0.95
R	VC-SFSD	18	6.80	116	0.95
S	VC-SFSD	18	8.10	138	0.95
T	VC-SFSD	18	4.85	82	0.95
U	VC-SFSD	18	4.24	72	0.95
V	VC-MF3	40	6.72	107	0.4
W	VC-MF3	40	7.05	112	0.4
X	EC-MF3	40	18.51	296	0.4
Y-Z	SFSD	18	13.21	237	1
AA	VC-MF3	40	10.85	173	0.4
BB	VC-MF3	40	7.75	124	0.4
CC	VC-MF3	40	5.90	94	0.4
DD	VC-MF3	40	6.00	95	0.4
EE	VC-MF3	40	9.35	149	0.4
FF	VC-MF3	40	4.26	68	0.4
GG	VC-MF3	40	4.98	79	0.4
HH	VC-MF3	40	6.71	107	0.4
II	EC-MF3	40	17.05	272	0.4
COS-1	COS	0	4.84	0	0
COS-2	COS	0	9.10	0	0
COS-3	COS	0	1.84	0	0
COS-4	COS	0	0.81	0	0
DC-1	DC	0	12.56	0	0
NP-1	COS(NP)	0	2.33	0	0
NP-2	COS	0	1.83	0	0
NP-3	COS	0	1.17	0	0
TOTAL LAND USE VALUES			444.50	5480	

LEGEND

- SF2 - SINGLE FAMILY DETACHED
- SF3 - SINGLE FAMILY DETACHED
- SFSD - SINGLE FAMILY SPECIAL DEVELOPMENT
- MF2 - MEDIUM DENSITY MULTI-FAMILY
- MF3 - HIGH DENSITY MULTI-FAMILY
- VC - VILLAGE CENTER
- EC - EMPLOYEMENT CENTER
- NF - NEIGHBORHOOD FOCUS
- COS - COMMUNITY OPEN SPACE
- 5' WIDE ON STREET BIKE LANE
- 10' WIDE SEPARATED BIKE LANE
- 10' WIDE SIDEWALK
- 8' WIDE SIDEWALK
- 5' WIDE SIDEWALK
- MULTI-MODAL TRAIL
- EASEMENT
- VILLAGE 22 BOUNDARY

NORTH

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

OWNER & DEVELOPER:

Howard Hughes
THE HOWARD HUGHES CORPORATION

THE HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY CORPORATION
10845 GRIFFITH PEAK DRIVE SUITE 160
LAS VEGAS, NV 89135
OFFICE PHONE NO. (702) 791-4000
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DISCLAIMER

THIS MAP DEPICTS EXISTING AND PROPOSED DEVELOPMENT IN SUMMERLIN. PROPOSED DEVELOPMENTS SHOWN ON THE PLAN ARE CONCEPTUAL AND PRELIMINARY, AND ARE INCLUDED ONLY TO SHOW INTENT AND RELATIONSHIP TO THE EXISTING COMMUNITY. PROPOSED DEVELOPMENTS MAY REQUIRE APPROVALS BY GOVERNMENTAL AGENCIES WHICH MAY NOT BE OBTAINED.

ALL PROPOSED LAND USES AND IMPROVEMENTS ARE SUBJECT TO MODIFICATION OR ELIMINATION WITHOUT NOTICE. THE INFORMATION DEPICTED HEREON SHOULD NOT BE A BASIS FOR A DECISION TO PURCHASE OR LEASE PROPERTY IN SUMMERLIN.

SUMMERLIN

SUMMERLIN WEST
VILLAGE 22
DEVELOPMENT PLAN

October 2019

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CURVE NUMBERS FOR SOILS - W.O. #7861

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes							
Soil	Percent	Group	Apartment/Condo$_1$	Townhouses$_2$	Open Space$_3$	Urban Districts$_4$	Impervious$_5$
Cave	100%	D	93	92	89	95	98
Total	**100%**		**93**	**92**	**89**	**95**	**98**

Soil # 155 Cave gravelly fine sandy loam, 4 to 15 percent slopes							
Soil	Percent	Group	Apartment/Condo$_1$	Townhouses$_2$	Open Space$_3$	Urban Districts$_4$	Impervious$_5$
Cave	100%	D	93	92	89	95	98
Total	**100%**		**93**	**92**	**89**	**95**	**98**

Soil # 156 Vace - Wechech association							
Soil	Percent	Group	Apartment/Condo$_1$	Townhouses$_2$	Open Space$_3$	Urban Districts$_4$	Impervious$_5$
Vace and Similar	45%	D	93	92	89	95	98
Wechech and Similar	25%	D	93	92	89	95	98
Wechech, steep, and similar	15%	D	93	92	89	95	98
Weiser	8%	B	88	87	79	92	98
Irongold	4%	D	93	92	89	95	98
Commski	2%	B	88	87	79	92	98
Threelakes	1%	A	81	80	68	89	98
Total	**100%**		**93**	**92**	**88**	**95**	**98**

Soil # 502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes							
Soil	Percent	Group	Apartment/Condo$_1$	Townhouses$_2$	Open Space$_3$	Urban Districts$_4$	Impervious$_5$
Canutio	55%	A	81	80	68	89	98
Cave	40%	D	93	92	89	95	98
Arizo	5%	D	93	92	89	95	98
Total	**100%**		**87**	**86**	**78**	**92**	**98**

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 (Townhouses)
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)

Curve Number calculations for ONSITE Basins

Basin	Type	Soil Percentage	Apartment/Condo$_1$	Townhouses$_2$	Open Space$_3$	Urban Districts$_4$	Impervious$_5$	CN Value
A	155	100%				100%		95.0
B	152	7%	40%			60%		93.5
	155	76%	40%			60%		
	502	17%	40%			60%		
C	155	100%				100%		95.0
D	155	100%				100%		95.0
E	155	100%				100%		95.0
F	155	100%				100%		95.0
G	155	100%				100%		95.0
H	155	100%				100%		95.0
I	152	12%		100%				92.0
	155	88%		100%				
J	152	2%		100%				92.0
	155	98%		100%				
K	152	36%		100%				92.0
	155	64%		100%				
L-M	155	81%		100%				94.4
	502	19%		100%				
N-O-P	152	2%		95%		5%		90.3
	155	98%		95%		5%		
Q	155	100%		95%		5%		92.2
R	155	66%		95%		5%		93.2
	502	34%		95%		5%		
S	155	27%		95%		5%		87.9
	502	73%		95%		5%		
T	502	100%		95%		5%		86.3
U	502	100%		95%		5%		86.3
V	155	0%	40%			60%		90.0
	502	100%	40%			60%		
W	502	100%	40%			60%		90.0
X	502	100%	40%			60%		90.0
Y-Z	156	7%		100%				92.2
	502	93%		100%				
AA	156	77%	100%					88.4
	502	23%	100%					
BB	156	26%	40%			60%		91.1
	502	74%	40%			60%		
CC	156	16%	40%			60%		90.7
	502	84%	40%			60%		
DD	156	13%	40%			60%		90.5
	502	87%	40%			60%		
EE	156	5%	40%			60%		90.2
	502	95%	40%			60%		
FF	156	100%	40%			60%		94.2

GG	156	100%	40%			60%		**94.2**
HH	156	100%	40%			60%		**94.2**
II	156	75%	40%			60%		**93.2**
	502	25%	40%			60%		
COS-1	155	16%			100%			**79.8**
	502	84%			100%			
COS-2	155	100%			100%			**89.0**
COS-3	156	52%			100%			**83.2**
	502	48%			100%			
COS-4	156	100%			100%			**88.0**
NP-1	155	100%			100%			**89.0**
NP-2	155	100%			100%			**89.0**
NP-3	156	25%			100%			**80.5**
	502	75%			100%			
DC-1	152	14%					100%	**98.0**
	155	46%					100%	
	156	9%					100%	
	502	31%					100%	
LM	155	95%					100%	**98.0**
	502	5%					100%	
LM2	155	88%					100%	**98.0**
	502	12%					100%	
DES1	155	100%					100%	**98.0**
DES2	152	23%					100%	**98.0**
	155	77%					100%	
DES3	155	100%					100%	**98.0**
DES4	155	18%					100%	**98.0**
	502	82%					100%	
DES5	156	7%					100%	**98.0**
	502	94%					100%	
DES6	156	100%					100%	**98.0**
CARR1	152	4%					100%	**98.0**
	155	96%					100%	
CARR2	155	55%					100%	**98.0**
	502	45%					100%	
CARR3	502	100%					100%	**98.0**
CARR4	156	67%					100%	**98.0**
	502	33%					100%	
STE1	502	100%					100%	**98.0**
STE2	502	100%					100%	**98.0**
STE3	502	100%					100%	**98.0**
STF	155	100%					100%	**98.0**
STF2	155	16%					100%	**98.0**
	502	84%					100%	
STG1	155	100%					100%	**98.0**
STG2	152	42%					100%	**98.0**
	155	58%					100%	

STG3	155	100%					100%	**98.0**
STH	155	100%					100%	**98.0**
STI	155	100%					100%	**98.0**
STJ1	155	100%					100%	**98.0**
STJ2	155	70%					100%	**98.0**
	502	30%					100%	
STJ3	156	50%					100%	**98.0**
	502	50%					100%	
STN1	155	502%					100%	**98.0**
STN2	155	44%					100%	**98.0**
	502	56%					100%	
STEE2	156	100%					100%	**98.0**
STEE3	156	100%					100%	**98.0**
25-HS1	155	94%				100%		**94.8**
	502	6%				100%		
25-HS1B	155	7%				100%		**92.2**
	502	93%				100%		
27-COS2	155	100%			100%			**89.0**
27-COS3	155	100%			100%			**89.0**
27-F	155	74%				100%		**94.2**
	502	26%				100%		

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861 **CALCULATED BY:** AH

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

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

Non-Urban		Urban	
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 ONSITE								
A	1651	3448	3310	0.084	20.2	5.8	30.6	8.8
B	1355	3336	3230	0.078	20.2	5.6	30.6	8.6
C	538	3454	3371	0.154	20.2	7.9	30.6	12.0
D	541	3368	3327	0.076	20.2	5.6	30.6	8.4
E	849	3526	3447	0.093	20.2	6.2	30.6	9.3
F	941	3514	3422	0.098	20.2	6.3	30.6	9.6
G	419	3435	3408	0.064	20.2	5.1	30.6	7.8
H	494	3408	3336	0.146	20.2	7.7	30.6	11.7
I	1044	3347	3299	0.046	20.2	4.3	30.6	6.6
J	403	3433	3371	0.154	20.2	7.9	30.6	12.0
K	326	3389	3346	0.132	20.2	7.3	30.6	11.1
L-M	1375	3514	3448	0.048	20.2	4.4	30.6	6.7
N-O-P	1164	3429	3375	0.046	20.2	4.4	30.6	6.6
Q	640	3353	3315	0.059	20.2	4.9	30.6	7.5
R	622	3364	3319	0.072	20.2	5.4	30.6	8.2
S	1000	3432	3375	0.057	20.2	4.8	30.6	7.3
T	284	3451	3403	0.169	20.2	8.3	30.6	12.6
U	276	3421	3384	0.134	20.2	7.4	30.6	11.2
V	680	3370	3329	0.060	20.2	5.0	30.6	7.5
W	700	3381	3333	0.069	20.2	5.3	30.6	8.0
X	1072	3338	3254	0.078	20.2	5.7	30.6	8.6
Y-Z	900	3530	3475	0.061	20.2	5.0	30.6	7.6
AA	1050	3535	3475	0.057	20.2	4.8	30.6	7.3
BB	703	3468	3428	0.057	20.2	4.8	30.6	7.3
CC	652	3431	3408	0.035	20.2	3.8	30.6	5.7
DD	621	3421	3391	0.048	20.2	4.4	30.6	6.7
EE	555	3393	3341	0.094	20.2	6.2	30.6	9.4
FF	269	3469	3416	0.197	20.2	9.0	30.6	13.6
GG	392	3426	3392	0.087	20.2	5.9	30.6	9.0
HH	505	3387	3343	0.087	20.2	6.0	30.6	9.0
II	962	3337	3268	0.072	20.2	5.4	30.6	8.2
COS-1	1373	3450	3350	0.073	14.8	4.0	29.4	7.9
COS-2	1676	3452	3417	0.021	14.8	2.1	29.4	4.2
COS-3	1035	3530	3465	0.063	14.8	3.7	29.4	7.4
COS-4	362	3326	3308	0.050	14.8	3.3	29.4	6.6
NP-1	98	3359	3343	0.163	20.2	8.2	30.6	12.4
NP-2	95	3460	3420	0.421	20.2	13.1	30.6	19.9
NP-3	123	3391	3376	0.122	20.2	7.1	30.6	10.7
DC-1	3630	3252	3219	0.009	20.2	1.9	30.6	2.9

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861 **CALCULATED BY:** AH

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

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

Non-Urban		Urban	
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)
LM	3472	3515	3305	0.060	20.2	5.0	30.6	7.5
LM2	2360	3654	3510	0.061	20.2	5.0	30.6	7.6
DES1	1148	3344	3303	0.036	20.2	3.8	30.6	5.8
DES2	1035	3354	3336	0.017	20.2	2.7	30.6	4.0
DES3	552	3369	3337	0.058	20.2	4.9	30.6	7.4
DES4	652	3385	3366	0.029	20.2	3.4	30.6	5.2
DES5	696	3393	3380	0.019	20.2	2.8	30.6	4.2
DES6	318	3400	3391	0.028	20.2	3.4	30.6	5.1
CARR1	1400	3343	3301	0.030	20.2	3.5	30.6	5.3
CARR2	920	3320	3302	0.020	20.2	2.8	30.6	4.3
CARR3	720	3335	3332	0.004	20.2	1.3	30.6	2.0
CARR4	735	3350	3337	0.018	20.2	2.7	30.6	4.1
STE1	870	3519	3461	0.067	20.2	5.2	30.6	7.9
STE2	867	3455	3384	0.082	20.2	5.8	30.6	8.8
STE3	505	3384	3341	0.085	20.2	5.9	30.6	8.9
STF	887	3436	3370	0.074	20.2	5.5	30.6	8.3
STF2	620	3362	3325	0.060	20.2	4.9	30.6	7.5
STG1	890	3513	3421	0.103	20.2	6.5	30.6	9.8
STG2	1025	3424	3348	0.074	20.2	5.5	30.6	8.3
STG3	405	3341	3309	0.079	20.2	5.7	30.6	8.6
STH	1102	3421	3343	0.071	20.2	5.4	30.6	8.1
STI	1262	3442	3345	0.077	20.2	5.6	30.6	8.5
STJ1	1498	3457	3415	0.028	20.2	3.4	30.6	5.1
STJ2	1025	3440	3413	0.026	20.2	3.3	30.6	5.0
STJ3	926	3473	3453	0.022	20.2	3.0	30.6	4.5
STN1	1450	3519	3508	0.008	20.2	1.8	30.6	2.7
STN2	1175	3546	3514	0.027	20.2	3.3	30.6	5.0
STEE2	791	3470	3393	0.097	20.2	6.3	30.6	9.5
STEE3	575	3386	3342	0.077	20.2	5.6	30.6	8.5
25-HS1	1685	3636	3520	0.069	20.2	5.3	30.6	8.0
25-HS1B	1355	3632	3531	0.075	20.2	5.5	30.6	8.4
27-COS2	990	3670	3597	0.074	14.8	4.0	29.4	8.0
27-COS3	4130	3791	3461	0.080	14.8	4.2	29.4	8.3
27-F	1215	3711	3624	0.072	20.2	5.4	30.6	8.2

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861 **CALCULATED BY:** AH

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance	
Existing:	**Developed**

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

$V1 = 1.48 * S^{1/2}$ $V2 = 2.94 * S^{1/2}$

$V1 = 2.02 * S^{1/2}$ $V2 = 3.06 * S^{1/2}$

$$k = 0.0132 C_n - 0.39$$

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.	
DEVELOPED CONDITION ONSITE																	
A	95.0	0.864	17.39	0.0272	100	1.0	4.25	1651	8.4	5.8	8.8	3.60	1751	19.73	7.84	0.078	
B	93.5	0.844	80.77	0.1262	100	1.0	4.61	1355	7.8	5.6	8.6	3.14	1455	18.08	7.75	0.077	
C	95.0	0.864	12.05	0.0188	100	1.0	4.25	538	15.4	7.9	12.0	1.10	638	13.54	5.35	0.054	
D	95.0	0.864	11.96	0.0187	100	1.0	4.25	541	7.6	5.6	8.4	1.58	641	13.56	5.83	0.058	
E	95.0	0.864	13.91	0.0217	100	1.0	4.25	849	9.3	6.2	9.3	1.98	949	15.27	6.22	0.062	
F	95.0	0.864	14.22	0.0222	100	1.0	4.25	941	9.8	6.3	9.6	2.09	1041	15.78	6.34	0.063	
G	95.0	0.864	7.05	0.0110	100	1.0	4.25	419	6.4	5.1	7.8	1.36	519	12.88	5.61	0.056	
H	95.0	0.864	7.64	0.0119	100	1.0	4.25	494	14.6	7.7	11.7	1.07	594	13.30	5.32	0.053	
I	92.0	0.824	13.44	0.0210	100	1.0	4.96	1044	4.6	4.3	6.6	3.31	1144	16.36	8.27	0.083	
J	92.0	0.824	5.93	0.0093	100	1.0	4.96	403	15.4	7.9	12.0	0.85	503	12.79	5.81	0.058	
K	92.0	0.824	5.28	0.0083	100	1.0	4.96	326	13.2	7.3	11.1	0.74	426	12.37	5.70	0.057	
L-M	94.4	0.856	21.14	0.0330	100	1.0	4.38	1375	4.8	4.4	6.7	4.06	1475	18.19	8.44	0.084	
N-O-P	90.3	0.801	14.52	0.0227	100	1.0	5.38	1164	4.6	4.4	6.6	3.59	1264	17.02	8.97	0.090	
Q	92.2	0.826	4.58	0.0072	100	1.0	4.93	640	5.9	4.9	7.5	2.01	740	14.11	6.93	0.069	
R	93.2	0.840	4.97	0.0078	100	1.0	4.68	622	7.2	5.4	8.2	1.78	722	14.01	6.46	0.065	
S	87.9	0.770	3.01	0.0047	100	1.0	5.94	1000	5.7	4.8	7.3	2.87	1100	16.11	8.81	0.088	
T	86.3	0.749	4.02	0.0063	100	1.0	6.32	284	16.9	8.3	12.6	0.57	384	12.13	6.89	0.069	
U	86.3	0.749	3.49	0.0055	100	1.0	6.32	276	13.4	7.4	11.2	0.62	376	12.09	6.94	0.069	
V	90.0	0.798	5.01	0.0078	100	1.0	5.44	680	6.0	5.0	7.5	2.08	780	14.33	7.52	0.075	
W	90.0	0.798	5.28	0.0083	100	1.0	5.44	700	6.9	5.3	8.0	1.99	800	14.44	7.43	0.074	
X	90.0	0.798	17.45	0.0273	100	1.0	5.44	1072	7.8	5.7	8.6	2.59	1172	16.51	8.02	0.080	
Y-Z	92.2	0.827	11.28	0.0176	100	1.0	4.91	900	6.1	5.0	7.6	2.55	1000	15.56	7.46	0.075	
AA	88.4	0.777	10.13	0.0158	100	1.0	5.82	1050	5.7	4.8	7.3	2.98	1150	16.39	8.80	0.088	
BB	91.1	0.812	6.29	0.0098	100	1.0	5.18	703	5.7	4.8	7.3	2.19	803	14.46	7.37	0.074	
CC	90.7	0.807	5.34	0.0083	100	1.0	5.28	652	3.5	3.8	5.7	2.64	752	14.18	7.91	0.079	
DD	90.5	0.805	4.76	0.0074	100	1.0	5.31	621	4.8	4.4	6.7	2.18	721	14.01	7.48	0.075	
EE	90.2	0.801	6.80	0.0106	100	1.0	5.39	555	9.4	6.2	9.4	1.45	655	13.64	6.83	0.068	
FF	94.2	0.853	3.49	0.0055	100	1.0	4.44	269	19.7	9.0	13.6	0.50	369	12.05	4.94	0.049	Use Min TLAG = 0.050 per HCDDM
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	
HH	94.2	0.853	4.85	0.0076	100	1.0	4.44	505	8.7	6.0	9.0	1.41	605	13.36	5.84	0.058	
II	93.2	0.840	16.03	0.0250	100	1.0	4.69	962	7.2	5.4	8.2	2.48	1062	15.90	7.17	0.072	
COS-1	79.8	0.663	2.87	0.0045	100	1.0	7.87	1373	7.3	4.0	7.9	3.92	1473	18.18	11.79	0.118	
COS-2	89.0	0.785	7.51	0.0117	100	1.0	5.67	1676	2.1	2.1	4.2	8.51	1776	19.87	14.18	0.142	
COS-3	83.2	0.708	1.70	0.0027	100	1.0	7.05	1035	6.3	3.7	7.4	3.46	1135	16.31	10.51	0.105	Use Min TLAG = 0.100 per HCDDM
COS-4	88.0	0.772	0.57	0.0009	100	1.0	5.91	362	5.0	3.3	6.6	1.83	462	12.57	7.74	0.077	Use Min TLAG = 0.100 per HCDDM
NP-1	89.0	0.785	1.73	0.0027	100	1.0	5.67	98	16.3	8.2	12.4	0.20	198	11.10	5.87	0.059	
NP-2	89.0	0.785	1.34	0.0021	100	1.0	5.67	95	42.1	13.1	19.9	0.12	195	11.08	5.79	0.058	
NP-3	80.5	0.673	0.70	0.0011	100	1.0	7.69	123	12.2	7.1	10.7	0.29	223	11.24	7.98	0.080	
DC-1	98.0	0.904	12.59	0.0197	100	1.0	3.54	3630	0.9	1.9	2.9	22.21	3730	30.72	25.74	0.257	
LM	98.0	0.904	10.04	0.0157	100	1.0	3.54	3472	6.0	5.0	7.5	8.26	3572	29.84	11.79	0.118	
LM2	98.0	0.904	7.23	0.0113	100	1.0	3.54	2360	6.1	5.0	7.6	5.77	2460	23.67	9.31	0.093	
DES1	98.0	0.904	4.46	0.0070	38	2.0	1.73	1148	3.6	3.8	5.8	4.05	1186	16.59	5.78	0.058	
DES2	98.0	0.904	3.09	0.0048	38	2.0	1.73	1035	1.7	2.7	4.0	5.34	1073	15.96	7.07	0.071	

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 22

W.O. # 7861 **CALCULATED BY:** AH

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance	
Existing:	**Developed**

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

$V1 = 1.48 * S^{1/2}$ $V2 = 2.94 * S^{1/2}$

$V1 = 2.02 * S^{1/2}$ $V2 = 3.06 * S^{1/2}$

$$k = 0.0132 C_n - 0.39$$

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.	
DES3	98.0	0.904	2.00	0.0031	30	2.0	1.54	552	5.8	4.9	7.4	1.83	582	13.23	3.37	0.034	Use Min TLAG = 0.050 per HCDDM
DES4	98.0	0.904	1.77	0.0028	30	2.0	1.54	652	2.9	3.4	5.2	2.90	682	13.79	4.44	0.044	Use Min TLAG = 0.050 per HCDDM
DES5	98.0	0.904	1.57	0.0025	30	2.0	1.54	696	1.9	2.8	4.2	3.80	726	14.03	5.34	0.053	
DES6	98.0	0.904	1.31	0.0020	30	2.0	1.54	318	2.8	3.4	5.1	1.56	348	11.93	3.10	0.031	Use Min TLAG = 0.050 per HCDDM
CARR1	98.0	0.904	6.95	0.0109	42	2.0	1.82	1400	3.0	3.5	5.3	5.21	1442	18.01	7.03	0.070	
CARR2	98.0	0.904	3.58	0.0056	42	2.0	1.82	920	2.0	2.8	4.3	4.58	962	15.34	6.40	0.064	
CARR3	98.0	0.904	2.14	0.0033	42	2.0	1.82	720	0.4	1.3	2.0	8.25	762	14.23	10.07	0.101	
CARR4	98.0	0.904	2.33	0.0036	42	2.0	1.82	735	1.8	2.7	4.1	4.06	777	14.32	5.88	0.059	
STE1	98.0	0.904	1.75	0.0027	21	2.0	1.29	870	6.7	5.2	7.9	2.38	891	14.95	3.66	0.037	Use Min TLAG = 0.050 per HCDDM
STE2	98.0	0.904	1.78	0.0028	21	2.0	1.29	867	8.2	5.8	8.8	2.14	888	14.93	3.43	0.034	Use Min TLAG = 0.050 per HCDDM
STE3	98.0	0.904	1.36	0.0021	21	2.0	1.29	505	8.5	5.9	8.9	1.42	526	12.92	2.71	0.027	Use Min TLAG = 0.050 per HCDDM
STF	98.0	0.904	1.84	0.0029	21	2.0	1.29	887	7.4	5.5	8.3	2.29	908	15.04	3.57	0.036	Use Min TLAG = 0.050 per HCDDM
STF2	98.0	0.904	1.21	0.0019	21	2.0	1.29	620	6.0	4.9	7.5	1.96	641	13.56	3.24	0.032	Use Min TLAG = 0.050 per HCDDM
STG1	98.0	0.904	1.85	0.0029	19	2.0	1.22	890	10.3	6.5	9.8	1.94	909	15.05	3.17	0.032	Use Min TLAG = 0.050 per HCDDM
STG2	98.0	0.904	2.86	0.0045	30	2.0	1.54	1025	7.4	5.5	8.3	2.57	1055	15.86	4.10	0.041	Use Min TLAG = 0.050 per HCDDM
STG3	98.0	0.904	0.72	0.0011	30	2.0	1.54	405	7.9	5.7	8.6	1.19	435	12.42	2.73	0.027	Use Min TLAG = 0.050 per HCDDM
STH	98.0	0.904	2.29	0.0036	21	2.0	1.29	1102	7.1	5.4	8.1	2.78	1123	16.24	4.07	0.041	Use Min TLAG = 0.050 per HCDDM
STI	98.0	0.904	2.42	0.0038	19	2.0	1.22	1262	7.7	5.6	8.5	2.99	1281	17.12	4.21	0.042	Use Min TLAG = 0.050 per HCDDM
STJ1	98.0	0.904	3.52	0.0055	19	2.0	1.22	1498	2.8	3.4	5.1	5.71	1517	18.43	6.93	0.069	
STJ2	98.0	0.904	3.10	0.0048	30	2.0	1.54	1025	2.6	3.3	5.0	4.30	1055	15.86	5.84	0.058	
STJ3	98.0	0.904	3.22	0.0050	30	2.0	1.54	926	2.2	3.0	4.5	4.39	956	15.31	5.92	0.059	
STN1	98.0	0.904	3.61	0.0056	40	2.0	1.77	1450	0.8	1.8	2.7	10.68	1490	18.28	12.45	0.125	
STN2	98.0	0.904	4.33	0.0068	40	2.0	1.77	1175	2.7	3.3	5.0	4.73	1215	16.75	6.50	0.065	
STEE2	98.0	0.904	1.79	0.0028	21	2.0	1.29	791	9.7	6.3	9.5	1.83	812	14.51	3.12	0.031	Use Min TLAG = 0.050 per HCDDM
STEE3	98.0	0.904	1.23	0.0019	21	2.0	1.29	575	7.7	5.6	8.5	1.64	596	13.31	2.92	0.029	Use Min TLAG = 0.050 per HCDDM
25-HS1	94.8	0.862	49.49	0.0773	21	2.0	1.56	1685	6.9	5.3	8.0	4.03	1706	19.48	5.59	0.056	
25-HS1B	92.2	0.827	11.63	0.0182	21	2.0	1.79	1355	7.5	5.5	8.4	3.22	1376	17.64	5.00	0.050	
27-COS2	89.0	0.785	5.25	0.0082	21	2.0	2.06	990	7.4	4.0	8.0	3.10	1011	15.62	5.16	0.052	
27-COS3	89.0	0.785	17.46	0.0273	21	2.0	2.06	4130	8.0	4.2	8.3	9.27	4151	33.06	11.34	0.113	
27-F	94.2	0.854	19.13	0.0299	21	2.0	1.61	1215	7.2	5.4	8.2	3.00	1236	16.87	4.61	0.046	Use Min TLAG = 0.050 per HCDDM
															Tc Min (Urban)= 5 min		
															Tc Min (Non Urb)= 10 min		

```
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   23OCT19  TIME  13:10:22  *                                                  *           (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 = OCTOBER 2019
            3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
            4          ID    STORM DISTRIBUTION = SDN #3
            5          ID    MODELED BY VTN (JYA)
            6          ID
            7          ID    ********************************************************
            8          ID    * UPDATE #2 - SUMMERLIN WEST VILLAGE 22                *
            9          ID    ********************************************************
           10          ID
           11          ID
           12          ID
           13          ID
           14          ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
           15          ID
           16          ID  100-YEAR,  6-HOUR STORM,  SDN3
           17          ID
           18          IT       5       0       0     100
           19          IO       5       0       0
           20          IN       5       0       0
           21          JR    PREC    1.00
                       *

           22          KK      LM
           23          BA  0.0157
           24          PB    3.41
           25          PC       0   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
           26          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
           27          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
           28          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
           29          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
           30          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
           31          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
           32          PC   0.998   0.999       1
           33          LS       0    98.0
           34          UD   0.118
                       *

           35          KK       D
           36          BA  0.0187
           37          PB    3.39
           38          LS       0    95.0
           39          UD   0.058
                       *

           40          KK    DES1
           41          BA  0.0070
           42          PB    3.39
           43          LS       0    98.0
           44          UD   0.058
                       *
```

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

  45          KK   CDES1
  46          KM   COMBINE D AND DES1
  47          HC       2
              *

  48          KK  RCDES1
  49          KM   ROUTE CDES1 TO CCOS-2
  50          RD     241   0.027   0.013       0    CIRC     2.5
              *

  51          KK   COS-2
  52          BA  0.0117
  53          PB    3.41
  54          LS       0    89.0
  55          UD   0.142
              *

  56          KK  CCOS-2
  57          KM   COMBINE CDES1 AND COS-2
  58          HC       2
              *

  59          KK RCCOS-2
  60          KM   ROUTE CCOS-2 TO CA
  61          RD     325   0.007   0.013       0    CIRC     3.0
              *

  62          KK       A
  63          BA  0.0272
  64          PB    3.41
  65          LS       0    95.0
  66          UD   0.078
              *

  67          KK      CA
  68          KM   COMBINE CCOS-2 AND A
  69          HC       2
              *

  70          KK     RCA
  71          KM   ROUTE CA TO CP1
  72          RD     325   0.050   0.013       0    CIRC     3.5
              *

  73          KK     CP1
  74          KM   COMBINE LM AND CA
  75          HC       2
              *
```



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

  76          KK     STI
  77          KM   KESTREL CREEK AVE
  78          BA  0.0038
  79          PB    3.41
  80          LS       0    98.0
  81          UD   0.050
              *

  82          KK       C
  83          BA  0.0188
  84          PB    3.41
  85          LS       0    95.0
  86          UD   0.054
              *

  87          KK    CSTI
  88          KM   COMBINE C AND STI
  89          HC       2
              *

  90          KK       G
  91          BA  0.0110
  92          PB    3.41
  93          LS       0    95.0
  94          UD   0.056
              *

  95          KK      CG
  96          KM   COMBINE CSTI AND CG
  97          HC       2
              *

  98          KK     RCG
```

```
             99          KM   ROUTE CG TO CH
            100          RD     556   0.081   0.013       0    CIRC     3.5
                         *

            101          KK       H
            102          BA  0.0119
            103          PB    3.41
            104          LS       0    95.0
            105          UD   0.053
                         *

            106          KK      CH
            107          KM   COMBINE CG AND CH
            108          HC       2
                         *
1                                      HEC-1 INPUT                                          PAGE  4

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


            109          KK     RCH
            110          KM   ROUTE CH TO CP2
            111          RD     255   0.093   0.013       0    CIRC     3.5
                         *

            112          KK     STH
            113          KM   CLOWDER PASS WAY
            114          BA  0.0036
            115          PB    3.41
            116          LS       0    98.0
            117          UD   0.050
                         *

            118          KK       J
            119          BA  0.0093
            120          PB    3.41
            121          LS       0    92.0
            122          UD   0.058
                         *

            123          KK      CJ
            124          KM   COMBINE J AND STH
            125          HC       2
                         *

            126          KK     RCJ
            127          KM   ROUTE CJ TO CDES2
            128          RD     637   0.080   0.013       0    CIRC     2.5
                         *

            129          KK       K
            130          BA  0.0081
            131          PB    3.40
            132          LS       0    95.0
            133          UD   0.050
                         *

            134          KK    DES2
            135          BA  0.0048
            136          PB    3.38
            137          LS       0    98.0
            138          UD   0.071
                         *

            139          KK   CDES2
            140          KM   COMBINE DES2, CJ, AND K
            141          HC       3
                         *
1                                      HEC-1 INPUT                                          PAGE  5

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


            142          KK  RCDES2
            143          KM   ROUTE CDES2 TO CP2
            144          RD     643   0.014   0.013       0    CIRC     3.5
                         *

            145          KK     CP2
            146          KM   COMBINE CDES2 & CH
            147          HC       2
                         *

            148          KK    RCP2
            149          KM   ROUTE CP2 TO CP5
            150          RD    1226   0.039   0.013       0    CIRC     4.5
                         *

            151          KK   CARR1
            152          BA  0.0109
            153          PB    3.38
```

```
             154          LS       0    98.0
             155          UD   0.070
                          *

             156          KK       I
             157          BA  0.0165
             158          PB    3.38
             159          LS       0    92.0
             160          UD   0.083
                          *

             161          KK   N-O-P
             162          BA  0.0227
             163          PB    3.40
             164          LS       0    90.3
             165          UD   0.090
                          *

             166          KK    NP-1
             167          BA  0.0027
             168          PB    3.40
             169          LS       0    89.0
             170          UD   0.059
                          *

             171          KK    STG2
             172          KM   FLEET WING AVE
             173          BA  0.0045
             174          PB    3.40
             175          LS       0    98.0
             176          UD   0.050
                          *
1                                        HEC-1 INPUT                                        PAGE  6

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

             177          KK   CSTG2
             178          KM   COMBINE N-O-P, NP-1 AND STG2
             179          HC       3
                          *

             180          KK    DES3
             181          BA  0.0031
             182          PB    3.38
             183          LS       0    98.0
             184          UD   0.050
                          *

             185          KK     CP3
             186          KM   COMBINES CSTG2 & DES3
             187          HC       2
                          *

             188          KK    RCP3
             189          KM   ROUTE CP3 TO CSTG3
             190          RD     513   0.080   0.013       0    CIRC     3.0
                          *

             191          KK    STG3
             192          BA  0.0011
             193          PB    3.38
             194          LS       0    98.0
             195          UD   0.050
                          *

             196          KK   CSTG3
             197          KM   COMBINES CP3 AND STG
             198          HC       2
                          *

             199          KK       Q
             200          BA  0.0072
             201          PB    3.38
             202          LS       0    92.2
             203          UD   0.069
                          *

             204          KK       R
             205          BA  0.0078
             206          PB    3.37
             207          LS       0    93.2
             208          UD   0.065
                          *

             209          KK     CQR
             210          KM   COMBINE R AND Q
             211          HC       2
                          *
1                                        HEC-1 INPUT                                        PAGE  7
```

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

 212          KK   CARR2
 213          BA  0.0056
 214          PB    3.37
 215          LS       0    98.0
 216          UD   0.064
              *

 217          KK  CCARR2
 218          KM   COMBINE CQR AND CARR2
 219          HC       2
              *

 220          KK RCCARR2
 221          KM   ROUTE CCARR2 TO CP4
 222          RD     414   0.033   0.013       0    CIRC     2.5
              *

 223          KK     CP4
 224          KM   COMBINE CP3 AND CCARR2
 225          HC       2
              *

 226          KK    RCP4
 227          KM   ROUTE CP4 TO CP5
 228          RD     582   0.010   0.013       0    CIRC     3.5
              *

 229          KK     CP5
 230          KM   COMBINE CARR1, I, CP2 AND CP4
 231          HC       4
              *

 232          KK      II
 233          BA  0.0250
 234          PB    3.37
 235          LS       0    93.2
 236          UD   0.072
              *

 237          KK       X
 238          BA  0.0273
 239          PB    3.37
 240          LS       0    90.0
 241          UD   0.080
              *

 242          KK       B
 243          BA  0.1262
 244          PB    3.36
 245          LS       0    93.5
 246          UD   0.077
              *
1                                    HEC-1 INPUT                                        PAGE  8

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

 247          KK    DC-1
 248          BA  0.0197
 249          PB    3.35
 250          LS       0      98
 251          UD   0.257
              *

 252          KK   COS-4
 253          BA  0.0009
 254          PB    3.35
 255          LS       0    88.0
 256          UD   0.077
              *

 257          KK DUMMY1A
 258          KM   REGIONAL FACILITY - BELTWAY CHANNEL NORTH
 259          KM   COMBINE II, X, B, DC1, AND COS-4
 260          HC       5
              *

 261          KK   COS-1
 262          BA  0.0045
 263          PB    3.41
 264          LS       0    79.8
 265          UD   0.118
              *

 266          KK  DUMMY1
 267          KM   REGIONAL FACILITY - BELTWAY CHANNEL NORTH
 268          KM   COMBINE CP1, CP5, DUMMY1A, AND COS-1
 269          HC       4
```

```
                *

 270            KK    27-F
 271            BA  0.0299
 272            PB    3.48
 273            LS       0    94.2
 274            UD   0.050
                *

 275            KK 27-COS2
 276            BA  0.0082
 277            PB    3.46
 278            LS       0    89.0
 279            UD   0.052
                *

 280            KK     LM2
 281            BA  0.0113
 282            PB    3.41
 283            LS       0    98.0
 284            UD   0.093
                *
1                                       HEC-1 INPUT                                             PAGE  9

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


 285            KK    CLM2
 286            KM   COMBINES OFFSITE V27 BASINS 27-F, V27-COS2, AND LM2
 287            HC       3
                *

 288            KK 27-COS3
 289            BA  0.0273
 290            PB    3.47
 291            LS       0    89.0
 292            UD   0.113
                *

 293            KK    COFF
 294            KM   COMBINES OFFSITE V27 BASINS
 295            KM   COMBINE CLM2 AND V27-COS3
 296            HC       2
                *

 297            KK   RCOFF
 298            KM   ROUTE COFF TO CSTJ1
 299            RD     744   0.058   0.013       0    CIRC     4.5
                *

 300            KK       E
 301            BA  0.0217
 302            PB    3.43
 303            LS       0    95.0
 304            UD   0.062
                *

 305            KK    STJ1
 306            KM   KETTLE RIDGE
 307            BA  0.0055
 308            PB    3.43
 309            LS       0    98.0
 310            UD   0.069
                *

 311            KK   CSTJ1
 312            KM   COMBINE COFF, E, AND STJ1
 313            HC       3
                *

 314            KK  RCSTJ1
 315            KM   ROUTE COFF TO CSTJ1
 316            RD     380   0.005   0.013       0    CIRC       5
                *

 317            KK    NP-2
 318            BA  0.0021
 319            PB    3.43
 320            LS       0    89.0
 321            UD   0.058
                *
1                                       HEC-1 INPUT                                             PAGE 10

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


 322            KK   CNP-2
 323            KM   COMBINE CSTJ1 AND CNP-2
 324            HC       2
                *
```

```
 325          KK  RCNP-2
 326          KM   ROUTE CNP-2 TO CF
 327          RD     390   0.005   0.013       0    DEEP       6
              *

 328          KK       F
 329          BA  0.0222
 330          PB    3.43
 331          LS       0    95.0
 332          UD   0.063
              *

 333          KK      CF
 334          KM   COMBINE CNP-1 AND CF
 335          HC       2
              *

 336          KK     RCF
 337          KM   ROUTE CF  TO CP6
 338          RD     320   0.005   0.013       0    DEEP       6
              *

 339          KK  25-HS1
 340          BA  0.0773
 341          PB    3.44
 342          LS       0    94.8
 343          UD   0.056
              *

 344          KK    STN1
 345          KM   SCURRY BEND
 346          BA  0.0056
 347          PB    3.44
 348          LS       0    98.0
 349          UD   0.125
              *

 350          KK   CSTN1
 351          KM   COMBINE 25-HS1 AND STN1
 352          HC       2
              *

 353          KK  RCSTN1
 354          KM   ROUTE CSTN1 TO CSTG1
 355          RD    1010   0.090   0.013       0    CIRC     4.5
              *
1                                          HEC-1 INPUT                                                PAGE 11

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


 356          KK    STG1
 357          BA  0.0029
 358          PB    3.42
 359          LS       0    98.0
 360          UD   0.050
              *

 361          KK   CSTG1
 362          KM   COMBINE CSTN1 AND STG1
 363          HC       2
              *

 364          KK     CP6
 365          KM   COMBINE CF AND CSTG1
 366          HC       2
              *

 367          KK    RCP6
 368          KM   ROUTE CP6 TO CSTJ2
 369          RD     530   0.005   0.013       0    DEEP       6       0
              *

 370          KK     L-M
 371          BA  0.0330
 372          PB    3.42
 373          LS       0    94.4
 374          UD   0.084
              *

 375          KK    STJ2
 376          BA  0.0048
 377          PB    3.42
 378          LS       0    98.0
 379          UD   0.058
              *

 380          KK   CSTJ2
 381          KM   COMBINE CP6, L-M AND STJ2
 382          HC       3
              *
```

```
          383          KK  RCSTJ2
          384          KM   ROUTE CSTJ2 TO CSTF
          385          RD    1000   0.069   0.015       0    DEEP       6       0
                       *

          386          KK     STF
          387          BA  0.0029
          388          PB    3.40
          389          LS       0    98.0
          390          UD   0.050
                       *
1                                        HEC-1 INPUT                                        PAGE 12

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


          391          KK    CSTF
          392          KM   COMBINE CSTJ2 AND CSTF
          393          HC       2
                       *

          394          KK       U
          395          BA  0.0055
          396          PB    3.40
          397          LS       0    86.3
          398          UD   0.069
                       *

          399          KK    DES4
          400          BA  0.0028
          401          PB    3.40
          402          LS       0    98.0
          403          UD   0.050
                       *

          404          KK   CDES4
          405          KM   COMBINE U AND DES4
          406          HC       2
                       *

          407          KK       S
          408          BA  0.0047
          409          PB    3.40
          410          LS       0    87.9
          411          UD   0.088
                       *

          412          KK      CS
          413          KM   CDES4 AND S
          414          HC       2
                       *

          415          KK     CP7
          416          KM   COMBINE CSTF AND CS
          417          HC       2
                       *

          418          KK    RCP7
          419          KM   ROUTE CP7 TO CSTF2
          420          RD     710   0.066   0.015       0    DEEP       6       0
                       *

          421          KK    STF2
          422          BA  0.0019
          423          PB    3.37
          424          LS       0    98.0
          425          UD   0.050
                       *
1                                        HEC-1 INPUT                                        PAGE 13

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


          426          KK   CSTF2
          427          KM   COMBINE CP7 AND STF2
          428          HC       2
                       *

          429          KK  RCSTF2
          430          KM   ROUTE CSTF2 TO CCARR3
          431          RD     420   0.005   0.015       0    DEEP       8       0
                       *

          432          KK       V
          433          BA  0.0078
          434          PB    3.37
          435          LS       0    90.0
          436          UD   0.075
                       *
```

```
 437          KK       W
 438          BA  0.0083
 439          PB    3.40
 440          LS       0    90.0
 441          UD   0.074
              *

 442          KK     CVW
 443          KM   COMBINE W AND V
 444          HC       2
              *

 445          KK   CARR3
 446          BA  0.0033
 447          PB    3.37
 448          LS       0    98.0
 449          UD   0.101
              *

 450          KK  RCARR3
 451          KM   ROUTE CCARR3 TO CP8
 452          RD     360   0.005   0.015       0    DEEP       8       0
              *

 453          KK  CCARR3
 454          KM   COMBINE STF2, CVW AND CARR3
 455          HC       3
              *

 456          KK    STE3
 457          BA  0.0021
 458          PB    3.40
 459          LS       0    98.0
 460          UD   0.050
              *
```



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


 461          KK     CP8
 462          KM   COMBINE STE3 AND CCARR3
 463          HC       2
              *

 464          KK    RCP8
 465          KM   ROUTE CP8 TO CEE
 466          RD     240   0.005   0.015       0    DEEP       8       0
              *

 467          KK      EE
 468          BA  0.0106
 469          PB    3.39
 470          LS       0    90.2
 471          UD   0.068
              *

 472          KK     CEE
 473          KM   COMBINES CP8 AND EE
 474          HC       2
              *

 475          KK    RCP8
 476          KM   ROUTE CEE TO CP9
 477          RD     220   0.005   0.015       0    DEEP       8       0
              *

 478          KK    NP-3
 479          BA  0.0011
 480          PB    3.39
 481          LS       0    80.5
 482          UD   0.080
              *

 483          KK   STEE3
 484          BA  0.0019
 485          PB    3.39
 486          LS       0    98.0
 487          UD   0.050
              *

 488          KK  CSTEE3
 489          KM   COMBINES NP-3 AND CSTEE3
 490          HC       2
              *

 491          KK     CP9
 492          KM   COMBINES CSTEE3 AND CEE
 493          HC       2
              *
```

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

 494          KK    RCP9
 495          KM   ROUTE CP9 TO DUMMY2
 496          RD     281   0.005   0.015       0    DEEP       8       0
              *

 497          KK      HH
 498          BA  0.0076
 499          PB    3.39
 500          LS       0    94.2
 501          UD   0.058
              *

 502          KK   CARR4
 503          BA  0.0036
 504          PB    3.37
 505          LS       0    98.0
 506          UD   0.059
              *

 507          KK  DUMMY2
 508          KM   REGIONAL FACILITY - BELTWAY CHANNEL SOUTH
 509          HC       3
              *

 510          KK 25-HS1B
 511          BA  0.0182
 512          PB    3.44
 513          LS       0    92.2
 514          UD   0.050
              *

 515          KK    STN2
 516          BA  0.0068
 517          PB    3.44
 518          LS       0    98.0
 519          UD   0.065
              *

 520          KK   CSTN2
 521          KM   COMBINE 25-HS1B AND STN2
 522          HC       2
              *

 523          KK  RCSTN2
 524          KM   ROUTE CSTN2 TO CSTE1
 525          RD    1000   0.067   0.015       0    CIRC       3
              *

 526          KK     Y-Z
 527          BA  0.0176
 528          PB    3.42
 529          LS       0    92.2
 530          UD   0.075
              *
1                                      HEC-1 INPUT                                          PAGE 16

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

 531          KK    STE1
 532          BA  0.0027
 533          PB    3.42
 534          LS       0    98.0
 535          UD   0.050
              *

 536          KK   CSTE1
 537          KM   COMBINE CSTN2, Y-Z AND STE1
 538          HC       3
              *

 539          KK  RCSTE1
 540          KM   ROUTE CSTE1 TO CSTJ3
 541          RD     980   0.005   0.015       0    DEEP       5       0
              *

 542          KK   COS-3
 543          BA  0.0027
 544          PB    3.42
 545          LS       0    83.2
 546          UD   0.105
              *

 547          KK    STJ3
 548          BA  0.0050
 549          PB    3.42
 550          LS       0    98.0
```

```
 551          UD   0.059
              *

 552          KK   CSTJ3
 553          KM   COMBINE CSTE1, COS-3 AND STJ3
 554          HC       3
              *

 555          KK      AA
 556          BA  0.0158
 557          PB    3.44
 558          LS       0    88.4
 559          UD   0.088
              *

 560          KK  DUMMY3
 561          KM   COMBINE CSTJ3 AND AA
 562          HC       2
              *

 563          KK    STE2
 564          BA  0.0028
 565          PB    3.40
 566          LS       0    98.0
 567          UD   0.050
              *
1                                          HEC-1 INPUT                                          PAGE 17

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


 568          KK      BB
 569          BA  0.0098
 570          PB    3.42
 571          LS       0    91.1
 572          UD   0.074
              *

 573          KK     CBB
 574          HC       2
              *

 575          KK       T
 576          BA  0.0063
 577          PB    3.42
 578          LS       0    86.3
 579          UD   0.069
              *

 580          KK      CT
 581          HC       2
              *

 582          KK      CC
 583          BA  0.0083
 584          PB    3.42
 585          LS       0    90.7
 586          UD   0.079
              *

 587          KK     CCC
 588          HC       2
              *

 589          KK    RCCC
 590          KM   ROUTE CCC TO CDD
 591          RD     570   0.005   0.015       0    CIRC       3
              *

 592          KK      DD
 593          BA  0.0074
 594          PB    3.40
 595          LS       0    90.5
 596          UD   0.075
              *

 597          KK     CDD
 598          HC       2
              *
1                                          HEC-1 INPUT                                          PAGE 18

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


 599          KK    RCDD
 600          KM   ROUTE CCDD TO CDES5
 601          RD     390   0.005   0.015       0    CIRC     3.5
              *

 602          KK    DES5
 603          BA  0.0025
```

```
            604          PB    3.40
            605          LS       0    98.0
            606          UD   0.053
                         *

            607          KK   CDES5
            608          HC       2
                         *

            609          KK  RCDES5
            610          KM   ROUTE CDES5 TO CGG
            611          RD     280   0.005   0.015       0    CIRC     3.5
                         *

            612          KK   STEE2
            613          BA  0.0028
            614          PB    3.41
            615          LS       0    98.0
            616          UD   0.050
                         *

            617          KK  CSTEE2
            618          HC       2
                         *

            619          KK      GG
            620          BA  0.0078
            621          PB    3.41
            622          LS       0    94.2
            623          UD   0.055
                         *

            624          KK     CGG
            625          HC       2
                         *

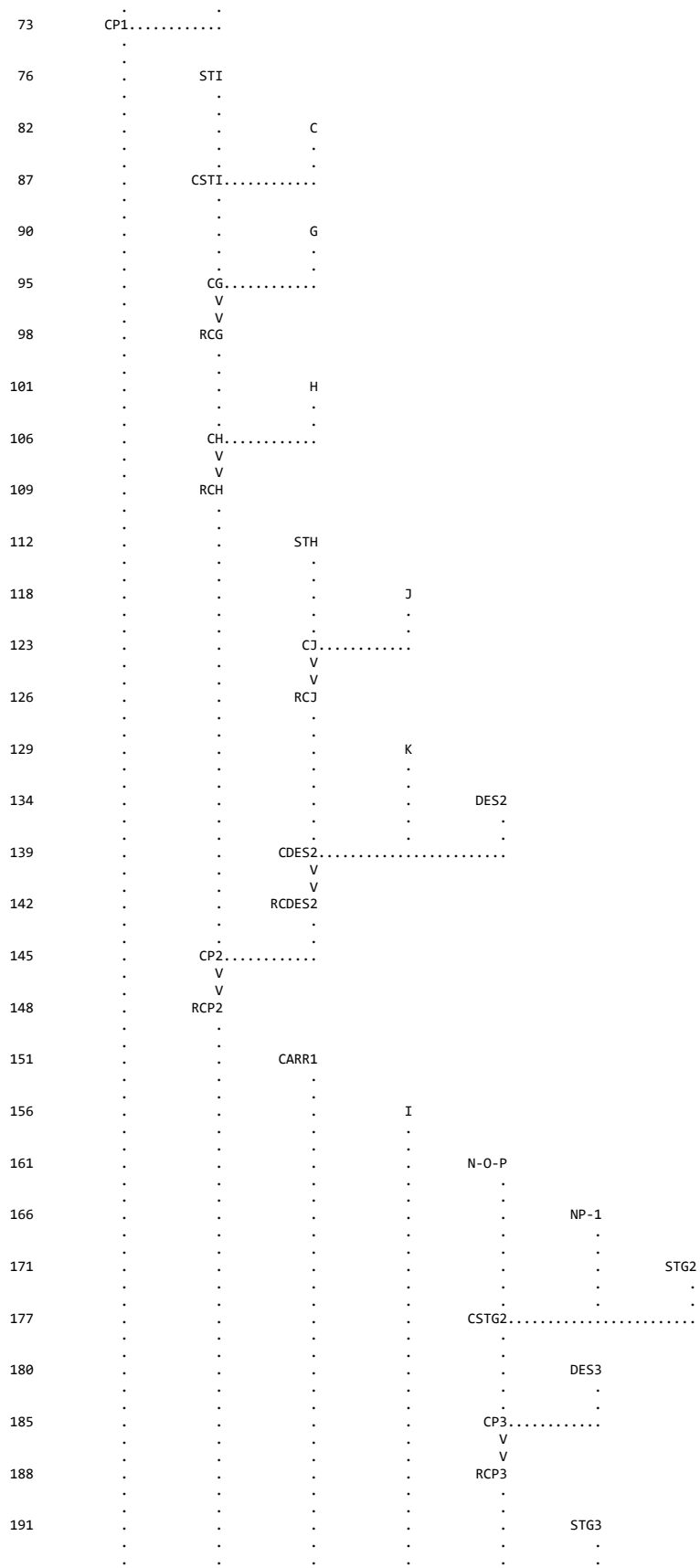
            626          KK      FF
            627          BA  0.0055
            628          PB    3.41
            629          LS       0    94.2
            630          UD   0.050
                         *
1                                              HEC-1 INPUT                                          PAGE 19

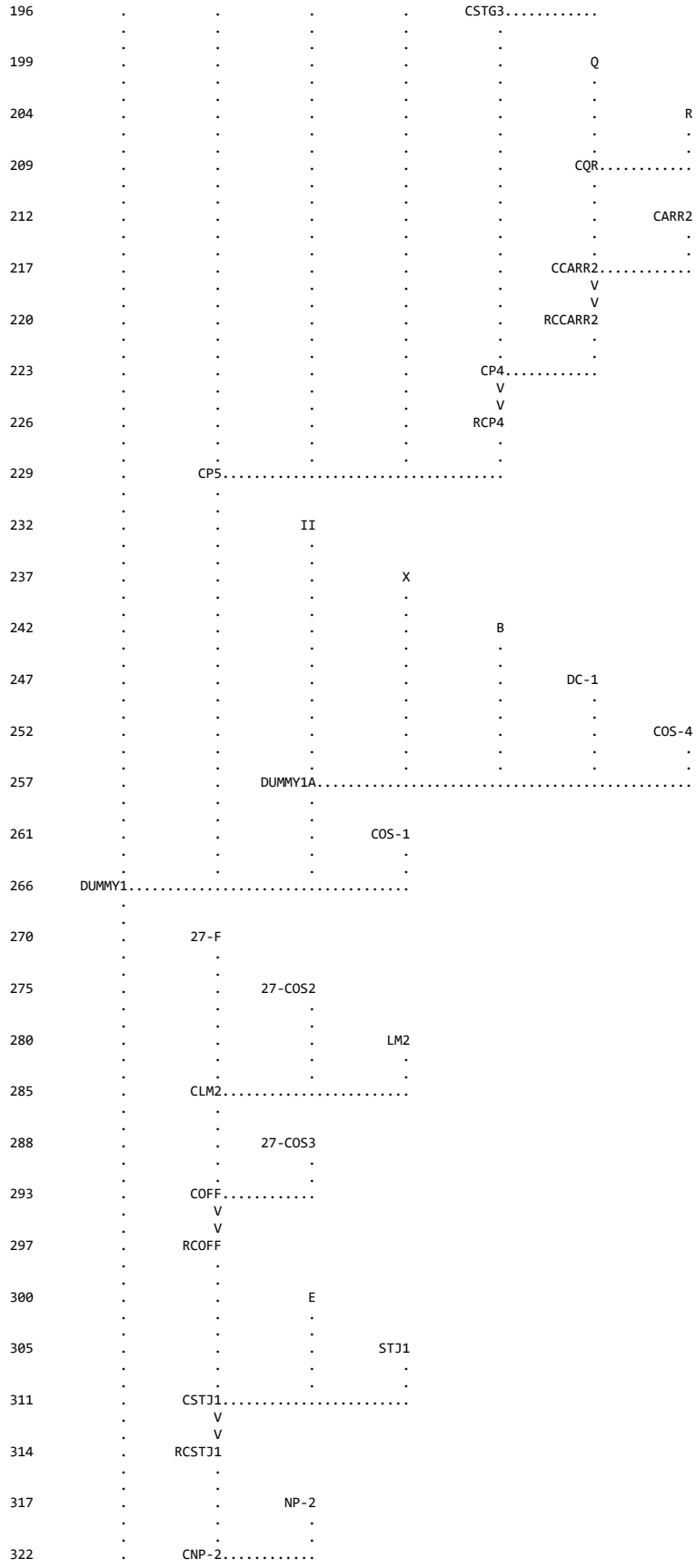
          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

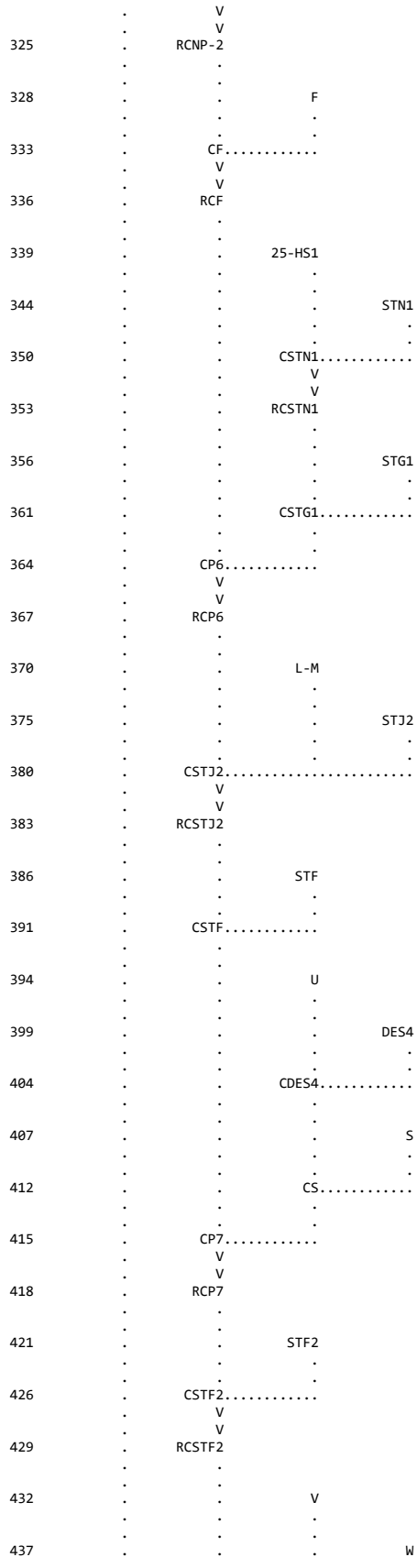

            631          KK  DUMMY4
            632          KM   COMBINE DUMMY3, FF, AND CGG
            633          HC       3
                         *
            634          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

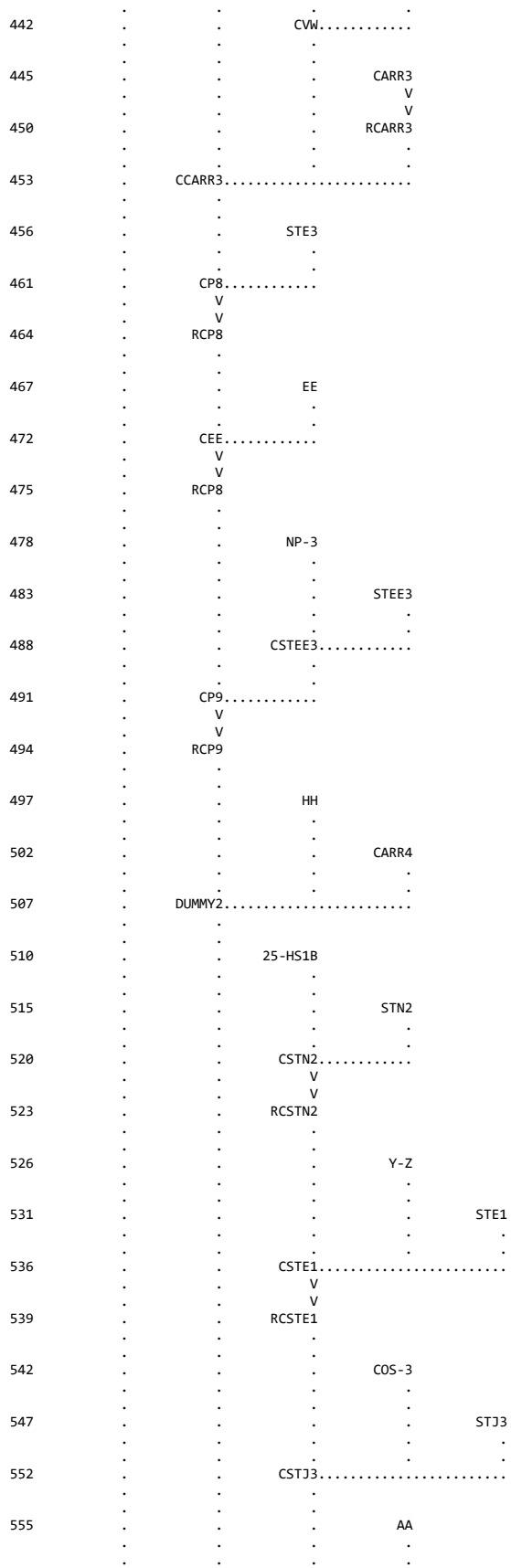
   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

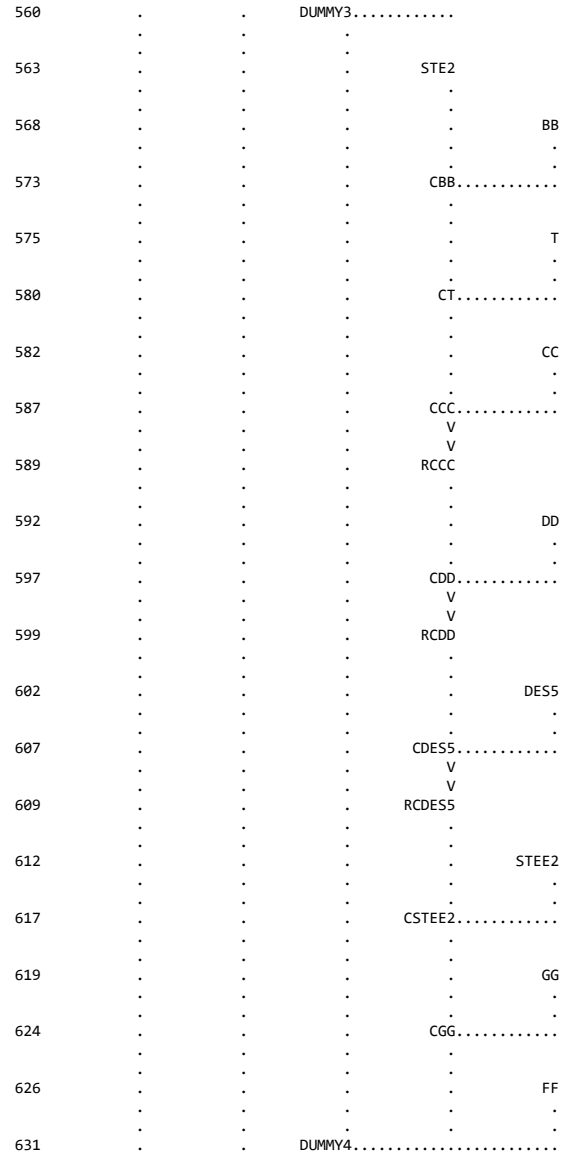
    22          LM
                 .
                 .
    35           .           D
                 .           .
                 .           .
    40           .           .       DES1
                 .           .          .
                 .           .          .
    45           .      CDES1............
                 .           V
                 .           V
    48           .     RCDES1
                 .           .
                 .           .
    51           .           .      COS-2
                 .           .          .
                 .           .          .
    56           .     CCOS-2............
                 .           V
                 .           V
    59           .    RCCOS-2
                 .           .
                 .           .
    62           .           .          A
                 .           .          .
                 .           .          .
    67           .          CA............
                 .           V
                 .           V
    70           .         RCA
                 .           .
```


73
CP1
76
STI
82
C
87
CSTI
90
G
95
CG
98
RCG
101
H
106
CH
109
RCH
112
STH
118
J
123
CJ
126
RCJ
129
K
134
DES2
139
CDES2
142
RCDES2
145
CP2
148
RCP2
151
CARR1
156
I
161
N-O-P
166
NP-1
171
STG2
177
CSTG2
180
DES3
185
CP3
188
RCP3
191
STG3


CSTG3
Q
R
CQR
CARR2
CCARR2
V
V
RCCARR2
CP4
V
V
RCP4
CP5
II
X
B
DC-1
COS-4
DUMMY1A
COS-1
DUMMY1
27-F
27-COS2
LM2
CLM2
27-COS3
COFF
V
V
RCOFF
E
STJ1
CSTJ1
V
V
RCSTJ1
NP-2
CNP-2


V
V
325 RCNP-2
328 F
333 CF
V
V
336 RCF
339 25-HS1
344 STN1
350 CSTN1
V
V
353 RCSTN1
356 STG1
361 CSTG1
364 CP6
V
V
367 RCP6
370 L-M
375 STJ2
380 CSTJ2
V
V
383 RCSTJ2
386 STF
391 CSTF
394 U
399 DES4
404 CDES4
407 S
412 CS
415 CP7
V
V
418 RCP7
421 STF2
426 CSTF2
V
V
429 RCSTF2
432 V
437 W


CVW
CARR3
RCARR3
CCARR3
STE3
CP8
RCP8
EE
CEE
RCP8
NP-3
STEE3
CSTEE3
CP9
RCP9
HH
CARR4
DUMMY2
25-HS1B
STN2
CSTN2
RCSTN2
Y-Z
STE1
CSTE1
RCSTE1
COS-3
STJ3
CSTJ3
AA



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              JUN   1998              *
 *           VERSION 4.1                *
 *                                      *
 *  RUN DATE   23OCT19  TIME  13:10:22  *
 *                                      *
 ****************************************
```

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

ULTIMATE CONDITION HYDROLOGIC MODEL
INPUT FILE DATE = OCTOBER 2019
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

```
*******************************************************
* UPDATE #2 - SUMMERLIN WEST VILLAGE 22                *
*******************************************************
```

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

100-YEAR, 6-HOUR STORM, SDN3

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

      IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME         0000  STARTING TIME
                          NQ          100  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME         0815  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE    8.25 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
+                     LM       .02     1   FLOW                    36.
                                            TIME                   3.50

 HYDROGRAPH AT
+                      D       .02     1   FLOW                    50.
                                            TIME                   3.50

 HYDROGRAPH AT
+                   DES1       .01     1   FLOW                    20.
                                            TIME                   3.50

  2 COMBINED AT
+                  CDES1       .03     1   FLOW                    70.
                                            TIME                   3.50

 ROUTED TO
+                 RCDES1       .03     1   FLOW                    69.
                                            TIME                   3.50

 HYDROGRAPH AT
+                  COS-2       .01     1   FLOW                    22.
                                            TIME                   3.58

  2 COMBINED AT
+                 CCOS-2       .04     1   FLOW                    89.
                                            TIME                   3.50

 ROUTED TO
+                RCCOS-2       .04     1   FLOW                    87.
                                            TIME                   3.50

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

  2 COMBINED AT
+                     CA       .06     1   FLOW                   156.
                                            TIME                   3.50

 ROUTED TO
+                    RCA       .06     1   FLOW                   155.
                                            TIME                   3.50
```

```
  2 COMBINED AT
+                    CP1       .08     1   FLOW         191.
                                           TIME        3.50

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

 HYDROGRAPH AT
+                      C       .02     1   FLOW          51.
                                           TIME        3.50

  2 COMBINED AT
+                   CSTI       .02     1   FLOW          62.
                                           TIME        3.50

 HYDROGRAPH AT
+                      G       .01     1   FLOW          30.
                                           TIME        3.50

  2 COMBINED AT
+                     CG       .03     1   FLOW          92.
                                           TIME        3.50

 ROUTED TO
+                    RCG       .03     1   FLOW          91.
                                           TIME        3.50

 HYDROGRAPH AT
+                      H       .01     1   FLOW          33.
                                           TIME        3.50

  2 COMBINED AT
+                     CH       .05     1   FLOW         124.
                                           TIME        3.50

 ROUTED TO
+                    RCH       .05     1   FLOW         123.
                                           TIME        3.50

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

 HYDROGRAPH AT
+                      J       .01     1   FLOW          24.
                                           TIME        3.50

  2 COMBINED AT
+                     CJ       .01     1   FLOW          34.
                                           TIME        3.50

 ROUTED TO
+                    RCJ       .01     1   FLOW          33.
                                           TIME        3.50

 HYDROGRAPH AT
+                      K       .01     1   FLOW          22.
                                           TIME        3.50

 HYDROGRAPH AT
+                   DES2       .00     1   FLOW          13.
                                           TIME        3.50

  3 COMBINED AT
+                  CDES2       .03     1   FLOW          68.
                                           TIME        3.50

 ROUTED TO
+                 RCDES2       .03     1   FLOW          66.
                                           TIME        3.50

  2 COMBINED AT
+                    CP2       .07     1   FLOW         189.
                                           TIME        3.50

 ROUTED TO
+                   RCP2       .07     1   FLOW         184.
                                           TIME        3.50

 HYDROGRAPH AT
+                  CARR1       .01     1   FLOW          29.
                                           TIME        3.50

 HYDROGRAPH AT
+                      I       .02     1   FLOW          38.
                                           TIME        3.50

 HYDROGRAPH AT
+                  N-O-P       .02     1   FLOW          49.
                                           TIME        3.50
```

```
 HYDROGRAPH AT
+                   NP-1       .00     1   FLOW          6.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STG2       .00     1   FLOW         13.
                                           TIME         3.50

  3 COMBINED AT
+                  CSTG2       .03     1   FLOW         68.
                                           TIME         3.50

 HYDROGRAPH AT
+                   DES3       .00     1   FLOW          9.
                                           TIME         3.50

  2 COMBINED AT
+                    CP3       .03     1   FLOW         77.
                                           TIME         3.50

 ROUTED TO
+                   RCP3       .03     1   FLOW         76.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STG3       .00     1   FLOW          3.
                                           TIME         3.50

  2 COMBINED AT
+                  CSTG3       .03     1   FLOW         79.
                                           TIME         3.50

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

 HYDROGRAPH AT
+                      R       .01     1   FLOW         20.
                                           TIME         3.50

  2 COMBINED AT
+                    CQR       .01     1   FLOW         37.
                                           TIME         3.50

 HYDROGRAPH AT
+                  CARR2       .01     1   FLOW         15.
                                           TIME         3.50

  2 COMBINED AT
+                 CCARR2       .02     1   FLOW         52.
                                           TIME         3.50

 ROUTED TO
+                RCCARR2       .02     1   FLOW         51.
                                           TIME         3.50

  2 COMBINED AT
+                    CP4       .05     1   FLOW        131.
                                           TIME         3.50

 ROUTED TO
+                   RCP4       .05     1   FLOW        127.
                                           TIME         3.50

  4 COMBINED AT
+                    CP5       .15     1   FLOW        379.
                                           TIME         3.50

 HYDROGRAPH AT
+                     II       .03     1   FLOW         61.
                                           TIME         3.50

 HYDROGRAPH AT
+                      X       .03     1   FLOW         60.
                                           TIME         3.50

 HYDROGRAPH AT
+                      B       .13     1   FLOW        304.
                                           TIME         3.50

 HYDROGRAPH AT
+                   DC-1       .02     1   FLOW         36.
                                           TIME         3.67

 HYDROGRAPH AT
+                  COS-4       .00     1   FLOW          2.
                                           TIME         3.50

  5 COMBINED AT
+                DUMMY1A       .20     1   FLOW        454.
```

```
                                        TIME         3.50

 HYDROGRAPH AT
+                  COS-1       .00     1   FLOW          6.
                                        TIME         3.58

  4 COMBINED AT
+                 DUMMY1       .44     1   FLOW       1030.
                                        TIME         3.50

 HYDROGRAPH AT
+                    27-F       .03     1   FLOW         83.
                                        TIME         3.50

 HYDROGRAPH AT
+                 27-COS2       .01     1   FLOW         20.
                                        TIME         3.50

 HYDROGRAPH AT
+                    LM2       .01     1   FLOW         28.
                                        TIME         3.50

  3 COMBINED AT
+                    CLM2      .05     1   FLOW        132.
                                        TIME         3.50

 HYDROGRAPH AT
+                 27-COS3       .03     1   FLOW         53.
                                        TIME         3.50

  2 COMBINED AT
+                    COFF      .08     1   FLOW        185.
                                        TIME         3.50

 ROUTED TO
+                   RCOFF       .08     1   FLOW        182.
                                        TIME         3.50

 HYDROGRAPH AT
+                       E       .02     1   FLOW         58.
                                        TIME         3.50

 HYDROGRAPH AT
+                    STJ1       .01     1   FLOW         15.
                                        TIME         3.50

  3 COMBINED AT
+                   CSTJ1       .10     1   FLOW        255.
                                        TIME         3.50

 ROUTED TO
+                  RCSTJ1       .10     1   FLOW        250.
                                        TIME         3.50

 HYDROGRAPH AT
+                    NP-2       .00     1   FLOW          5.
                                        TIME         3.50

  2 COMBINED AT
+                   CNP-2       .11     1   FLOW        255.
                                        TIME         3.50

 ROUTED TO
+                  RCNP-2       .11     1   FLOW        250.
                                        TIME         3.50

 HYDROGRAPH AT
+                       F       .02     1   FLOW         59.
                                        TIME         3.50

  2 COMBINED AT
+                      CF       .13     1   FLOW        309.
                                        TIME         3.50

 ROUTED TO
+                     RCF       .13     1   FLOW        303.
                                        TIME         3.50

 HYDROGRAPH AT
+                  25-HS1       .08     1   FLOW        211.
                                        TIME         3.50

 HYDROGRAPH AT
+                    STN1       .01     1   FLOW         13.
                                        TIME         3.58

  2 COMBINED AT
+                   CSTN1       .08     1   FLOW        224.
                                        TIME         3.50

 ROUTED TO
```

```
+                RCSTN1       .08     1   FLOW         220.
                                             TIME         3.50

 HYDROGRAPH AT
+                 STG1       .00     1   FLOW           8.
                                             TIME         3.50

  2 COMBINED AT
+                 CSTG1       .09     1   FLOW         229.
                                             TIME         3.50

  2 COMBINED AT
+                  CP6       .21     1   FLOW         532.
                                             TIME         3.50

 ROUTED TO
+                 RCP6       .21     1   FLOW         518.
                                             TIME         3.50

 HYDROGRAPH AT
+                  L-M       .03     1   FLOW          81.
                                             TIME         3.50

 HYDROGRAPH AT
+                 STJ2       .00     1   FLOW          13.
                                             TIME         3.50

  3 COMBINED AT
+                 CSTJ2       .25     1   FLOW         612.
                                             TIME         3.50

 ROUTED TO
+                RCSTJ2       .25     1   FLOW         602.
                                             TIME         3.50

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

  2 COMBINED AT
+                  CSTF       .25     1   FLOW         610.
                                             TIME         3.50

 HYDROGRAPH AT
+                    U       .01     1   FLOW          11.
                                             TIME         3.50

 HYDROGRAPH AT
+                  DES4       .00     1   FLOW           8.
                                             TIME         3.50

  2 COMBINED AT
+                 CDES4       .01     1   FLOW          19.
                                             TIME         3.50

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

  2 COMBINED AT
+                   CS       .01     1   FLOW          29.
                                             TIME         3.50

  2 COMBINED AT
+                  CP7       .27     1   FLOW         639.
                                             TIME         3.50

 ROUTED TO
+                 RCP7       .27     1   FLOW         632.
                                             TIME         3.50

 HYDROGRAPH AT
+                 STF2       .00     1   FLOW           5.
                                             TIME         3.50

  2 COMBINED AT
+                 CSTF2       .27     1   FLOW         637.
                                             TIME         3.50

 ROUTED TO
+                RCSTF2       .27     1   FLOW         623.
                                             TIME         3.50

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

 HYDROGRAPH AT
+                    W       .01     1   FLOW          19.
                                             TIME         3.50
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  2 COMBINED AT
+                    CVW       .02     1   FLOW          36.
                                           TIME         3.50

 HYDROGRAPH AT
+                   CARR3       .00     1   FLOW           8.
                                           TIME         3.50

 ROUTED TO
+                  RCARR3       .00     1   FLOW           8.
                                           TIME         3.50

  3 COMBINED AT
+                  CCARR3       .29     1   FLOW         667.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STE3       .00     1   FLOW           6.
                                           TIME         3.50

  2 COMBINED AT
+                     CP8       .29     1   FLOW         673.
                                           TIME         3.50

 ROUTED TO
+                    RCP8       .29     1   FLOW         664.
                                           TIME         3.50

 HYDROGRAPH AT
+                      EE       .01     1   FLOW          25.
                                           TIME         3.50

  2 COMBINED AT
+                     CEE       .30     1   FLOW         689.
                                           TIME         3.50

 ROUTED TO
+                    RCP8       .30     1   FLOW         680.
                                           TIME         3.50

 HYDROGRAPH AT
+                    NP-3       .00     1   FLOW           2.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STEE3       .00     1   FLOW           5.
                                           TIME         3.50

  2 COMBINED AT
+                  CSTEE3       .00     1   FLOW           7.
                                           TIME         3.50

  2 COMBINED AT
+                     CP9       .30     1   FLOW         688.
                                           TIME         3.50

 ROUTED TO
+                    RCP9       .30     1   FLOW         678.
                                           TIME         3.50

 HYDROGRAPH AT
+                      HH       .01     1   FLOW          20.
                                           TIME         3.50

 HYDROGRAPH AT
+                   CARR4       .00     1   FLOW          10.
                                           TIME         3.50

  3 COMBINED AT
+                  DUMMY2       .32     1   FLOW         708.
                                           TIME         3.50

 HYDROGRAPH AT
+                25-HS1B       .02     1   FLOW          48.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STN2       .01     1   FLOW          19.
                                           TIME         3.50

  2 COMBINED AT
+                   CSTN2       .03     1   FLOW          67.
                                           TIME         3.50

 ROUTED TO
+                  RCSTN2       .03     1   FLOW          65.
                                           TIME         3.50

 HYDROGRAPH AT
+                     Y-Z       .02     1   FLOW          42.
                                           TIME         3.50
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 HYDROGRAPH AT
+                   STE1       .00     1   FLOW          8.
                                           TIME         3.50

  3 COMBINED AT
+                  CSTE1       .05     1   FLOW        115.
                                           TIME         3.50

 ROUTED TO
+                 RCSTE1       .05     1   FLOW        107.
                                           TIME         3.50

 HYDROGRAPH AT
+                   COS-3      .00     1   FLOW          4.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STJ3       .00     1   FLOW         14.
                                           TIME         3.50

  3 COMBINED AT
+                  CSTJ3       .05     1   FLOW        126.
                                           TIME         3.50

 HYDROGRAPH AT
+                     AA       .02     1   FLOW         33.
                                           TIME         3.50

  2 COMBINED AT
+                 DUMMY3       .07     1   FLOW        159.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STE2       .00     1   FLOW          8.
                                           TIME         3.50

 HYDROGRAPH AT
+                     BB       .01     1   FLOW         23.
                                           TIME         3.50

  2 COMBINED AT
+                    CBB       .01     1   FLOW         31.
                                           TIME         3.50

 HYDROGRAPH AT
+                      T       .01     1   FLOW         13.
                                           TIME         3.50

  2 COMBINED AT
+                     CT       .02     1   FLOW         44.
                                           TIME         3.50

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

  2 COMBINED AT
+                    CCC       .03     1   FLOW         63.
                                           TIME         3.50

 ROUTED TO
+                   RCCC       .03     1   FLOW         60.
                                           TIME         3.50

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

  2 COMBINED AT
+                    CDD       .03     1   FLOW         77.
                                           TIME         3.50

 ROUTED TO
+                   RCDD       .03     1   FLOW         74.
                                           TIME         3.50

 HYDROGRAPH AT
+                   DES5       .00     1   FLOW          7.
                                           TIME         3.50

  2 COMBINED AT
+                  CDES5       .04     1   FLOW         81.
                                           TIME         3.50

 ROUTED TO
+                 RCDES5       .04     1   FLOW         80.
                                           TIME         3.50

 HYDROGRAPH AT
+                  STEE2       .00     1   FLOW          8.
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                                        TIME         3.50

  2 COMBINED AT
+                 CSTEE2       .04     1   FLOW          88.
                                        TIME         3.50

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

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

 HYDROGRAPH AT
+                     FF       .01     1   FLOW          15.
                                        TIME         3.50

  3 COMBINED AT
+                 DUMMY4       .12     1   FLOW         282.
                                        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
            RCDES1  MANE          .22     69.31    210.22      2.92      5.00     69.07    210.00        2.92


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4002E+01 EXCESS= .0000E+00 OUTFLOW= .4002E+01 BASIN STORAGE= .1969E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCCOS-2  MANE          .47     87.71    210.20      2.72      5.00     87.19    210.00        2.72


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5425E+01 EXCESS= .0000E+00 OUTFLOW= .5424E+01 BASIN STORAGE= .4464E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCA  MANE          .19    155.37    210.19      2.77      5.00    154.65    210.00        2.78


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9561E+01 EXCESS= .0000E+00 OUTFLOW= .9561E+01 BASIN STORAGE= .1942E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCG  MANE          .29     91.58    210.20      2.89      5.00     91.06    210.00        2.89


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5175E+01 EXCESS= .0000E+00 OUTFLOW= .5175E+01 BASIN STORAGE= .2873E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCH  MANE          .12    123.23    210.04      2.88      5.00    123.08    210.00        2.88


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6989E+01 EXCESS= .0000E+00 OUTFLOW= .6989E+01 BASIN STORAGE= .1204E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCJ  MANE          .43     33.61    210.51      2.73      5.00     33.37    210.00        2.73


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1875E+01 EXCESS= .0000E+00 OUTFLOW= .1875E+01 BASIN STORAGE= .3567E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCDES2  MANE          .73     67.25    210.43      2.84      5.00     66.40    210.00        2.85


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3910E+01 EXCESS= .0000E+00 OUTFLOW= .3910E+01 BASIN STORAGE= .7532E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .73    186.67    210.84      2.87      5.00    184.26    210.00        2.87


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1091E+02 EXCESS= .0000E+00 OUTFLOW= .1091E+02 BASIN STORAGE= .8878E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP3  MANE          .29     76.78    210.29      2.55      5.00     76.14    210.00        2.55
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4490E+01 EXCESS= .0000E+00 OUTFLOW= .4490E+01 BASIN STORAGE= .2690E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCCARR2	MANE	.37	51.68	210.13	2.74	5.00	51.44	210.00	2.74	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3006E+01 EXCESS= .0000E+00 OUTFLOW= .3006E+01 BASIN STORAGE= .3196E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.66	129.07	210.69	2.64	5.00	127.48	210.00	2.64	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7688E+01 EXCESS= .0000E+00 OUTFLOW= .7688E+01 BASIN STORAGE= .6725E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCOFF	MANE	.38	183.88	210.27	2.65	5.00	182.24	210.00	2.65	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1084E+02 EXCESS= .0000E+00 OUTFLOW= .1084E+02 BASIN STORAGE= .4273E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTJ1	MANE	.48	250.37	210.43	2.73	5.00	250.31	210.00	2.73	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1511E+02 EXCESS= .0000E+00 OUTFLOW= .1511E+02 BASIN STORAGE= .5607E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCNP-2	MANE	.52	250.86	210.48	2.72	5.00	250.12	210.00	2.72	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1538E+02 EXCESS= .0000E+00 OUTFLOW= .1538E+02 BASIN STORAGE= .1047E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCF	MANE	.41	304.65	210.23	2.75	5.00	303.48	210.00	2.75	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1879E+02 EXCESS= .0000E+00 OUTFLOW= .1878E+02 BASIN STORAGE= .8389E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTN1	MANE	.41	221.54	210.18	2.88	5.00	220.20	210.00	2.89	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1275E+02 EXCESS= .0000E+00 OUTFLOW= .1275E+02 BASIN STORAGE= .5014E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.59	520.09	210.36	2.81	5.00	517.62	210.00	2.81	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3204E+02 EXCESS= .0000E+00 OUTFLOW= .3203E+02 BASIN STORAGE= .1553E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTJ2	MANE	.45	608.79	210.39	2.81	5.00	602.17	210.00	2.82	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3779E+02 EXCESS= .0000E+00 OUTFLOW= .3779E+02 BASIN STORAGE= .1206E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.32	635.65	210.19	2.80	5.00	631.67	210.00	2.80	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3994E+02 EXCESS= .0000E+00 OUTFLOW= .3994E+02 BASIN STORAGE= .8070E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTF2	MANE	.50	626.08	210.22	2.80	5.00	622.83	210.00	2.80	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4028E+02 EXCESS= .0000E+00 OUTFLOW= .4027E+02 BASIN STORAGE= .1270E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCARR3	MANE	1.27	7.90	211.47	3.14	5.00	7.63	210.00	3.14	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5521E+00 EXCESS= .0000E+00 OUTFLOW= .5521E+00 BASIN STORAGE= .1050E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.28	665.68	210.11	2.78	5.00	664.00	210.00	2.78	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4321E+02 EXCESS= .0000E+00 OUTFLOW= .4320E+02 BASIN STORAGE= .7574E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.26	681.97	210.12	2.77	5.00	680.39	210.00	2.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4455E+02 EXCESS= .0000E+00 OUTFLOW= .4454E+02 BASIN STORAGE= .6454E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	.33	679.63	210.08	2.77	5.00	677.90	210.00	2.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4497E+02 EXCESS= .0000E+00 OUTFLOW= .4496E+02 BASIN STORAGE= .8376E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTN2	MANE	.70	65.57	210.88	2.76	5.00	65.03	210.00	2.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3685E+01 EXCESS= .0000E+00 OUTFLOW= .3685E+01 BASIN STORAGE= .6612E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTE1	MANE	1.78	110.49	211.63	2.72	5.00	107.44	210.00	2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6575E+01 EXCESS= .0000E+00 OUTFLOW= .6571E+01 BASIN STORAGE= .3348E-03 PERCENT ERROR= .1

FOR PLAN = 1 RATIO= .00

RCCC	MANE	1.13	61.16	210.84	2.44	5.00	59.99	210.00	2.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3534E+01 EXCESS= .0000E+00 OUTFLOW= .3533E+01 BASIN STORAGE= .1137E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCDD	MANE	.73	75.16	210.34	2.43	5.00	74.39	210.00	2.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4482E+01 EXCESS= .0000E+00 OUTFLOW= .4481E+01 BASIN STORAGE= .7532E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCDES5	MANE	.52	80.22	210.45	2.48	5.00	79.73	210.00	2.48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4905E+01 EXCESS= .0000E+00 OUTFLOW= .4903E+01 BASIN STORAGE= .5246E-04 PERCENT ERROR= .0

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

A.2. Summerlin Parkway Extension TDS Reference

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: March 31, 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**			**COPIES TO:** VTN Nevada, Inc.
Cross Streets:	Summerlin Parkway & I-215 Western Beltway			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5159D.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-410-001			CCRFCD
Zoning Action:	N/A			CCPW
FEMA Flood Zone	YES	NO **X**		
Proposed Storm Drain	YES **X**	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	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	See Comments Below	$100.00	
			TOTAL FEES (LDDRS):	**$1,300.00**	----

REMARKS:

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

***** The Conditional Approval of this Drainage Study is to allow the engineer/developer to submit the Improvement Plans to City Land Development Only**

***** Do not submit the Drainage Study to Clark County Regional Flood Control District (CCRFCD) prior to the Structural Design and Calculations being approved by the City Building & Safety Department**

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

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

The following comments are repeated until the are complete:

1. **This drainage study is acceptable in concept;** however, *City of Las Vegas* will not formally accept the study until the *Clark County Regional Flood Control District (CCRFCD)* has issued a letter of concurrence. The engineer should contact the CCRFCD to confirm that they have begun their review.

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. The site is also adjacent to the Clark County Western Beltway project. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and incorporate any concerns for boundary conditions along the east border. CCPW concurrence is required prior to final acceptance of the study.

3. 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.

4. For the two proposed *Modified Type A* drop inlets in *Desert Foothills Drive*, make sure that the L-bracket used in the modified Type CM inlets is used. Provide structural design and calculations to *City Building Department* for review and approval prior to the final approval of the subject drainage study.

5. All storm drain inlets that are more than 10' deep require a special structure detail and structural calculation and approval from City Building Department prior to the final approval of the drainage study.

6. All special structures and mainline storm drain connection require details and structural calculations to be reviewed by the *City of Las Vegas Building & Safety Department*. Approval by the *Building Department* must be obtained prior to the final approval of the subject drainage study.

7. 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.

8. **Previous Comment #12**: ***Sheet GR5 to Sheet GR7 and Sheet UT5 to Sheet UT7****: The regional facility 8'x8' RCB in Sunset Run Drive is too close to the northern curb. In case of needing repair and maintenance in the future, the staging area will break into the curb area which is costly and problematic. Relocate the RCB to the center of the street as far as possible.*

   The response is to maintain the original proposed location for the proposed regional facility 8'x8' RCB in *Sunset Run Drive*.

   In the final map, dedicate the amenity zone behind the northern curb of *Sunset Run Drive* and east of *Kettle Bend Road* as a Public Drainage Easement to be Privately Maintained by the *Summerlin Master HOA*.

In an effort to increase administrative efficiency, for all original and re-submittal packages including updates and the addenda, the City of Las Vegas Public Works Department requires both a hardcopy and a digital copy (PDF) on CD for the drainage study.

A letter sealed and signed by a Nevada registered civil engineer must be included in every submittal certifying documents on the electronic CD matches 100% of the hardcopy submittal. The new submittal requirement is effective on May 1, 2019. If there are any questions regarding these new requirements, please contact Albert Sung in the City Flood Control Section at (702) 229-6541.

Sample Letter to certify CD.pdf

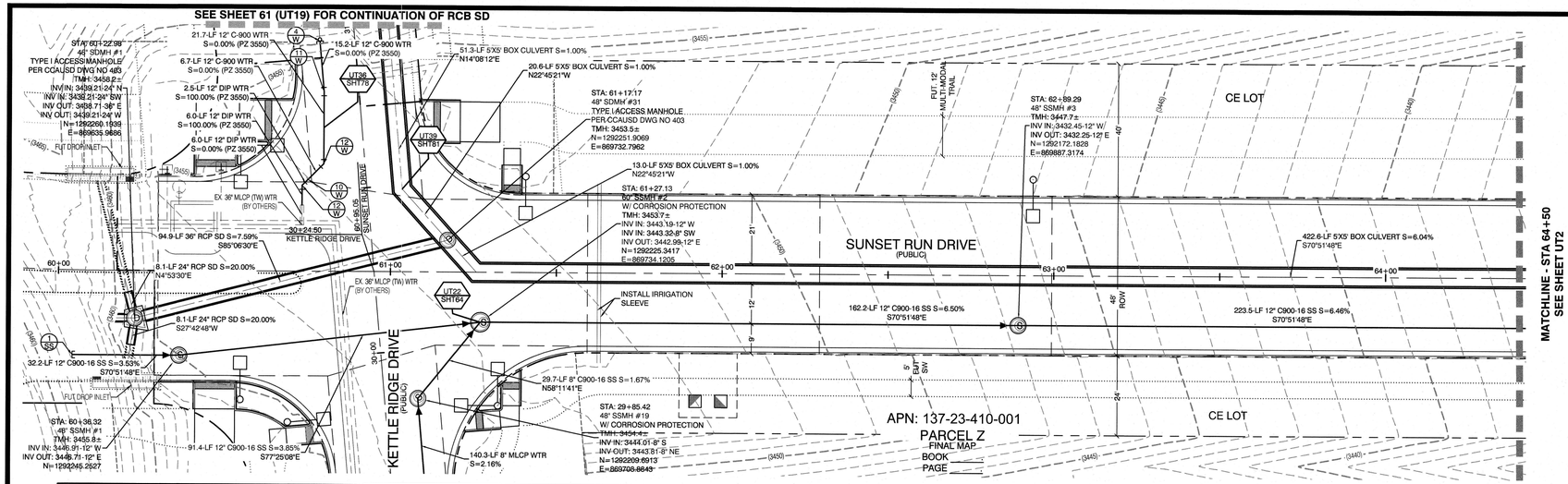
NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained 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.

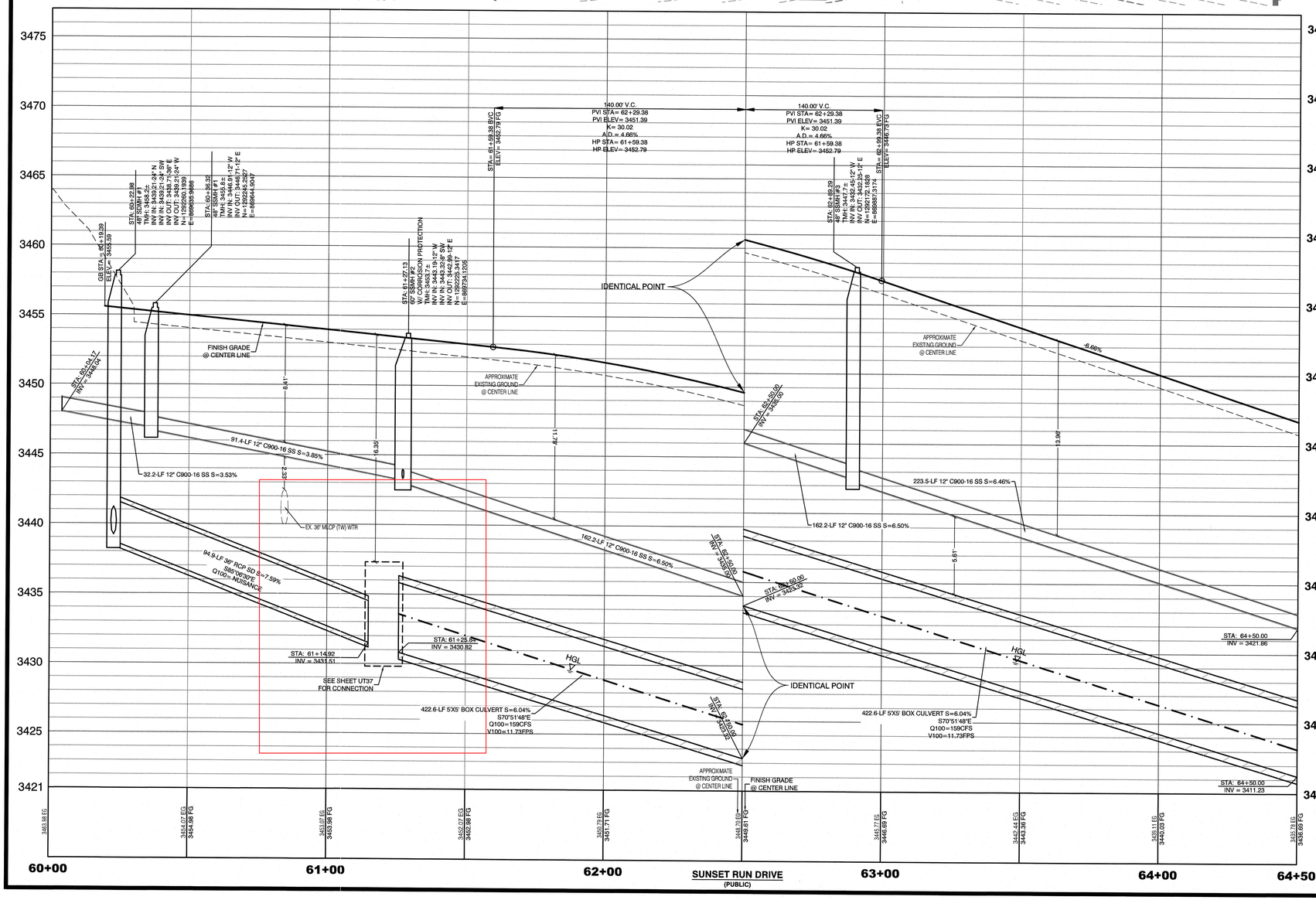
END OF REMARKS

ays

T/R/S: T20S/R59E/23

AREA K-23





PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

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

PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02.

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL 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.

CONSTRUCTION NOTES

	WATER	PUBLIC
1 W	FIRE HYDRANT ASSEMBLY; INCLUDING 12"X6" OR 30"X6" TEE WITH 6" G.V. (PER UDACS PLATE NO. 39 & 40)	8 EA.
2 W	12" GATE VALVE (PER UDACS PLATE 39)	7 EA.
3 W	16" GATE VALVE (PER UDACS PLATE 39)	4 EA.
4 W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	9 EA.
5 W	16" CAP & BLOW OFF (PER UDACS PLATE 36)	3 EA.
6 W	12"X12" TEE (PER UDACS PLATE 31)	2 EA.
7 W	16"X12" TEE (PER UDACS PLATE 31)	2 EA.
8 W	24"X12" TEE (PER UDACS PLATE 31)	4 EA.
9 W	24"X16" TEE (PER UDACS PLATE 31)	2 EA.
10 W	12" VERTICAL BEND (PER UDACS PLATE 31)	1 EA.
11 W	12" 5° BEND (PER UDACS PLATE 31)	4 EA.
12 W	12" 45° BEND (PER UDACS PLATE 31)	5 EA.
13 W	16" 5° BEND (PER UDACS PLATE 31)	2 EA.
14 W	12"X16" REDUCER (PER UDACS PLATE 31)	1 EA.
15 W	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 #6	6 EA.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	115 LF.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,787 LF.
	16" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,193 LF.
POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE W/ 24" MANHOLE COVER PER SD-1 & SD-4	18 EA.
	12" C-900-16 SANITARY SEWER MAIN	3,025 LF.
	16" C-900-16 SANITARY SEWER MAIN	57 LF.
1 SD-6	SEWER CAP (PER STD 4.6 & 4.11)	12 EA.
POC	SEWER POINT OF CONNECTION	

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR 1-800-227-2600 AND 1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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.

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

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10846 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 791-4000

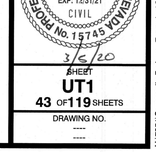
CITY OF LAS VEGAS

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

UTILITY PLAN & PROFILE 1
60+00 TO 64+50

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

DRAWN BY: BCC	07/17/2019	SCALE:	1"=20' HORIZ. 1"=4' VERT.
DESIGNED BY: BCC	07/17/2019		
CHECKED BY: WJM	02/10/2020		
PROJECT NO: 7851			



SHEET
UT1
43 OF 119 SHEETS

DRAWING NO.

H:\7851\Summerlin Parkway Extension\Sheet Set\7851 UT-1.dwg/3/4/2020 3:39 PM/john

Appendix B. Hydrology Appendix

B.1. Parameters

B.2. HEC-1 Model

B.1 Parameters

Kettle Ridge Drive Interim Hydrology

Collection Subbasins

CN Calculation Summary

BASIN ID	LAND USE INDEX NUMBER	LAND USE DESCRIPTION	SOIL MAP UNIT #	SUBREGION CN	SUBREGION AREA (SQ FT)	SUBBASIN AREA (SQ FT)	PERCENT OF SUBBASIN	CUMULATIVE PERCENT	AREAL WEIGHTED CN	CUMULATIVE CN	COMPOSITE CN
INT-1	1	Undeveloped Land, Open Desert	1155	88	300093	735055	40.8%	**41%**	35.93	35.93	
INT-1	1	Undeveloped Land, Open Desert	1502	73	434965	735055	59.2%	**100%**	43.20	79.12	**79.1**
INT-2	1	Undeveloped Land, Open Desert	1156	87	135791	540759	25.1%	**25%**	21.85	21.85	
INT-2	1	Undeveloped Land, Open Desert	1502	73	404933	540759	74.9%	**100%**	54.66	76.51	**76.5**
INT-3	1	Undeveloped Land, Open Desert	1156	87	11110	11112	100.0%	**100%**	86.99	86.99	**87.0**
INT-4	1	Undeveloped Land, Open Desert	1156	87	109124	109200	99.9%	**100%**	86.94	86.94	**86.9**
ST-1E	7	Public Facility and Residential, 8-12 units/acre	1155	94	6047	26253	23.0%	**23%**	21.65	21.65	
ST-1E	7	Public Facility and Residential, 8-12 units/acre	1502	88	20206	26253	77.0%	**100%**	67.73	89.38	**89.4**
ST-1W	7	Public Facility and Residential, 8-12 units/acre	1155	94	11455	43053	26.6%	**27%**	25.01	25.01	
ST-1W	7	Public Facility and Residential, 8-12 units/acre	1502	88	31591	43053	73.4%	**100%**	64.57	89.58	**89.6**
ST-2E	7	Public Facility and Residential, 8-12 units/acre	1502	88	16748	16749	100.0%	**100%**	88.00	88.00	**88.0**
ST-2W	7	Public Facility and Residential, 8-12 units/acre	1502	88	27474	27462	100.0%	**100%**	88.04	88.04	**88.0**
ST-3E	7	Public Facility and Residential, 8-12 units/acre	1156	93	3088	9119	33.9%	**34%**	31.49	31.49	
ST-3E	7	Public Facility and Residential, 8-12 units/acre	1502	88	6027	9119	66.1%	**100%**	58.16	89.65	**89.6**
ST-3W	7	Public Facility and Residential, 8-12 units/acre	1156	93	5891	15039	39.2%	**39%**	36.43	36.43	
ST-3W	7	Public Facility and Residential, 8-12 units/acre	1502	88	9142	15039	60.8%	**100%**	53.49	89.92	**89.9**
ST-4E	7	Public Facility and Residential, 8-12 units/acre	1156	93	6868	6863	100.1%	**100%**	93.06	93.06	**93.1**
ST-4W	7	Public Facility and Residential, 8-12 units/acre	1156	93	11339	11341	100.0%	**100%**	92.98	92.98	**93.0**
ST-5E	7	Public Facility and Residential, 8-12 units/acre	1156	93	18325	18367	99.8%	**100%**	92.79	92.79	**92.8**
ST-5W	7	Public Facility and Residential, 8-12 units/acre	1156	93	53788	53834	99.9%	**100%**	92.92	92.92	**92.9**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Summerlin West Village 22 Kettle Ridge Drive (Street J) (Kindle Rise Way to Sunset Run Drive) **DATE: 6/11/20**

INTERIM CONDITION

SUB-BASIN DATA							INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag
DESIG: (1)	DEV./EX. (D or E)	Rain 100-yr 6-hr (inch)	CN	K (2)	AREA Ac (3)	AREA Mi^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Min (13)	Min (14)	Tlag= 0.6Tc/60 Hours
INT-1	E	3.43	79.1	0.654	16.87	0.02637	100.0	5.0	4.7	1600	6.00	3.6	7.2	4.8	9.5	N/A	**0.10****
INT-2	E	3.43	76.5	0.620	12.41	0.01940	100.0	5.0	5.1	1400	4.00	3.0	5.9	5.4	10.4	N/A	**0.104**
INT-3	E	3.43	87.0	0.758	0.26	0.00040	100.0	10.0	2.9	200	15.00	5.7	11.4	0.6	3.4	N/A	**0.10****
INT-4	E	3.43	86.9	0.758	2.51	0.00392	100.0	5.0	3.6	600	7.50	4.1	8.1	2.3	5.9	N/A	**0.10****
ST-1E	D	3.43	89.4	0.790	0.60	0.00094	20.0	2.0	2.0	650	6.77	5.3	8.0	1.9	3.9	13.7	**0.05***
ST-1W	D	3.43	89.6	0.792	0.99	0.00154	20.0	2.0	2.0	650	6.77	5.3	8.0	1.9	3.9	13.7	**0.05***
ST-2E	D	3.43	88.0	0.772	0.38	0.00060	20.0	2.0	2.1	400	0.72	1.7	2.6	3.9	6.0	12.3	**0.060**
ST-2W	D	3.43	88.0	0.772	0.63	0.00099	20.0	2.0	2.1	400	0.72	1.7	2.6	3.9	6.0	12.3	**0.060**
ST-3E	D	3.43	89.6	0.793	0.21	0.00033	20.0	2.0	2.0	225	0.72	1.7	2.6	2.2	4.1	11.4	**0.05***
ST-3W	D	3.43	89.9	0.797	0.35	0.00054	20.0	2.0	1.9	225	0.72	1.7	2.6	2.2	4.1	11.4	**0.05***
ST-4E	D	3.43	93.1	0.838	0.16	0.00025	20.0	2.0	1.7	175	1.81	2.7	4.1	1.1	2.7	11.1	**0.05***
ST-4W	D	3.43	93.0	0.837	0.26	0.00041	20.0	2.0	1.7	175	1.81	2.7	4.1	1.1	2.8	11.1	**0.05***
ST-5E	D	3.43	92.8	0.835	0.42	0.00066	20.0	2.0	1.7	400	1.81	2.7	4.1	2.5	4.1	12.3	**0.05***
ST-5W	D	3.43	92.9	0.837	1.24	0.00193	20.0	2.0	1.7	400	1.81	2.7	4.1	2.5	4.1	12.3	**0.05***

Tc = Ti + Tt Tlag = 0.6 Tc

Ti = 1.8 (1.1 - K) L^1/2 / S^1/3

K = 0.0132 (CN) - 0.39

Tc Check = L/180+10

For the travel time (Tt) calculations, V1 applies to the first 500 feet of travel distance; V2 applies to the remaining travel distance.

V1 = 14.8*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2

V2 = 29.4*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2

REFERENCE :

STANDARD FORM 4

*Minimum recommended Tc for developed subbasins is 5 mins. A value of 0.05 was use for the Tlag where the calculated Tc was less than 5 mins.

**Minimum recommended Tc for undeveloped subbasins is 10 mins. A value of 0.10 was use for the Tlag where the calculated Tc was less than 10 mins.

B.2 HEC-1 Model

```
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   02JUN20  TIME  09:09:15  *                    *           (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


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

                         *DIAGRAM
 *** FREE ***
              1          ID  TECHNICAL DRAINAGE STUDY
              2          ID  SUMMERLIN VILLAGE 22 WEST
              3          ID  STREET J (Kettle Ridge Couplet)
              4          ID  DESIGN STORM 100-YEAR 6 HOUR
              5          ID
              6          ID  JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES
              7          ID
              8          ID    AREA (SQUARE MILES)           DARF
              9          ID
             10          ID          0 - 0.5                 0.99
             11          ID          Estimated 10-year       0.57
             12          ID
             13          IT       5       0       0     300
             14          IO       5       0       0
             15          IN       5       0       0
             16          JR    PREC    0.99    0.57
                         *

             17          KK   INT-1
             18          BA 0.02637
             19          PB    3.43
             20          PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
             21          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
             22          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
             23          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
             24          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
             25          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
             26          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
             27          PC   0.998   0.999   1.000
             28          LS       0    79.1
             29          UD   0.100
                         *

             30          KK   INT-2
             31          BA 0.01940
             32          PB    3.43
             33          LS       0    76.5
             34          UD   0.104
                         *

             35          KK   INT-3
             36          BA 0.00040
             37          PB    3.43
             38          LS       0    87.0
             39          UD   0.100
                         *

             40          KK   INT-4
             41          BA 0.00392
             42          PB    3.43
```

```
            43          LS       0    86.9
            44          UD   0.100
                        *
1                                                  HEC-1 INPUT                                                  PAGE  2

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


            45          KK   ST-1E
            46          BA 0.00094
            47          PB    3.43
            48          LS       0    89.4
            49          UD   0.050
                        *

            50          KK   ST-1W
            51          BA 0.00154
            52          PB    3.43
            53          LS       0    89.6
            54          UD   0.050
                        *

            55          KK   ST-2E
            56          BA 0.00060
            57          PB    3.43
            58          LS       0    88.0
            59          UD   0.060
                        *

            60          KK   ST-2W
            61          BA 0.00099
            62          PB    3.43
            63          LS       0    88.0
            64          UD   0.060
                        *

            65          KK   ST-3E
            66          BA 0.00033
            67          PB    3.43
            68          LS       0    89.6
            69          UD   0.050
                        *

            70          KK   ST-3W
            71          BA 0.00054
            72          PB    3.43
            73          LS       0    89.9
            74          UD   0.050
                        *

            75          KK   ST-4E
            76          BA 0.00025
            77          PB    3.43
            78          LS       0    93.1
            79          UD   0.050
                        *
1                                                  HEC-1 INPUT                                                  PAGE  3

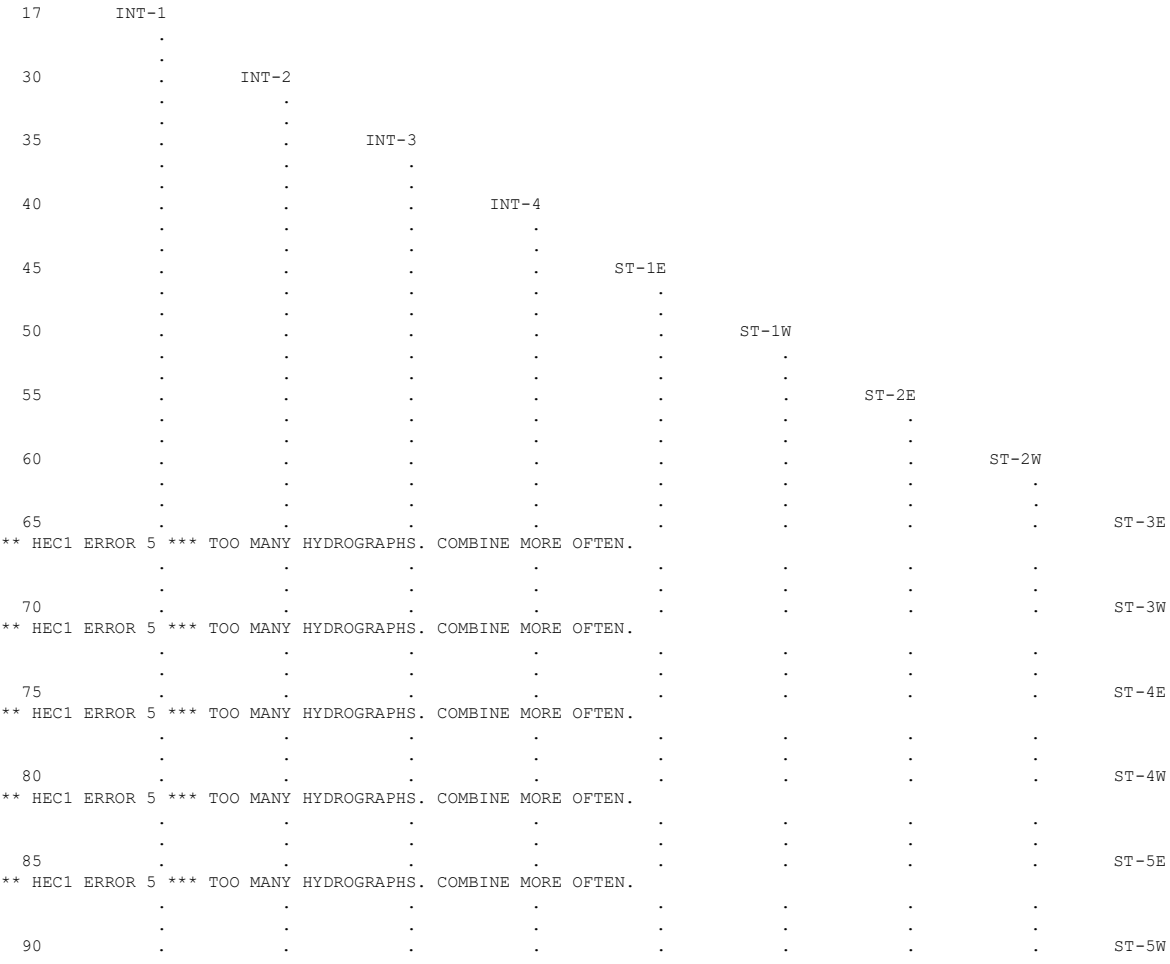
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            80          KK   ST-4W
            81          BA 0.00041
            82          PB    3.43
            83          LS       0    93.0
            84          UD   0.050
                        *

            85          KK   ST-5E
            86          BA 0.00066
            87          PB    3.43
            88          LS       0    92.8
            89          UD   0.050
                        *

            90          KK   ST-5W
            91          BA 0.00193
            92          PB    3.43
            93          LS       0    92.9
            94          UD   0.050
                        * ZZ
 *** WARNING *** ZZ-CARD MISSING
            95          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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



*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

5 ERRORS IN STREAM SYSTEM

1**********
* *
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* *
* RUN DATE 02JUN20 TIME 09:09:15 *
* *
****

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

TECHNICAL DRAINAGE STUDY
SUMMERLIN VILLAGE 22 WEST
STREET J (Kettle Ridge Couplet)
DESIGN STORM 100-YEAR 6 HOUR

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES

AREA (SQUARE MILES)	DARF
0 - 0.5	0.99
Estimated 10-year	0.57

14 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 .57
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	RATIO 2
					.99	.57
HYDROGRAPH AT						
+	INT-1	.03	1	FLOW	36.	12.
				TIME	3.50	3.58
HYDROGRAPH AT						
+	INT-2	.02	1	FLOW	23.	7.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	INT-3	.00	1	FLOW	1.	0.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	INT-4	.00	1	FLOW	7.	3.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-1E	.00	1	FLOW	2.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-1W	.00	1	FLOW	4.	2.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-2E	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-2W	.00	1	FLOW	2.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-3E	.00	1	FLOW	1.	0.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-3W	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-4E	.00	1	FLOW	1.	0.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-4W	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-5E	.00	1	FLOW	2.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-5W	.00	1	FLOW	5.	3.
				TIME	3.50	3.50

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

Appendix C. Hydraulics Appendix

C.1. Drop Inlet Calculations/ Nomographs

C.2. Normal Depth Calculations

C.3. Ultimate Condition WSPG-W Model

C.4. Riprap Calculations

C.1 Drop Inlet Calculations/Nomographs

Combination Inlet On Grade - SDDI#1

Project Description	
Solve For	Efficiency

Input Data	
Discharge	5.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

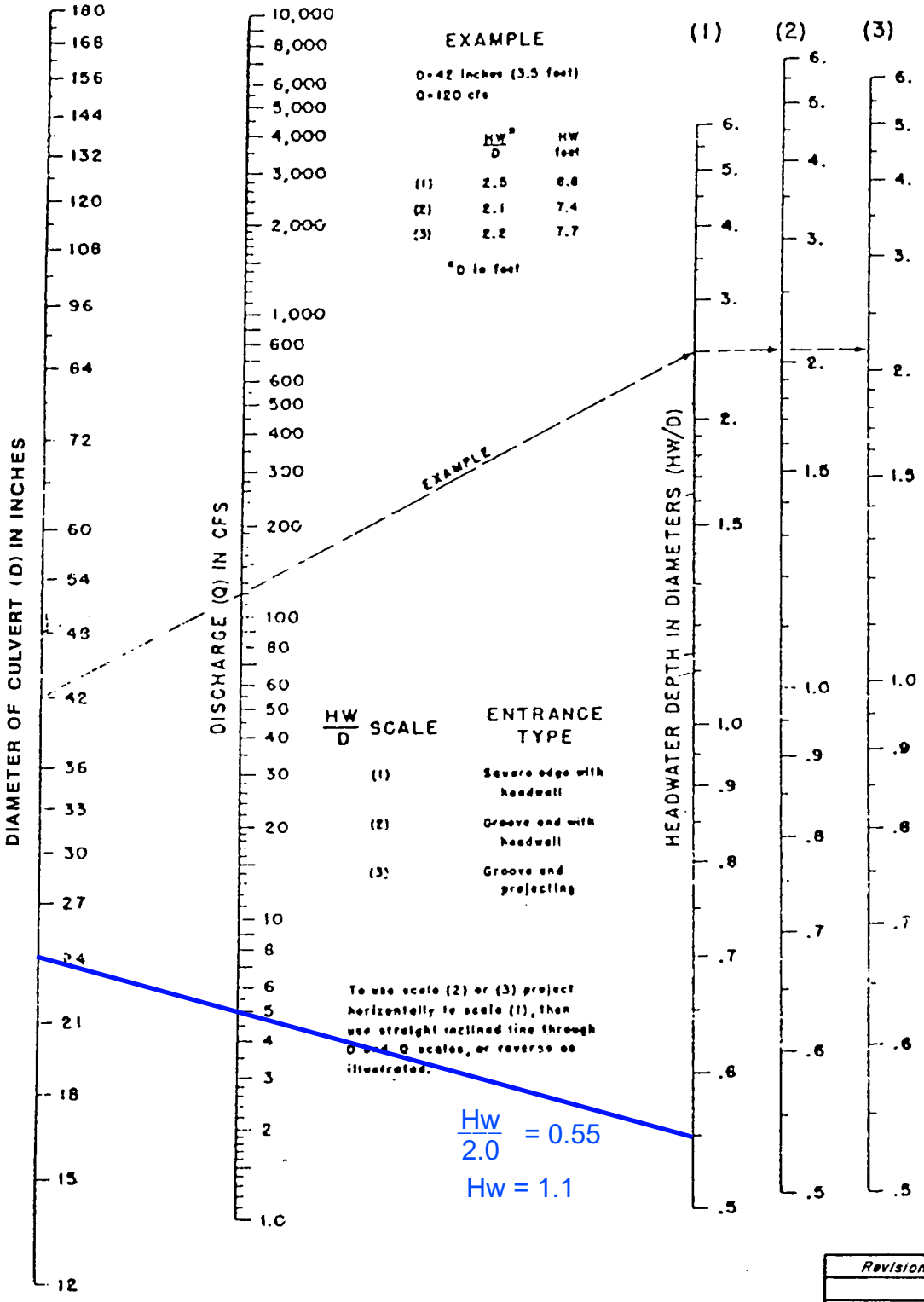
Results	
Efficiency	82.98 %
Intercepted Flow	4.15 cfs
Bypass Flow	0.85 cfs
Spread	8.3 ft
Depth	0.3 ft
Flow Area	0.8 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	6.58 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.086
Grate Flow Ratio	0.523
Equivalent Cross Slope	0.131 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.282
Total Interception Length	22.2 ft

Messages

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #1



Total Q =3-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0} = 0.55$

Hw = 1.1

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Combination Inlet On Grade - SDDI#2

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

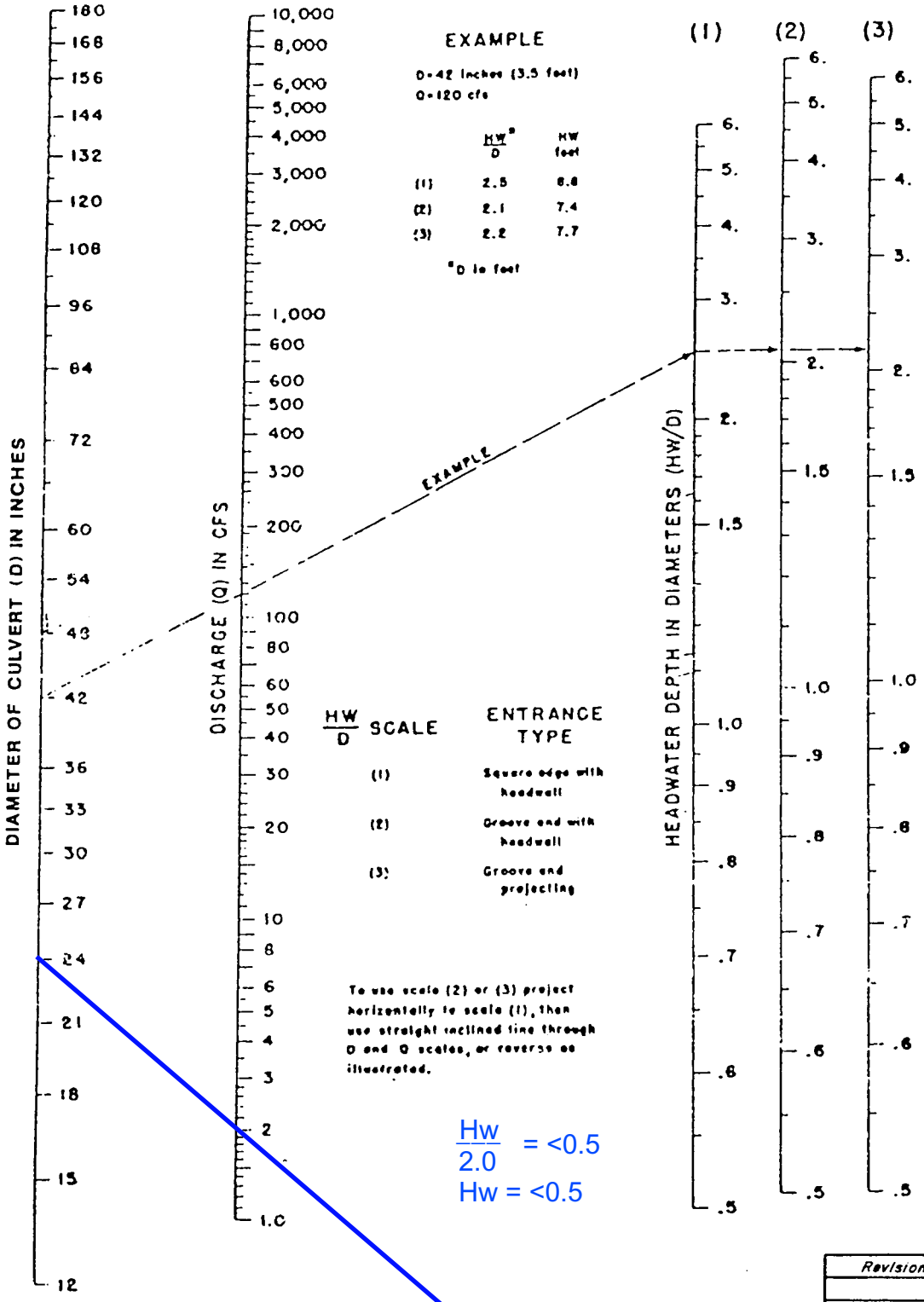
Results	
Efficiency	99.71 %
Intercepted Flow	1.99 cfs
Bypass Flow	0.01 cfs
Spread	5.4 ft
Depth	0.2 ft
Flow Area	0.4 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.60 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.111
Grate Flow Ratio	0.735
Equivalent Cross Slope	0.176 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.494
Total Interception Length	12.6 ft

Messages

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #2



Total Q =2-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0}$ = <0.5

Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Combination Inlet On Grade - SDDI#3

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

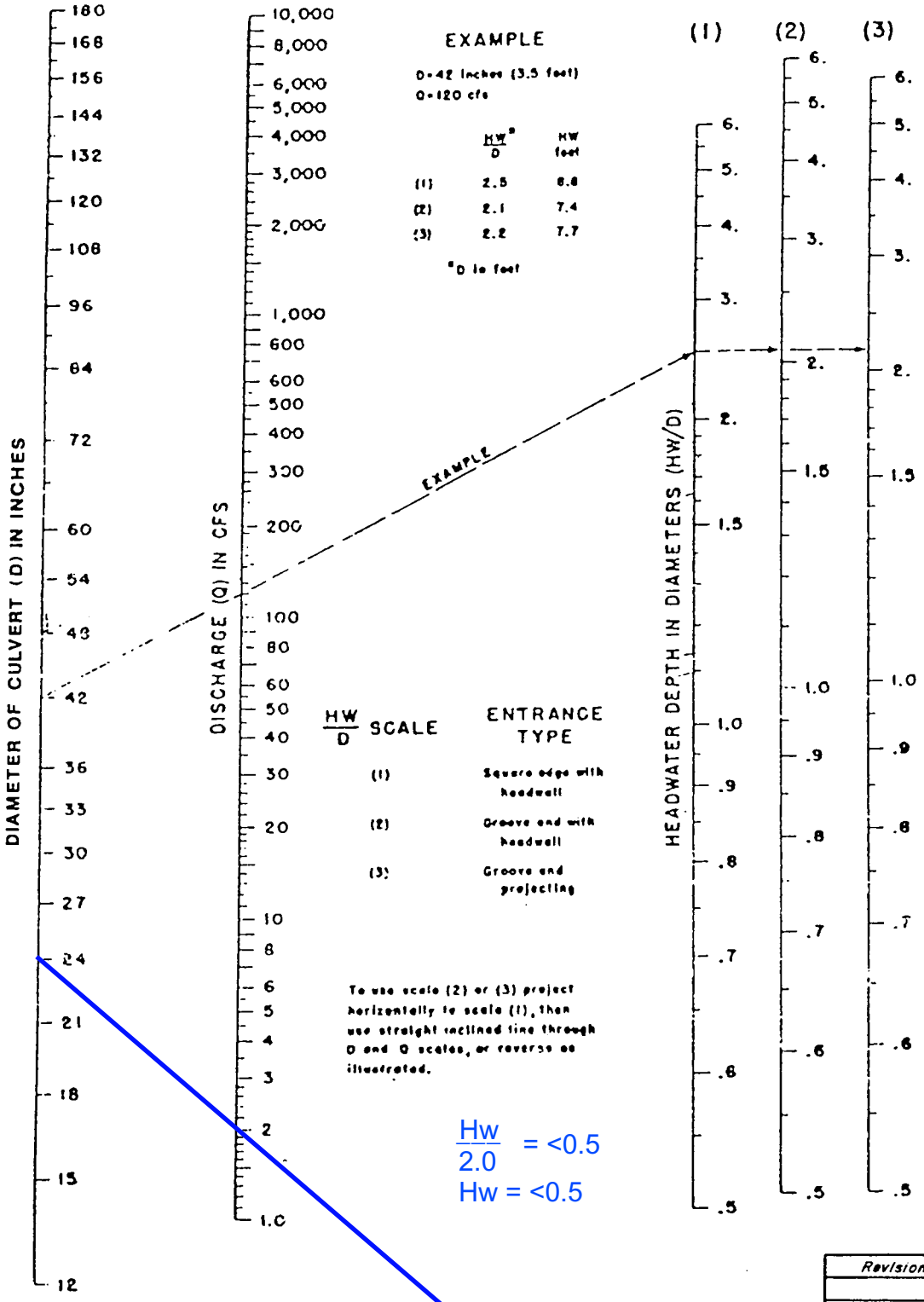
Results	
Efficiency	100.00 %
Intercepted Flow	1.00 cfs
Bypass Flow	0.00 cfs
Spread	3.5 ft
Depth	0.2 ft
Flow Area	0.2 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.17 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.127
Grate Flow Ratio	0.903
Equivalent Cross Slope	0.211 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.739
Total Interception Length	8.5 ft

Messages

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #3



Total Q =1-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0} = <0.5$

Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Combination Inlet On Grade - SDDI#4

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

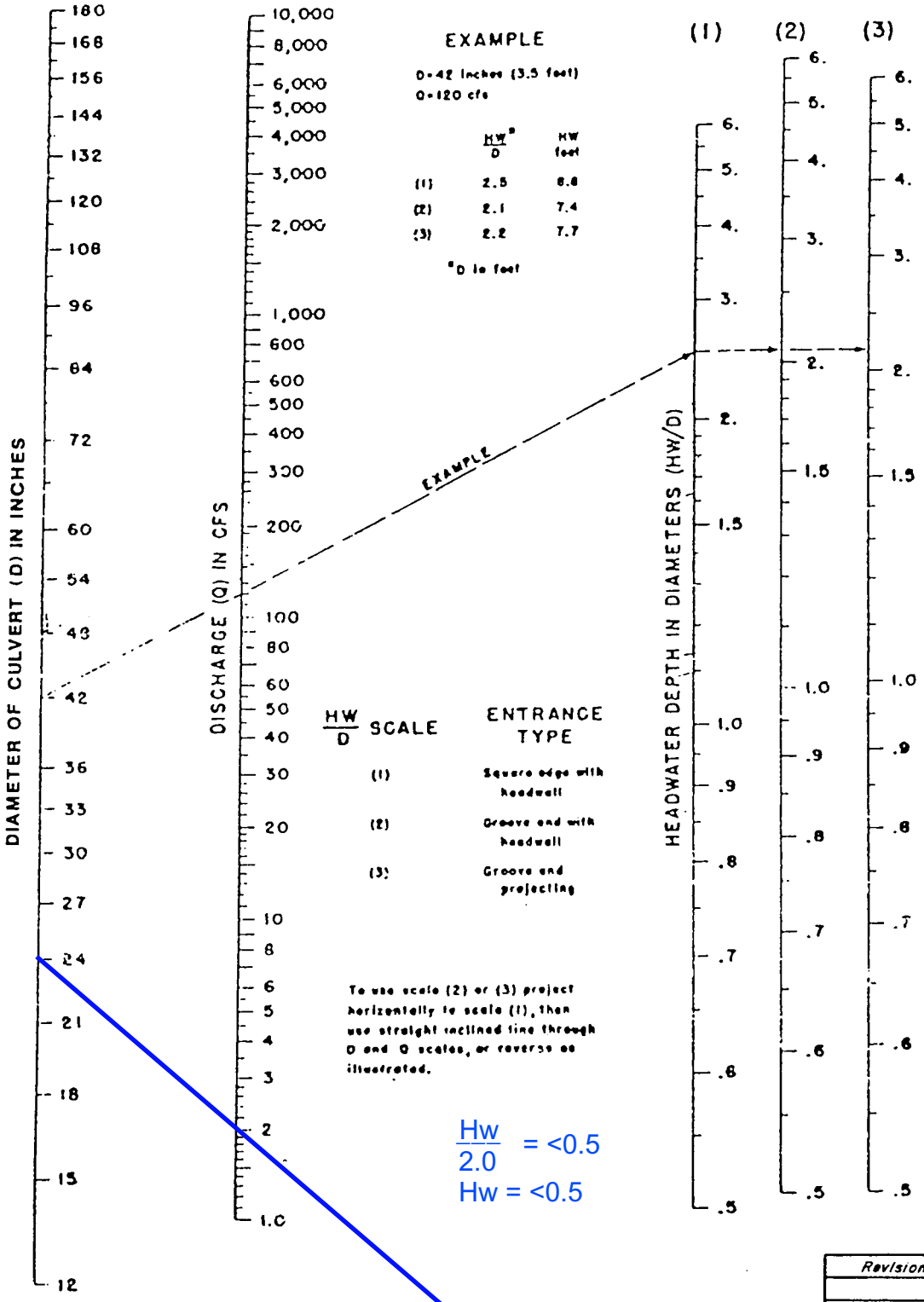
Results	
Efficiency	100.00 %
Intercepted Flow	1.00 cfs
Bypass Flow	0.00 cfs
Spread	3.5 ft
Depth	0.2 ft
Flow Area	0.2 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.17 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.127
Grate Flow Ratio	0.903
Equivalent Cross Slope	0.211 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.739
Total Interception Length	8.5 ft

Messages

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #4



Total Q =1-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0}$ = <0.5

Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Combination Inlet On Grade - SDDI#5

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

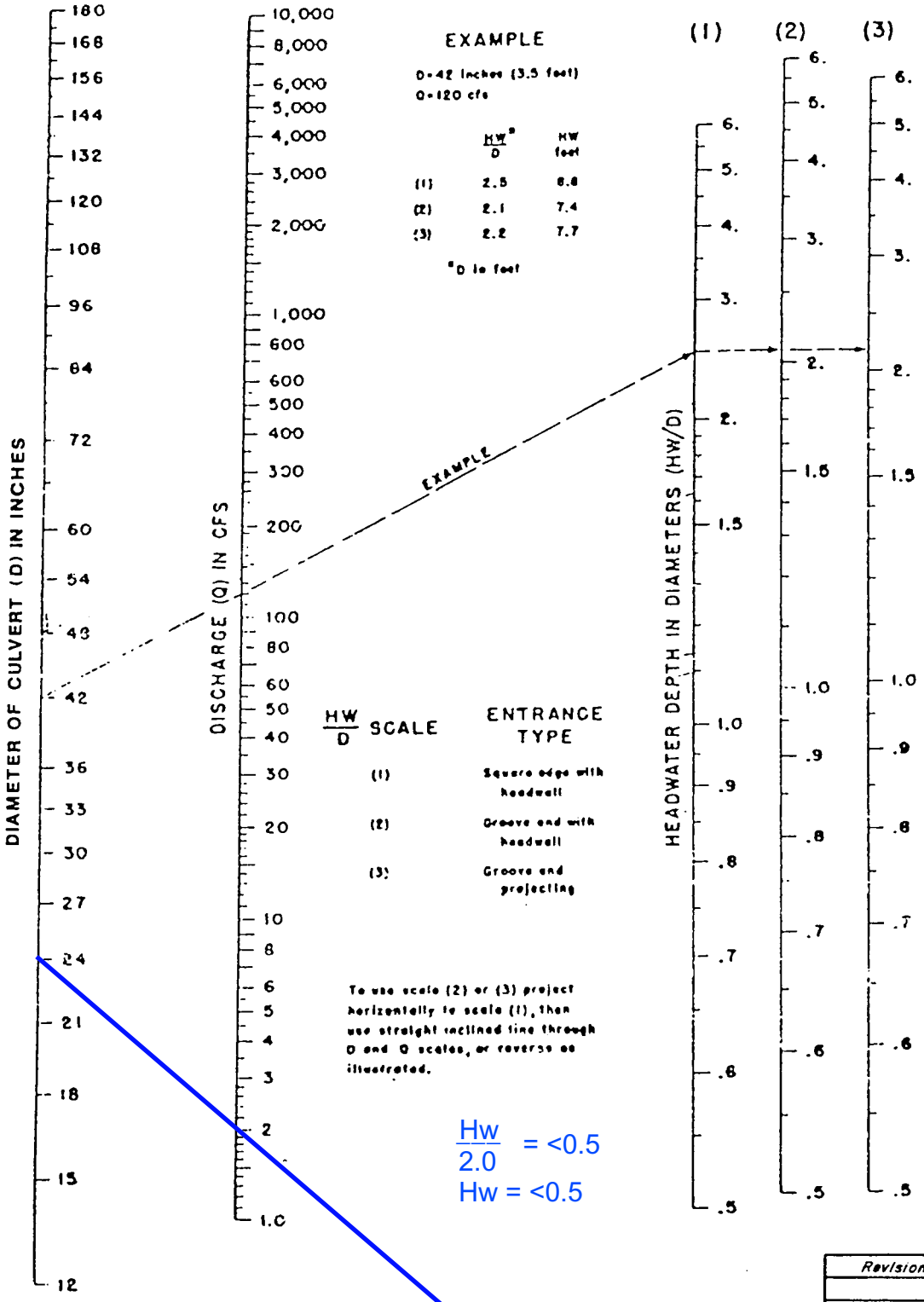
Results	
Efficiency	99.71 %
Intercepted Flow	1.99 cfs
Bypass Flow	0.01 cfs
Spread	5.4 ft
Depth	0.2 ft
Flow Area	0.4 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.60 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.111
Grate Flow Ratio	0.735
Equivalent Cross Slope	0.176 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.494
Total Interception Length	12.6 ft

Messages

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #5



Total Q =2-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0}$ = <0.5

Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Combination Inlet On Grade - SDDI#6

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

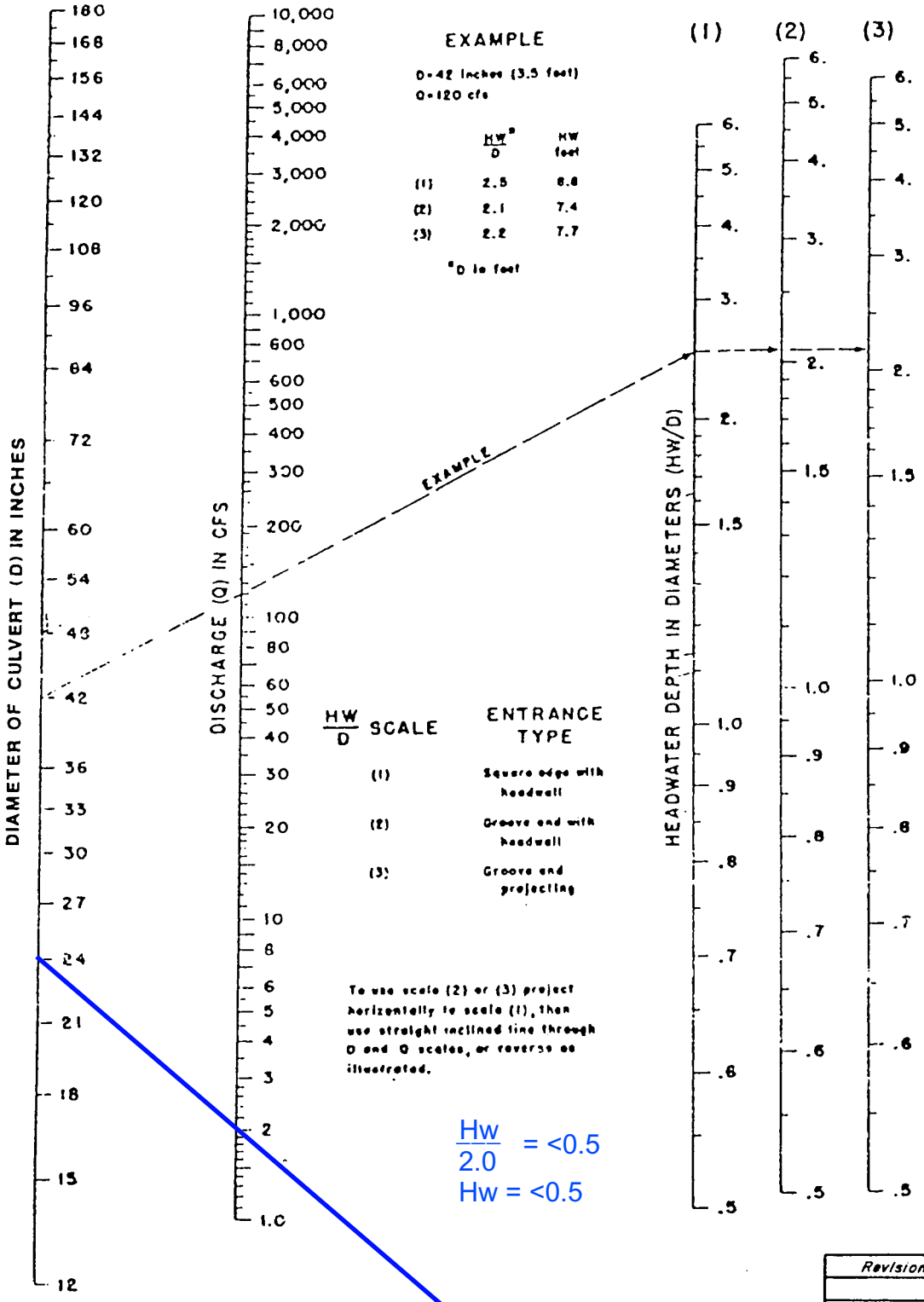
Results	
Efficiency	99.71 %
Intercepted Flow	1.99 cfs
Bypass Flow	0.01 cfs
Spread	5.4 ft
Depth	0.2 ft
Flow Area	0.4 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.60 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.111
Grate Flow Ratio	0.735
Equivalent Cross Slope	0.176 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.494
Total Interception Length	12.6 ft

Messages

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #6



Total Q =2-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0}$ = <0.5

Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Combination Inlet On Grade - SDDI#7

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

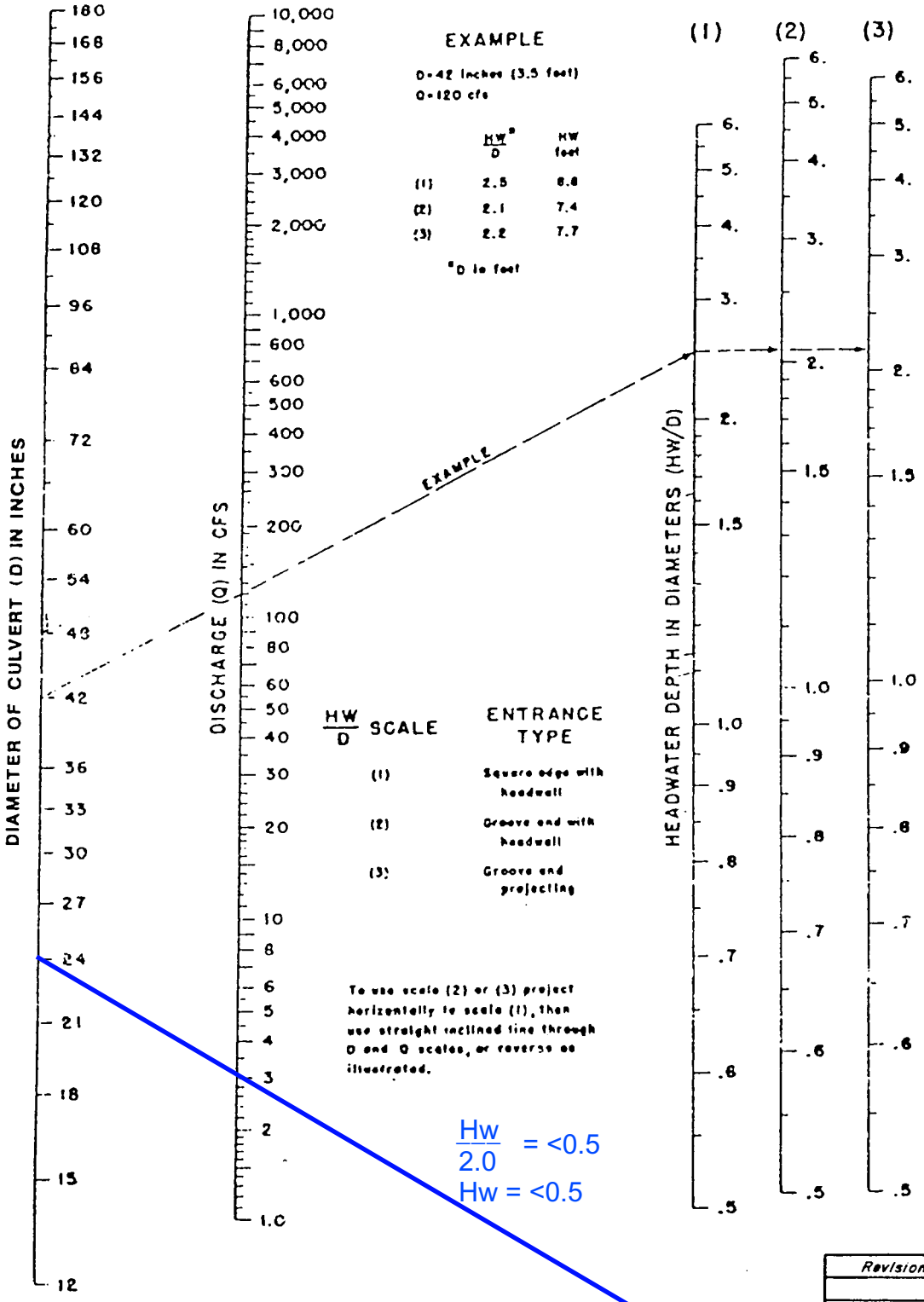
Results	
Efficiency	94.63 %
Intercepted Flow	2.84 cfs
Bypass Flow	0.16 cfs
Spread	6.6 ft
Depth	0.2 ft
Flow Area	0.5 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.98 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.100
Grate Flow Ratio	0.636
Equivalent Cross Slope	0.155 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.386
Total Interception Length	16.2 ft

Messages

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #7



Total Q =3-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0}$ = <0.5

Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Combination Inlet On Grade - SDDI#8

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.00 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

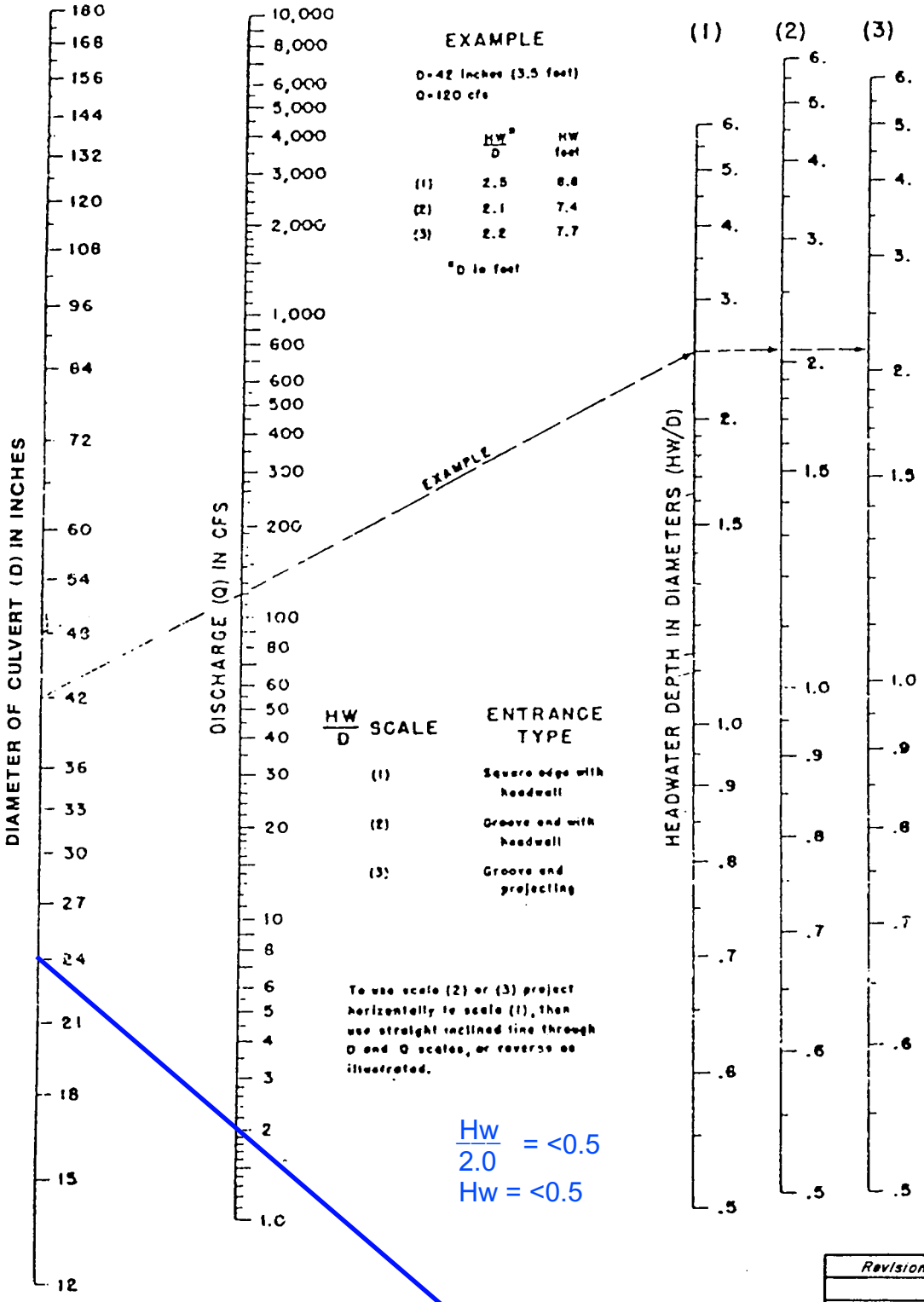
Results	
Efficiency	99.71 %
Intercepted Flow	1.99 cfs
Bypass Flow	0.01 cfs
Spread	5.4 ft
Depth	0.2 ft
Flow Area	0.4 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.60 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.111
Grate Flow Ratio	0.735
Equivalent Cross Slope	0.176 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.494
Total Interception Length	12.6 ft

Messages

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #8



Total Q =2-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0}$ = <0.5

Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Ditch Inlet In Sag - SDDI#9-INT

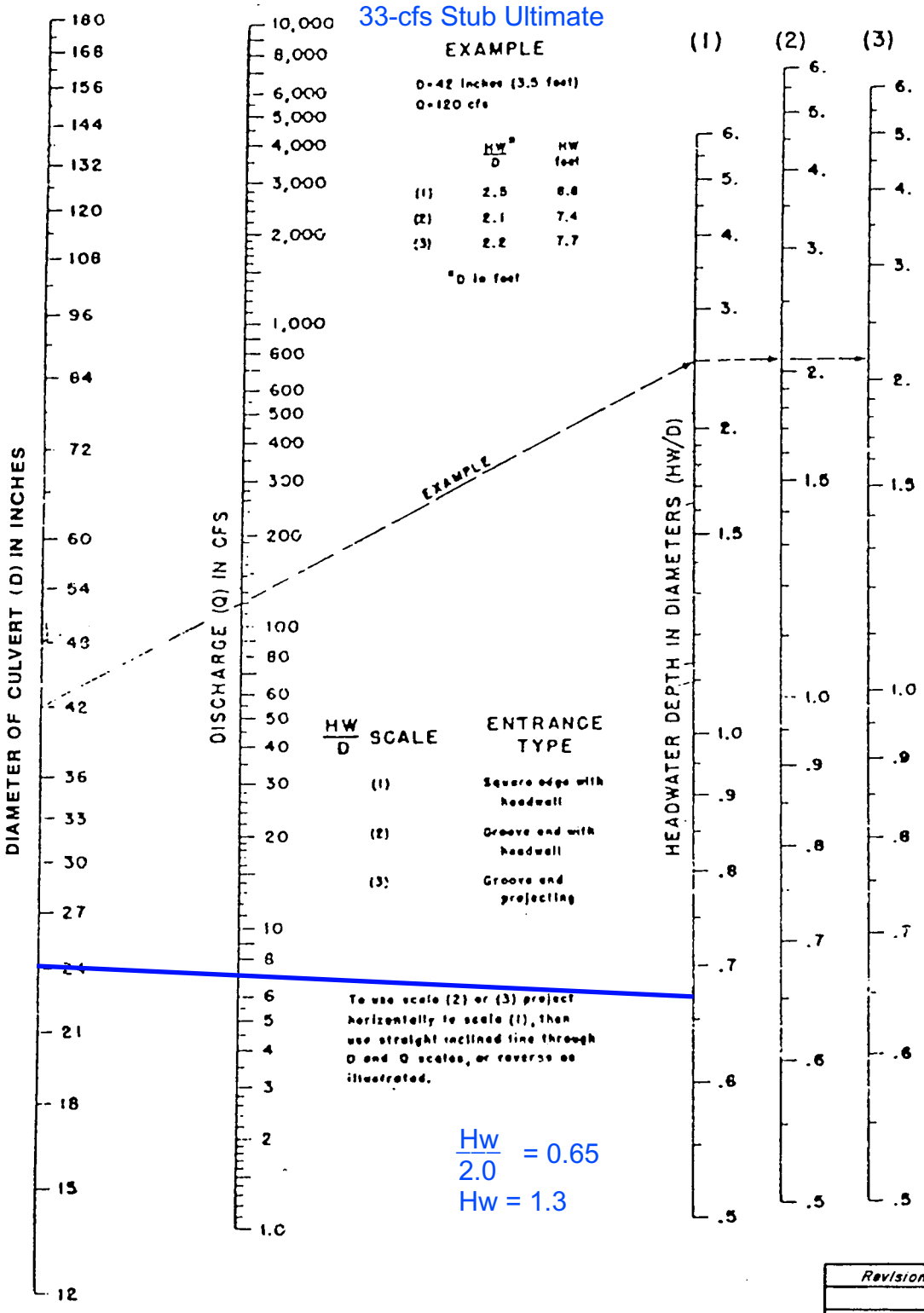
Project Description	
Solve For	Spread

Input Data	
Discharge	7.00 cfs
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	0.00 ft
Grate Width	4.00 ft
Grate Length	4.0 ft
Local Depression	0.0 in
Local Depression Width	24.0 in
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %

Results	
Spread	2.0 ft
Depth	0.3 ft
Wetted Perimeter	2.1 ft
Top Width	2.01 ft
Open Grate Area	6.4 ft²
Active Grate Weir Length	12.0 ft

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #9 7-cfs Interim
33-cfs Stub Ultimate



Total Q =7-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0} = 0.65$

Hw = 1.3

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Ditch Inlet In Sag - SDDI#10-INT

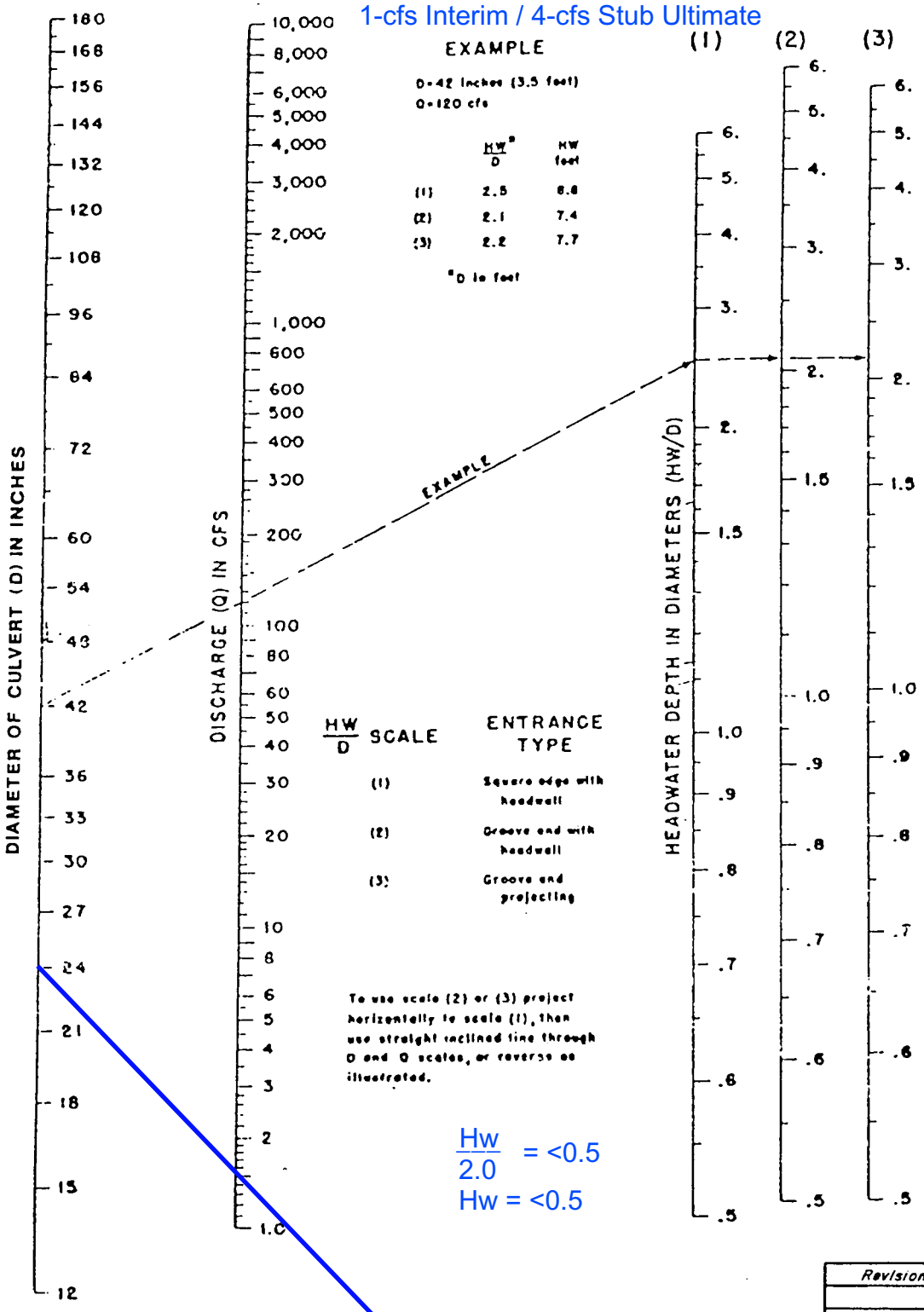
Project Description	
Solve For	Spread

Input Data	
Discharge	1.00 cfs
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	0.00 ft
Grate Width	4.00 ft
Grate Length	4.0 ft
Local Depression	0.0 in
Local Depression Width	24.0 in
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %

Results	
Spread	0.6 ft
Depth	0.1 ft
Wetted Perimeter	0.6 ft
Top Width	0.55 ft
Open Grate Area	6.4 ft²
Active Grate Weir Length	12.0 ft

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #10
1-cfs Interim / 4-cfs Stub Ultimate



Total Q =1-CFS
24" RCP
LATERAL

$\frac{Hw}{2.0}$ = <0.5
Hw = <0.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

Ditch Inlet In Sag - SDDI#11-INT

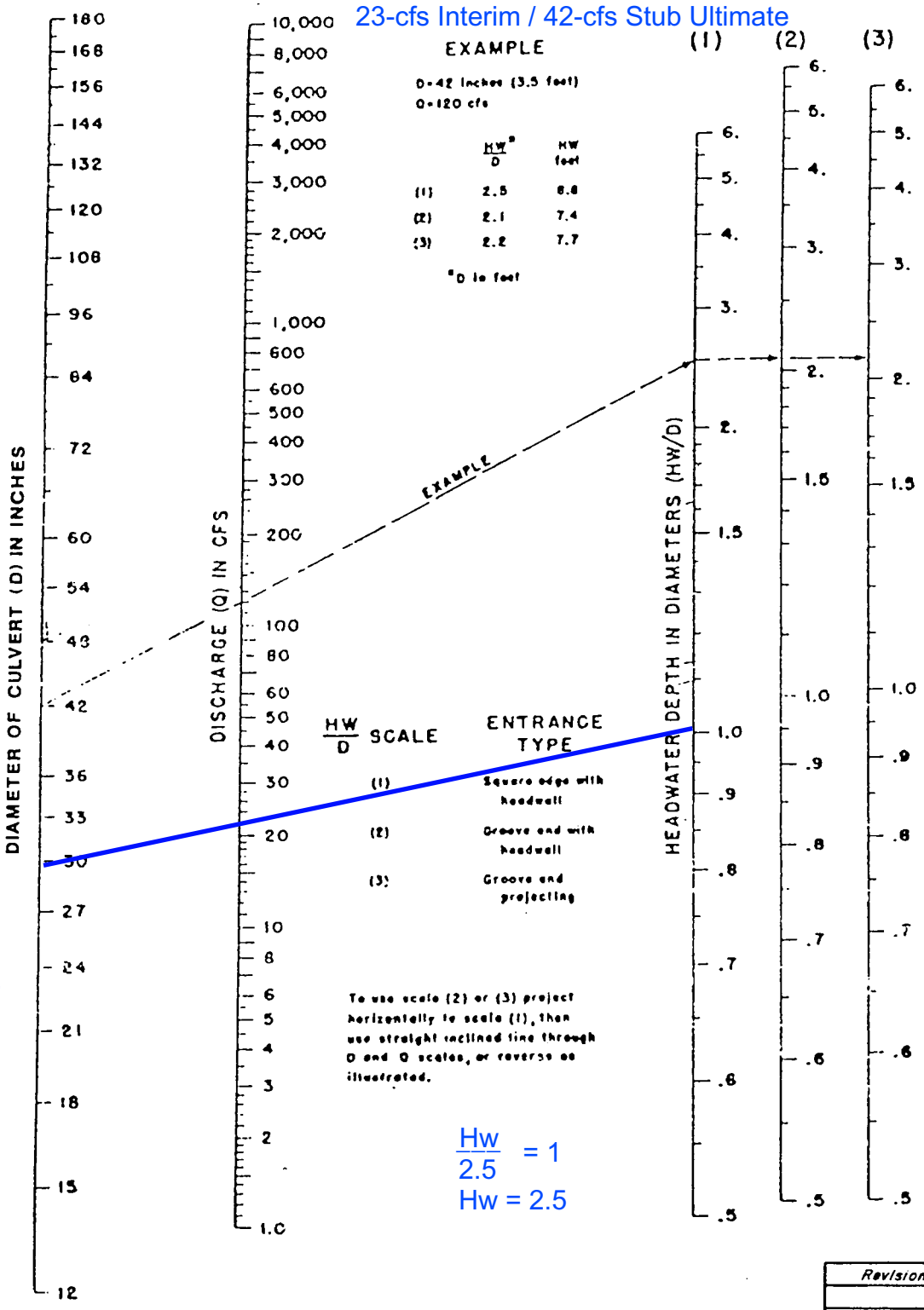
Project Description	
Solve For	Spread

Input Data	
Discharge	23.00 cfs
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	0.00 ft
Grate Width	4.00 ft
Grate Length	4.0 ft
Local Depression	0.0 in
Local Depression Width	24.0 in
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %

Results	
Spread	4.5 ft
Depth	0.7 ft
Wetted Perimeter	4.7 ft
Top Width	4.45 ft
Open Grate Area	6.4 ft²
Active Grate Weir Length	12.0 ft

NOMOGRAPH – INLET CONTROL RCP

DROP INLET #11
23-cfs Interim / 42-cfs Stub Ultimate



Total Q =23-CFS
30" RCP
LATERAL

$\frac{Hw}{2.5} = 1$

Hw = 2.5

Revision	Date

WRC ENGINEERING

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

FIGURE 1005

C.2 Normal Depth Calculations

KettleRidge-1W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.068 ft/ft
Discharge	4.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.10
0+20	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+02, 0.10)	0.013
(0+02, 0.10)	(0+20, 0.46)	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	0.26 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	0.8 ft²
Wetted Perimeter	9.2 ft
Hydraulic Radius	0.09 ft
Top Width	8.93 ft
Normal Depth	0.26 ft
Critical Depth	0.36 ft
Critical Slope	0.007 ft/ft
Velocity	5.02 ft/s
Velocity Head	0.39 ft
Specific Energy	0.65 ft
Froude Number	2.888
Flow Type	Supercritical

GVF Input Data

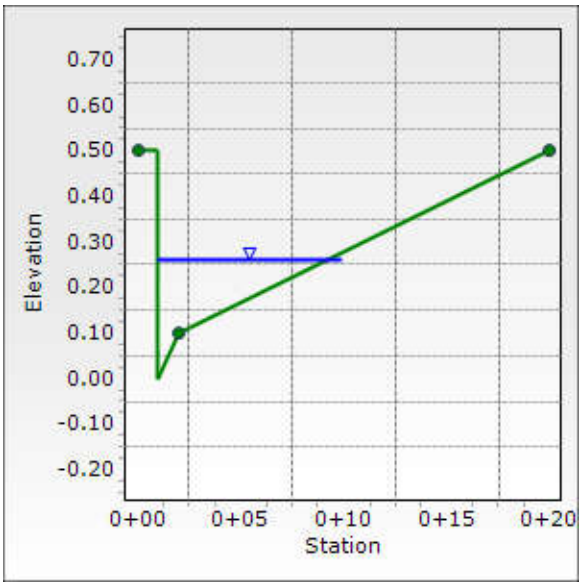
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.26 ft
Critical Depth	0.36 ft
Channel Slope	0.068 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for KettleRidge-1W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.068 ft/ft
Normal Depth	0.26 ft
Discharge	4.20 cfs



KettleRidge-1E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.068 ft/ft
Discharge	3.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.46
0+18	0.10
0+19	0.00
0+19	0.50
0+20	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.46)	(0+18, 0.10)	0.016
(0+18, 0.10)	(0+20, 0.50)	0.013

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

Results	
Normal Depth	0.24 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	0.7 ft²
Wetted Perimeter	8.2 ft
Hydraulic Radius	0.08 ft
Top Width	7.99 ft
Normal Depth	0.24 ft
Critical Depth	0.33 ft
Critical Slope	0.007 ft/ft
Velocity	4.72 ft/s
Velocity Head	0.35 ft
Specific Energy	0.59 ft
Froude Number	2.853
Flow Type	Supercritical

GVF Input Data

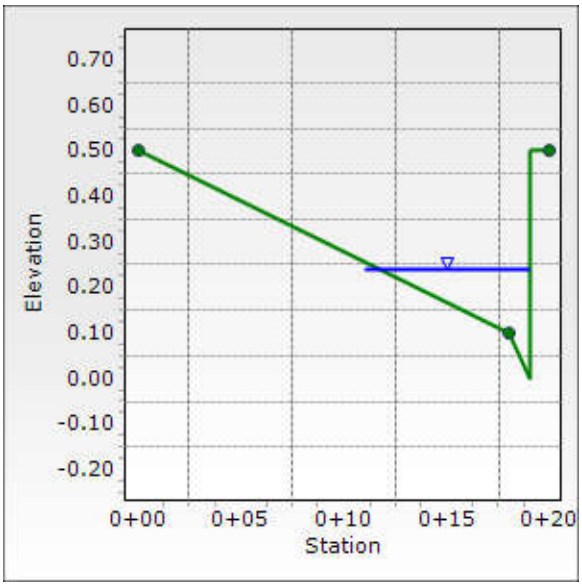
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.24 ft
Critical Depth	0.33 ft
Channel Slope	0.068 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for KettleRidge-1E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.068 ft/ft
Normal Depth	0.24 ft
Discharge	3.20 cfs



KettleRidge-2W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.10
0+20	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+02, 0.10)	0.013
(0+02, 0.10)	(0+20, 0.46)	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	0.32 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.5 ft²
Wetted Perimeter	12.5 ft
Hydraulic Radius	0.12 ft
Top Width	12.18 ft
Normal Depth	0.32 ft
Critical Depth	0.32 ft
Critical Slope	0.007 ft/ft
Velocity	1.97 ft/s
Velocity Head	0.06 ft
Specific Energy	0.38 ft
Froude Number	0.981
Flow Type	Subcritical

GVF Input Data

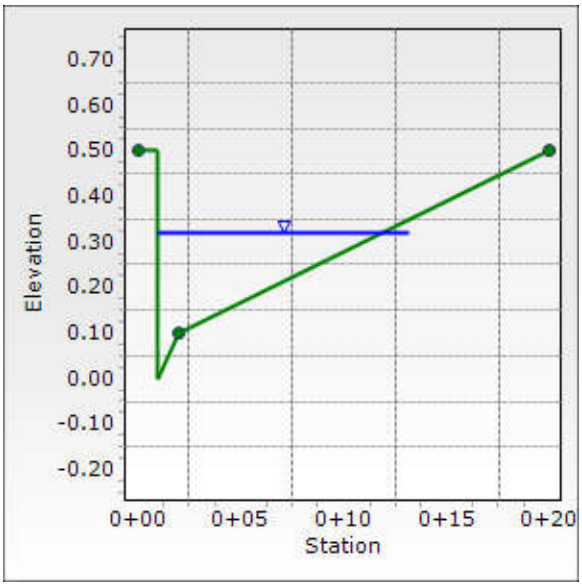
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.32 ft
Critical Depth	0.32 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for KettleRidge-2W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Normal Depth	0.32 ft
Discharge	3.00 cfs



KettleRidge-2E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	2.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.46
0+18	0.10
0+19	0.00
0+19	0.50
0+20	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.46)	(0+18, 0.10)	0.016
(0+18, 0.10)	(0+20, 0.50)	0.013

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

Results	
Normal Depth	0.29 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.1 ft²
Wetted Perimeter	10.7 ft
Hydraulic Radius	0.11 ft
Top Width	10.44 ft
Normal Depth	0.29 ft
Critical Depth	0.28 ft
Critical Slope	0.008 ft/ft
Velocity	1.77 ft/s
Velocity Head	0.05 ft
Specific Energy	0.34 ft
Froude Number	0.949
Flow Type	Subcritical

GVF Input Data

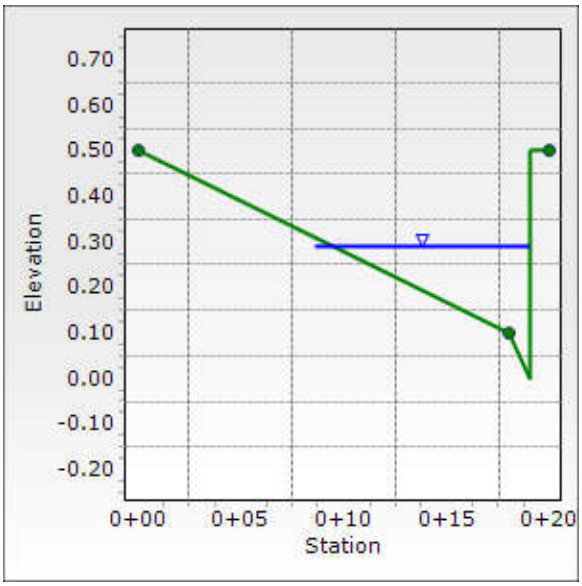
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.29 ft
Critical Depth	0.28 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for KettleRidge-2E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Normal Depth	0.29 ft
Discharge	2.00 cfs



KettleRidge-3W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	2.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.10
0+20	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+02, 0.10)	0.013
(0+02, 0.10)	(0+20, 0.46)	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	0.29 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.1 ft²
Wetted Perimeter	10.7 ft
Hydraulic Radius	0.10 ft
Top Width	10.38 ft
Normal Depth	0.29 ft
Critical Depth	0.28 ft
Critical Slope	0.008 ft/ft
Velocity	1.79 ft/s
Velocity Head	0.05 ft
Specific Energy	0.34 ft
Froude Number	0.962
Flow Type	Subcritical

GVF Input Data

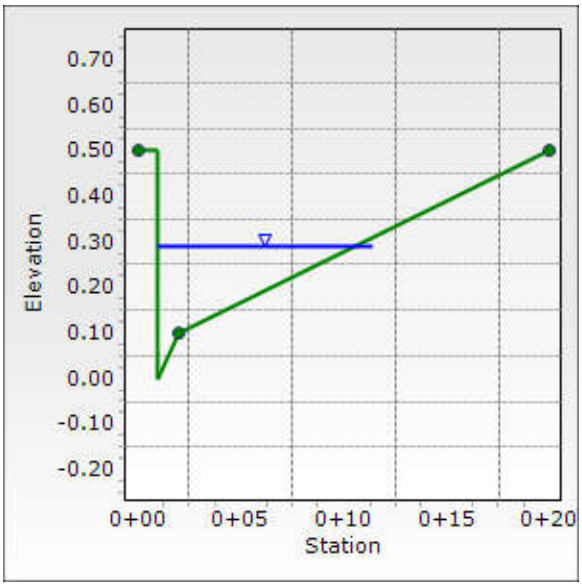
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.29 ft
Critical Depth	0.28 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for KettleRidge-3W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Normal Depth	0.29 ft
Discharge	2.00 cfs



KettleRidge-3E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	2.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.46
0+18	0.10
0+19	0.00
0+19	0.50
0+20	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.46)	(0+18, 0.10)	0.016
(0+18, 0.10)	(0+20, 0.50)	0.013

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

Results	
Normal Depth	0.29 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.1 ft²
Wetted Perimeter	10.7 ft
Hydraulic Radius	0.10 ft
Top Width	10.38 ft
Normal Depth	0.29 ft
Critical Depth	0.28 ft
Critical Slope	0.008 ft/ft
Velocity	1.79 ft/s
Velocity Head	0.05 ft
Specific Energy	0.34 ft
Froude Number	0.962
Flow Type	Subcritical

GVF Input Data

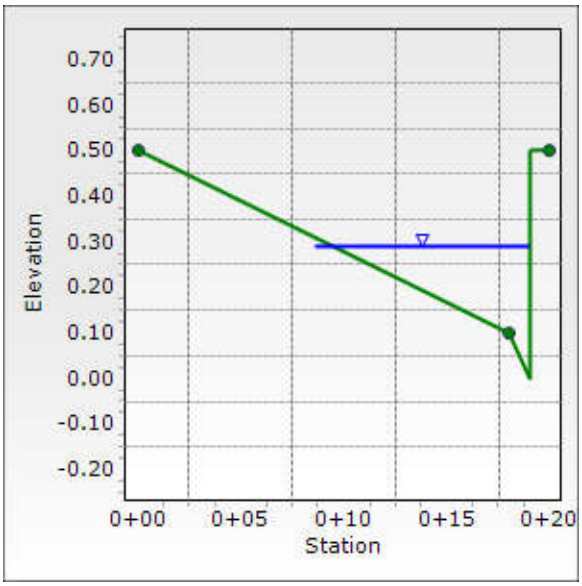
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.29 ft
Critical Depth	0.28 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for KettleRidge-3E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Normal Depth	0.29 ft
Discharge	2.00 cfs



KettleRidge-4W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.10
0+20	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+02, 0.10)	0.013
(0+02, 0.10)	(0+20, 0.46)	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	0.21 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	0.5 ft²
Wetted Perimeter	6.7 ft
Hydraulic Radius	0.07 ft
Top Width	6.49 ft
Normal Depth	0.21 ft
Critical Depth	0.23 ft
Critical Slope	0.008 ft/ft
Velocity	2.17 ft/s
Velocity Head	0.07 ft
Specific Energy	0.28 ft
Froude Number	1.436
Flow Type	Supercritical

GVF Input Data

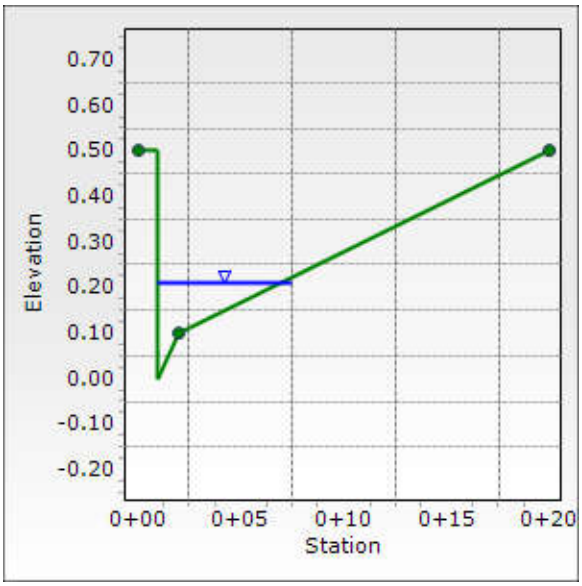
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.21 ft
Critical Depth	0.23 ft
Channel Slope	0.018 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for KettleRidge-4W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Normal Depth	0.21 ft
Discharge	1.00 cfs



KettleRidge-4E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.46
0+18	0.10
0+19	0.00
0+19	0.50
0+20	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.46)	(0+18, 0.10)	0.016
(0+18, 0.10)	(0+20, 0.50)	0.013

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

Results	
Normal Depth	0.21 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	0.5 ft²
Wetted Perimeter	6.7 ft
Hydraulic Radius	0.07 ft
Top Width	6.49 ft
Normal Depth	0.21 ft
Critical Depth	0.23 ft
Critical Slope	0.008 ft/ft
Velocity	2.17 ft/s
Velocity Head	0.07 ft
Specific Energy	0.28 ft
Froude Number	1.436
Flow Type	Supercritical

GVF Input Data

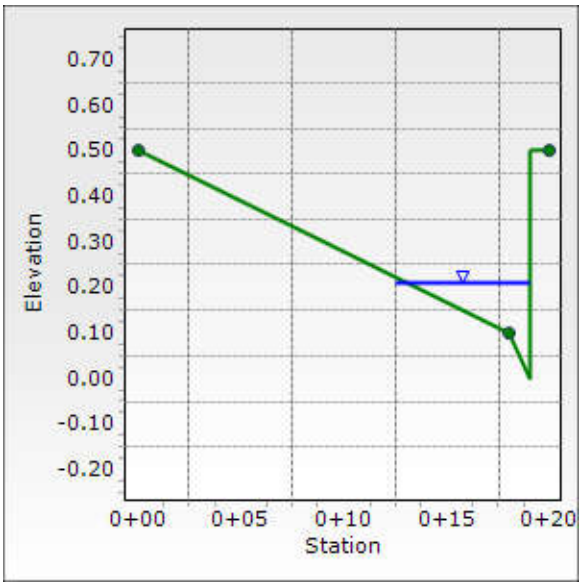
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.21 ft
Critical Depth	0.23 ft
Channel Slope	0.018 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for KettleRidge-4E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Normal Depth	0.21 ft
Discharge	1.00 cfs



KettleRidge-5W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Discharge	5.90 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.10
0+20	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+02, 0.10)	0.013
(0+02, 0.10)	(0+20, 0.46)	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	0.0 to 0.5 ft
Flow Area	1.8 ft²
Wetted Perimeter	13.6 ft
Hydraulic Radius	0.13 ft
Top Width	13.22 ft
Normal Depth	0.34 ft
Critical Depth	0.40 ft
Critical Slope	0.007 ft/ft
Velocity	3.30 ft/s
Velocity Head	0.17 ft
Specific Energy	0.51 ft
Froude Number	1.581
Flow Type	Supercritical

GVF Input Data

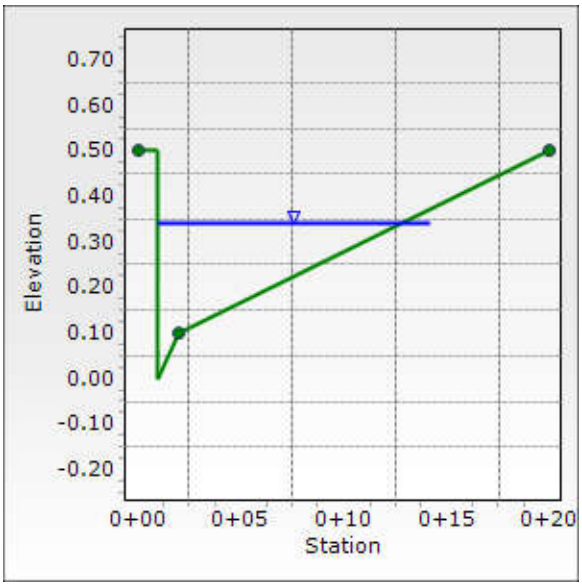
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.34 ft
Critical Depth	0.40 ft
Channel Slope	0.018 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for KettleRidge-5W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Normal Depth	0.34 ft
Discharge	5.90 cfs



KettleRidge-5E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Discharge	2.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.46
0+18	0.10
0+19	0.00
0+19	0.50
0+20	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.46)	(0+18, 0.10)	0.016
(0+18, 0.10)	(0+20, 0.50)	0.013

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

Results	
Normal Depth	0.25 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	0.8 ft²
Wetted Perimeter	8.9 ft
Hydraulic Radius	0.09 ft
Top Width	8.63 ft
Normal Depth	0.25 ft
Critical Depth	0.28 ft
Critical Slope	0.008 ft/ft
Velocity	2.55 ft/s
Velocity Head	0.10 ft
Specific Energy	0.35 ft
Froude Number	1.489
Flow Type	Supercritical

GVF Input Data

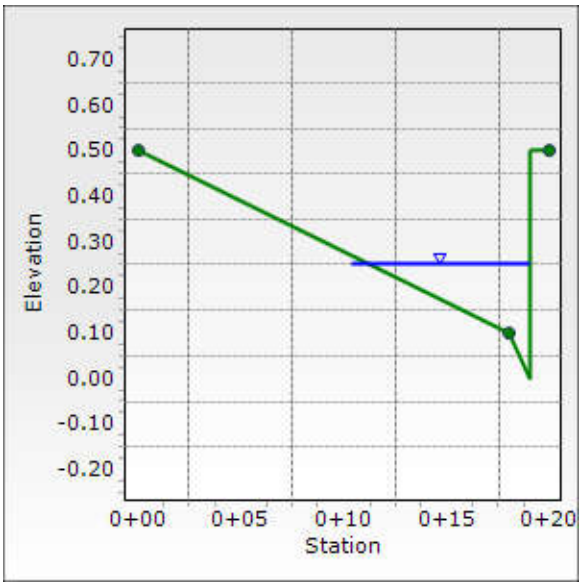
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.25 ft
Critical Depth	0.28 ft
Channel Slope	0.018 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for KettleRidge-5E-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Normal Depth	0.25 ft
Discharge	2.00 cfs



C.3 Ultimate Condition WSPG-W Model

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS - 100 YEAR ULTIMATE CONDITION
SO    552.78 3430.85  55                        3434.00
R     555.78 3430.95  55      .013                                  .000    00.0 0
REM****       VTN
R     573.40 3431.09  55      .013                                  .000    00.0 0
R     574.40 3431.10  55      .013                                  .000    00.0 0
R     575.40 3431.11  55      .013                                  .000    15.0 0
TS    576.40 3431.12  55      .013                                  .000    07.0 1
R     577.40 3431.13  55      .013                                  .000    15.0 0
R     578.40 3431.14  55      .013                                  .000    00.0 0
R     579.40 3431.15  55      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#1 DI #1,2
R     628.74 3431.71  55      .013                                  .000    00.0 0
R     629.74 3431.74  55      .013                                  .000    00.0 0
R     630.74 3431.78  55      .013                                  .000    00.0 1
JX    631.74 3431.81  55 24 24.013     3.0     2.0  3431.91 3431.91  90.0-90.0    .000
TS    632.74 3431.85  54      .013                                  .000    00.0 0
R     633.74 3431.88  54      .013                                  .000    00.0 0
R     634.74 3431.91  54      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#2  DI#9
R     988.65 3435.54  54      .013                                  .000    00.0 0
R     989.65 3435.57  54      .013                                  .000    00.0 0
R     990.65 3435.60  54      .013                                  .000    00.0 1
JX    991.65 3435.64  54 24   .013   33.0           3435.74        -90.0        .000
TS    992.65 3435.67  48      .013                                  .000    00.0 0
R     993.65 3435.70  48      .013                                  .000    00.0 0
R     994.65 3435.74  48      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#3 DI#3,4
R    1038.71 3436.24  48      .013                                  .000    00.0 0
R    1039.71 3436.28  48      .013                                  .000    00.0 0
R    1040.71 3436.31  48      .013                                  .000    00.0 1
JX   1041.71 3436.34  48 24 24.013     1.0     1.0  3436.44 3436.44  90.0-90.0    .000
R    1042.71 3436.38  48      .013                                  .000    00.0 0
R    1043.71 3436.41  48      .013                                  .000    00.0 0
R    1044.71 3436.44  48      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#4   DI#10
R    1112.63 3437.18  48      .013                                  .000    00.0 0
R    1113.63 3437.22  48      .013                                  .000    00.0 0
R    1114.63 3437.25  48      .013                                  .000    00.0 1
JX   1115.63 3437.28  48 24   .013    4.0           3437.38        -90.0        .000
TS   1116.63 3437.31  48      .013                                  .000    00.0 0
R    1117.63 3437.34  48      .013                                  .000    00.0 0
R    1118.63 3437.38  48      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#5
R    1389.17 3440.14  48      .013                                  .000    00.0 0
R    1390.17 3440.18  48      .013                                  .000    00.0 0
R    1391.17 3440.21  48      .013                                  .000    04.0 0
R    1392.17 3440.24  48      .013                                  .000    00.0 1
R    1393.17 3440.27  48      .013                                  .000    04.0 0
R    1394.17 3440.30  48      .013                                  .000    00.0 0
R    1395.17 3440.34  48      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#6 DI#5,6
R    1449.50 3440.95  48      .013                                  .000    00.0 0
R    1450.50 3440.98  48      .013                                  .000    00.0 0
R    1451.50 3441.01  48      .013                                  .000    01.0 1
JX   1452.50 3441.05  48 24 24.013     2.0     2.0  3441.15 3441.15  90.0-90.0    .000
R    1453.50 3441.08  48      .013                                  .000    01.0 0
R    1454.50 3441.11  48      .013                                  .000    00.0 0
R    1455.50 3441.15  48      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#7
R    1590.14 3442.55  48      .013                                  .000    00.0 0
R    1591.14 3442.58  48      .013                                  .000    00.0 0
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R    1592.14 3442.61  48      .013                                  .000    04.0 0
R    1593.14 3442.65  48      .013                                  .000    00.0 1
R    1594.14 3442.68  48      .013                                  .000    04.0 0
R    1595.14 3442.71  48      .013                                  .000    00.0 0
R    1596.14 3442.75  48      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#8
R    1775.88 3444.61  48      .013                                  .000    00.0 0
R    1776.88 3444.64  48      .013                                  .000    00.0 0
R    1777.88 3444.67  48      .013                                  .000    00.0 1
JX   1778.88 3444.71  48 30   .013   42.000         3444.810        -90.0         .000
TS   1779.88 3444.74  42      .013                                  .000    00.0 0
R    1780.88 3444.77  42      .013                                  .000    00.0 0
R    1781.88 3444.81  42      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#9 DI#7,8
R    1867.39 3445.73  42      .013                                  .000    00.0 0
R    1868.39 3445.76  42      .013                                  .000    00.0 0
R    1869.39 3445.80  42      .013                                  .000    00.0 1
JX   1870.39 3445.83  42 24 24.013     3.0     2.0  3435.93 3435.93  90.0-90.0    .000
R    1871.39 3445.86  42      .013                                  .000    00.0 0
R    1872.39 3445.90  42      .013                                  .000    00.0 0
R    1873.39 3445.93  42      .013                                  .000    00.0 0
REM*****      ATKINS     SDMH#10
R    1927.90 3446.53  42      .013                                  .000    15.0 0
R    1928.90 3446.56  42      .013                                  .000    15.0 0
R    1929.90 3446.60  42      .013                                  .000    15.0 0
TS   1930.90 3446.63  36      .013                                  .000    15.0 1
R    1931.90 3446.66  36      .013                                  .000    15.0 0
R    1932.90 3446.70  36      .013                                  .000    15.0 0
R    1933.90 3446.73  36      .013                                  .000    15.0 0
REM*****     ATKINS     STUB TO FUTURE FLIGHT RANGE AVENUE
R    2000.00 3447.42  36      .013                                  .000    15.0 0
SH   2000.00 3447.42 36
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q           115.000   .0
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WATER SURFACE PROFILE LISTING Date: 6-10-2020 Time:10:40:57

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - 100 YEAR ULTIMATE CONDITION

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
552.780	3430.850	2.702	3433.552	210.00	15.55	3.75	3437.30	.00	3.80	5.00	5.000	5.000	.00	0 .0
3.000	.0333					.0128	.04	2.70	1.67	1.91	.013	.00	.00	BOX
555.780	3430.950	2.736	3433.686	210.00	15.35	3.66	3437.34	.00	3.80	5.00	5.000	5.000	.00	0 .0
17.620	.0080					.0129	.23	2.74	1.64	3.27	.013	.00	.00	BOX
573.400	3431.090	2.686	3433.776	210.00	15.64	3.80	3437.57	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0133	.01	2.69	1.68	2.99	.013	.00	.00	BOX
574.400	3431.100	2.684	3433.784	210.00	15.65	3.80	3437.59	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0133	.01	2.68	1.68	2.99	.013	.00	.00	BOX
575.400	3431.110	2.682	3433.792	210.00	15.66	3.81	3437.60	.00	3.80	5.00	5.000	5.000	.00	0 .0
TRANS STR	.0100					.0133	.01	2.68	1.69		.013	.00	.00	BOX
576.400	3431.120	2.679	3433.799	210.00	15.68	3.82	3437.62	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0098					.0134	.01	2.68	1.69	3.02	.013	.00	.00	BOX
577.400	3431.130	2.677	3433.807	210.00	15.69	3.82	3437.63	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0134	.01	2.68	1.69	2.99	.013	.00	.00	BOX
578.400	3431.140	2.675	3433.815	210.00	15.70	3.83	3437.64	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0134	.01	2.67	1.69	2.99	.013	.00	.00	BOX
579.400	3431.150	2.673	3433.823	210.00	15.71	3.83	3437.66	.00	3.80	5.00	5.000	5.000	.00	0 .0
49.340	.0114					.0139	.68	2.67	1.69	2.85	.013	.00	.00	BOX

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - 100 YEAR ULTIMATE CONDITION

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
628.740	3431.710	2.610	3434.320	210.00	16.09	4.02	3438.34	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0300					.0143	.01	2.61	1.76	1.98	.013	.00	.00	BOX
629.740	3431.740	2.618	3434.357	210.00	16.05	4.00	3438.36	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0400					.0141	.01	2.62	1.75	1.79	.013	.00	.00	BOX
630.740	3431.780	2.630	3434.410	210.00	15.97	3.96	3438.37	.00	3.80	5.00	5.000	5.000	.00	0 .0
JUNCT STR	.0300					.0150	.01	2.63	1.74		.013	.00	.00	BOX
631.740	3431.810	2.460	3434.270	205.00	16.67	4.31	3438.58	.00	3.74	5.00	5.000	5.000	.00	0 .0
TRANS STR	.0400					.0133	.01	2.46	1.87		.013	.00	.00	BOX
632.740	3431.850	3.739	3435.590	205.00	14.51	3.27	3438.86	.00	4.07	3.37	4.500	.000	.00	1 .0
1.000	.0298					.0105	.01	3.74	1.25	2.52	.013	.00	.00	PIPE
633.740	3431.880	3.776	3435.656	205.00	14.39	3.21	3438.87	.00	4.07	3.31	4.500	.000	.00	1 .0
1.000	.0300					.0103	.01	3.78	1.22	2.52	.013	.00	.00	PIPE
634.740	3431.910	3.819	3435.729	205.00	14.25	3.15	3438.88	.00	4.07	3.22	4.500	.000	.00	1 .0
155.299	.0103					.0103	1.59	3.82	1.19	3.82	.013	.00	.00	PIPE
790.039	3433.503	3.819	3437.322	205.00	14.25	3.15	3440.47	.00	4.07	3.22	4.500	.000	.00	1 .0
198.611	.0103					.0102	2.03	3.82	1.19	3.82	.013	.00	.00	PIPE
988.650	3435.540	3.844	3439.385	205.00	14.17	3.12	3442.50	.00	4.07	3.18	4.500	.000	.00	1 .0
1.000	.0300					.0100	.01	3.84	1.17	2.52	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
989.650	3435.570	3.908	3439.479	205.00	13.97	3.03	3442.51	.00	4.07	3.04	4.500	.000	.00	1 .0
1.000	.0300					.0097	.01	3.91	1.12	2.52	.013	.00	.00	PIPE
990.650	3435.600	4.069	3439.669	205.00	13.55	2.85	3442.52	.00	4.07	2.65	4.500	.000	.00	1 .0
JUNCT STR	.0398					.0086	.01	4.07	1.00		.013	.00	.00	PIPE
991.650	3435.640	5.875	3441.515	172.00	10.81	1.82	3443.33	.00	3.81	.00	4.500	.000	.00	1 .0
TRANS STR	.0300					.0110	.01	5.88	.00		.013	.00	.00	PIPE
992.650	3435.670	5.310	3440.979	172.00	13.69	2.91	3443.89	.00	3.74	.00	4.000	.000	.00	1 .0
1.000	.0300					.0143	.01	5.31	.00	2.44	.013	.00	.00	PIPE
993.650	3435.700	5.294	3440.994	172.00	13.69	2.91	3443.90	.00	3.74	.00	4.000	.000	.00	1 .0
1.000	.0400					.0143	.01	5.29	.00	2.23	.013	.00	.00	PIPE
994.650	3435.740	5.268	3441.008	172.00	13.69	2.91	3443.92	.00	3.74	.00	4.000	.000	.00	1 .0
44.060	.0113					.0143	.63	5.27	.00	4.00	.013	.00	.00	PIPE
1038.710	3436.240	5.400	3441.640	172.00	13.69	2.91	3444.55	.00	3.74	.00	4.000	.000	.00	1 .0
1.000	.0400					.0143	.01	5.40	.00	2.23	.013	.00	.00	PIPE
1039.710	3436.280	5.374	3441.655	172.00	13.69	2.91	3444.56	.00	3.74	.00	4.000	.000	.00	1 .0
1.000	.0300					.0143	.01	5.37	.00	2.44	.013	.00	.00	PIPE
1040.710	3436.310	5.504	3441.814	172.00	13.69	2.91	3444.72	.00	3.74	.00	4.000	.000	.00	1 .0
JUNCT STR	.0300					.0142	.01	5.50	.00		.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1041.710	3436.340	5.623	3441.963	170.00	13.53	2.84	3444.80	.00	3.73	.00	4.000	.000	.00	1 .0
1.000	.0398					.0140	.01	5.62	.00	2.22	.013	.00	.00	PIPE
1042.710	3436.380	5.597	3441.977	170.00	13.53	2.84	3444.82	.00	3.73	.00	4.000	.000	.00	1 .0
1.000	.0300					.0140	.01	5.60	.00	2.43	.013	.00	.00	PIPE
1043.710	3436.410	5.581	3441.991	170.00	13.53	2.84	3444.83	.00	3.73	.00	4.000	.000	.00	1 .0
1.000	.0300					.0140	.01	5.58	.00	2.43	.013	.00	.00	PIPE
1044.710	3436.440	5.565	3442.005	170.00	13.53	2.84	3444.85	.00	3.73	.00	4.000	.000	.00	1 .0
67.920	.0109					.0140	.95	5.57	.00	4.00	.013	.00	.00	PIPE
1112.630	3437.180	5.776	3442.956	170.00	13.53	2.84	3445.80	.00	3.73	.00	4.000	.000	.00	1 .0
1.000	.0400					.0140	.01	5.78	.00	2.21	.013	.00	.00	PIPE
1113.630	3437.220	5.750	3442.970	170.00	13.53	2.84	3445.81	.00	3.73	.00	4.000	.000	.00	1 .0
1.000	.0300					.0140	.01	5.75	.00	2.43	.013	.00	.00	PIPE
1114.630	3437.250	5.876	3443.126	170.00	13.53	2.84	3445.97	.00	3.73	.00	4.000	.000	.00	1 .0
JUNCT STR	.0300					.0137	.01	5.88	.00		.013	.00	.00	PIPE
1115.630	3437.280	6.124	3443.404	166.00	13.21	2.71	3446.11	.00	3.70	.00	4.000	.000	.00	1 .0
TRANS STR	.0300					.0134	.01	6.12	.00		.013	.00	.00	PIPE
1116.630	3437.310	6.108	3443.418	166.00	13.21	2.71	3446.13	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	6.11	.00	2.39	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - 100 YEAR ULTIMATE CONDITION

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
1117.630	3437.340	6.091	3443.431	166.00	13.21	2.71	3446.14	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0398					.0134	.01	6.09	.00	2.19	.013	.00	.00	PIPE
1118.630	3437.380	6.065	3443.445	166.00	13.21	2.71	3446.15	.00	3.70	.00	4.000	.000	.00	1 .0
270.540	.0102					.0134	3.61	6.06	.00	4.00	.013	.00	.00	PIPE
1389.170	3440.140	6.918	3447.058	166.00	13.21	2.71	3449.77	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0400					.0134	.01	6.92	.00	2.18	.013	.00	.00	PIPE
1390.170	3440.180	6.891	3447.071	166.00	13.21	2.71	3449.78	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	6.89	.00	2.39	.013	.00	.00	PIPE
1391.170	3440.210	6.910	3447.120	166.00	13.21	2.71	3449.83	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	6.91	.00	2.39	.013	.00	.00	PIPE
1392.170	3440.240	7.029	3447.269	166.00	13.21	2.71	3449.98	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	7.03	.00	2.39	.013	.00	.00	PIPE
1393.170	3440.270	7.048	3447.318	166.00	13.21	2.71	3450.03	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	7.05	.00	2.39	.013	.00	.00	PIPE
1394.170	3440.300	7.031	3447.332	166.00	13.21	2.71	3450.04	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0400					.0134	.01	7.03	.00	2.18	.013	.00	.00	PIPE
1395.170	3440.340	7.005	3447.345	166.00	13.21	2.71	3450.05	.00	3.70	.00	4.000	.000	.00	1 .0
54.330	.0112					.0134	.73	7.00	.00	4.00	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1449.500	3440.950	7.121	3448.071	166.00	13.21	2.71	3450.78	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	7.12	.00	2.39	.013	.00	.00	PIPE
1450.500	3440.980	7.104	3448.084	166.00	13.21	2.71	3450.79	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	7.10	.00	2.39	.013	.00	.00	PIPE
1451.500	3441.010	7.232	3448.242	166.00	13.21	2.71	3450.95	.00	3.70	.00	4.000	.000	.00	1 .0
JUNCT STR	.0400					.0130	.01	7.23	.00		.013	.00	.00	PIPE
1452.500	3441.050	7.463	3448.513	162.00	12.89	2.58	3451.09	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	7.46	.00	2.35	.013	.00	.00	PIPE
1453.500	3441.080	7.454	3448.534	162.00	12.89	2.58	3451.11	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	7.45	.00	2.35	.013	.00	.00	PIPE
1454.500	3441.110	7.437	3448.547	162.00	12.89	2.58	3451.13	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0398					.0127	.01	7.44	.00	2.15	.013	.00	.00	PIPE
1455.500	3441.150	7.410	3448.560	162.00	12.89	2.58	3451.14	.00	3.68	.00	4.000	.000	.00	1 .0
134.640	.0104					.0127	1.71	7.41	.00	4.00	.013	.00	.00	PIPE
1590.140	3442.550	7.722	3450.272	162.00	12.89	2.58	3452.85	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	7.72	.00	2.35	.013	.00	.00	PIPE
1591.140	3442.580	7.705	3450.285	162.00	12.89	2.58	3452.87	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	7.70	.00	2.35	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1592.140	3442.610	7.721	3450.332	162.00	12.89	2.58	3452.91	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0398					.0127	.01	7.72	.00	2.15	.013	.00	.00	PIPE
1593.140	3442.650	7.823	3450.473	162.00	12.89	2.58	3453.05	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	7.82	.00	2.35	.013	.00	.00	PIPE
1594.140	3442.680	7.840	3450.520	162.00	12.89	2.58	3453.10	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	7.84	.00	2.35	.013	.00	.00	PIPE
1595.140	3442.710	7.823	3450.533	162.00	12.89	2.58	3453.11	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0400					.0127	.01	7.82	.00	2.15	.013	.00	.00	PIPE
1596.140	3442.750	7.796	3450.546	162.00	12.89	2.58	3453.13	.00	3.68	.00	4.000	.000	.00	1 .0
179.740	.0103					.0127	2.29	7.80	.00	4.00	.013	.00	.00	PIPE
1775.880	3444.610	8.222	3452.832	162.00	12.89	2.58	3455.41	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0298					.0127	.01	8.22	.00	2.36	.013	.00	.00	PIPE
1776.880	3444.640	8.205	3452.844	162.00	12.89	2.58	3455.43	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	8.20	.00	2.35	.013	.00	.00	PIPE
1777.880	3444.670	8.316	3452.986	162.00	12.89	2.58	3455.57	.00	3.68	.00	4.000	.000	.00	1 .0
JUNCT STR	.0400					.0098	.01	8.32	.00		.013	.00	.00	PIPE
1778.880	3444.710	10.615	3455.325	120.00	9.55	1.42	3456.74	.00	3.30	.00	4.000	.000	.00	1 .0
TRANS STR	.0300					.0106	.01	10.62	.00		.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-10-2020 Time:10:40:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1779.880	3444.740	10.096	3454.836	120.00	12.47	2.42	3457.25	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0300					.0142	.01	10.10	.00	2.13	.013	.00	.00	PIPE
1780.880	3444.770	10.080	3454.850	120.00	12.47	2.42	3457.27	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0400					.0142	.01	10.08	.00	1.95	.013	.00	.00	PIPE
1781.880	3444.810	10.055	3454.865	120.00	12.47	2.42	3457.28	.00	3.25	.00	3.500	.000	.00	1 .0
85.510	.0108					.0142	1.22	10.05	.00	3.50	.013	.00	.00	PIPE
1867.390	3445.730	10.351	3456.081	120.00	12.47	2.42	3458.50	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0300					.0142	.01	10.35	.00	2.13	.013	.00	.00	PIPE
1868.390	3445.760	10.335	3456.095	120.00	12.47	2.42	3458.51	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0400					.0142	.01	10.34	.00	1.95	.013	.00	.00	PIPE
1869.390	3445.800	10.430	3456.230	120.00	12.47	2.42	3458.65	.00	3.25	.00	3.500	.000	.00	1 .0
JUNCT STR	.0300					.0136	.01	10.43	.00		.013	.00	.00	PIPE
1870.390	3445.830	10.808	3456.638	115.00	11.95	2.22	3458.86	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0300					.0131	.01	10.81	.00	2.08	.013	.00	.00	PIPE
1871.390	3445.860	10.791	3456.651	115.00	11.95	2.22	3458.87	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0398					.0131	.01	10.79	.00	1.90	.013	.00	.00	PIPE
1872.390	3445.900	10.765	3456.665	115.00	11.95	2.22	3458.88	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0300					.0131	.01	10.76	.00	2.08	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-10-2020 Time:10:40:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1873.390	3445.930	10.748	3456.678	115.00	11.95	2.22	3458.90	.00	3.21	.00	3.500	.000	.00	1 .0
54.510	.0110					.0131	.71	10.75	.00	3.50	.013	.00	.00	PIPE
1927.900	3446.530	10.970	3457.500	115.00	11.95	2.22	3459.72	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0300					.0131	.01	10.97	.00	2.08	.013	.00	.00	PIPE
1928.900	3446.560	11.063	3457.623	115.00	11.95	2.22	3459.84	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0400					.0131	.01	11.06	.00	1.90	.013	.00	.00	PIPE
1929.900	3446.600	11.145	3457.745	115.00	11.95	2.22	3459.96	.00	3.21	.00	3.500	.000	.00	1 .0
TRANS STR	.0298					.0214	.02	11.15	.00		.013	.00	.00	PIPE
1930.900	3446.630	10.191	3456.821	115.00	16.27	4.11	3460.93	.00	2.94	.00	3.000	.000	.00	1 .0
1.000	.0300					.0297	.03	10.19	.00	2.45	.013	.00	.00	PIPE
1931.900	3446.660	10.394	3457.054	115.00	16.27	4.11	3461.16	.00	2.94	.00	3.000	.000	.00	1 .0
1.000	.0400					.0297	.03	10.39	.00	2.15	.013	.00	.00	PIPE
1932.900	3446.700	10.587	3457.287	115.00	16.27	4.11	3461.40	.00	2.94	.00	3.000	.000	.00	1 .0
1.000	.0300					.0297	.03	10.59	.00	2.45	.013	.00	.00	PIPE
1933.900	3446.730	10.791	3457.521	115.00	16.27	4.11	3461.63	.00	2.94	.00	3.000	.000	.00	1 .0
66.100	.0104					.0297	1.97	10.79	.00	3.00	.013	.00	.00	PIPE
2000.000	3447.420	12.269	3459.689	115.00	16.27	4.11	3463.80	.00	2.94	.00	3.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with ULT HGL / INT Flow)
SO    631.74 3431.81  55                        3434.27
R     634.74 3431.91  24      .013                                .000    00.0 0
R     668.08 3443.39  24      .013                                .000    00.0 0
SH    671.08 3443.39  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             5.000   .0
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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
631.740	3431.810	2.460	3434.270	5.00	1.59	.04	3434.31	.00	.79	.00	2.000	.000	.00	1 .0
3.000	.0333					.0005	.00	2.46	.00	.47	.013	.00	.00	PIPE
634.740	3431.910	2.362	3434.271	5.00	1.59	.04	3434.31	.00	.79	.00	2.000	.000	.00	1 .0
1.052	.3443					.0005	.00	2.36	.00	.27	.013	.00	.00	PIPE
635.792	3432.272	2.000	3434.272	5.00	1.59	.04	3434.31	.00	.79	.00	2.000	.000	.00	1 .0
.337	.3443					.0005	.00	2.00	.00	.27	.013	.00	.00	PIPE
636.129	3432.388	1.882	3434.270	5.00	1.63	.04	3434.31	.00	.79	.94	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
636.129	3432.388	.273	3432.661	5.00	19.43	5.86	3438.52	.00	.79	1.37	2.000	.000	.00	1 .0
2.946	.3443					.2990	.88	.27	7.91	.27	.013	.00	.00	PIPE
639.075	3433.403	.276	3433.679	5.00	19.09	5.66	3439.34	.00	.79	1.38	2.000	.000	.00	1 .0
7.092	.3443					.2731	1.94	.28	7.72	.27	.013	.00	.00	PIPE
646.167	3435.845	.285	3436.130	5.00	18.20	5.15	3441.28	.00	.79	1.40	2.000	.000	.00	1 .0
4.326	.3443					.2384	1.03	.29	7.24	.27	.013	.00	.00	PIPE
650.493	3437.334	.295	3437.629	5.00	17.36	4.68	3442.31	.00	.79	1.42	2.000	.000	.00	1 .0
3.050	.3443					.2081	.63	.29	6.79	.27	.013	.00	.00	PIPE
653.542	3438.384	.305	3438.689	5.00	16.55	4.25	3442.94	.00	.79	1.44	2.000	.000	.00	1 .0
2.315	.3443					.1817	.42	.30	6.36	.27	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:34

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
655.857	3439.181	.315	3439.496	5.00	15.78	3.87	3443.36	.00	.79	1.46	2.000	.000	.00	1 .0
1.837	.3443					.1587	.29	.31	5.96	.27	.013	.00	.00	PIPE
657.694	3439.814	.325	3440.139	5.00	15.04	3.51	3443.65	.00	.79	1.48	2.000	.000	.00	1 .0
1.500	.3443					.1386	.21	.33	5.59	.27	.013	.00	.00	PIPE
659.194	3440.330	.336	3440.666	5.00	14.34	3.19	3443.86	.00	.79	1.50	2.000	.000	.00	1 .0
1.250	.3443					.1210	.15	.34	5.24	.27	.013	.00	.00	PIPE
660.444	3440.760	.348	3441.108	5.00	13.68	2.90	3444.01	.00	.79	1.52	2.000	.000	.00	1 .0
1.057	.3443					.1057	.11	.35	4.91	.27	.013	.00	.00	PIPE
661.501	3441.125	.359	3441.484	5.00	13.04	2.64	3444.12	.00	.79	1.54	2.000	.000	.00	1 .0
.904	.3443					.0923	.08	.36	4.60	.27	.013	.00	.00	PIPE
662.406	3441.436	.371	3441.807	5.00	12.43	2.40	3444.21	.00	.79	1.56	2.000	.000	.00	1 .0
.780	.3443					.0807	.06	.37	4.31	.27	.013	.00	.00	PIPE
663.185	3441.705	.384	3442.088	5.00	11.85	2.18	3444.27	.00	.79	1.58	2.000	.000	.00	1 .0
.677	.3443					.0705	.05	.38	4.04	.27	.013	.00	.00	PIPE
663.862	3441.938	.397	3442.335	5.00	11.30	1.98	3444.32	.00	.79	1.60	2.000	.000	.00	1 .0
.590	.3443					.0616	.04	.40	3.78	.27	.013	.00	.00	PIPE
664.453	3442.141	.410	3442.552	5.00	10.78	1.80	3444.35	.00	.79	1.62	2.000	.000	.00	1 .0
.516	.3443					.0538	.03	.41	3.54	.27	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:34

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
664.969	3442.319	.424	3442.743	5.00	10.28	1.64	3444.38	.00	.79	1.64	2.000	.000	.00	1 .0
.453	.3443					.0470	.02	.42	3.32	.27	.013	.00	.00	PIPE
665.422	3442.475	.439	3442.913	5.00	9.80	1.49	3444.40	.00	.79	1.66	2.000	.000	.00	1 .0
.398	.3443					.0411	.02	.44	3.11	.27	.013	.00	.00	PIPE
665.820	3442.612	.454	3443.065	5.00	9.34	1.35	3444.42	.00	.79	1.68	2.000	.000	.00	1 .0
.349	.3443					.0359	.01	.45	2.91	.27	.013	.00	.00	PIPE
666.169	3442.732	.469	3443.201	5.00	8.91	1.23	3444.43	.00	.79	1.69	2.000	.000	.00	1 .0
.306	.3443					.0314	.01	.47	2.73	.27	.013	.00	.00	PIPE
666.475	3442.837	.485	3443.322	5.00	8.49	1.12	3444.44	.00	.79	1.71	2.000	.000	.00	1 .0
.269	.3443					.0275	.01	.49	2.55	.27	.013	.00	.00	PIPE
666.744	3442.930	.502	3443.432	5.00	8.10	1.02	3444.45	.00	.79	1.73	2.000	.000	.00	1 .0
.235	.3443					.0240	.01	.50	2.39	.27	.013	.00	.00	PIPE
666.979	3443.010	.519	3443.530	5.00	7.72	.93	3444.46	.00	.79	1.75	2.000	.000	.00	1 .0
.205	.3443					.0210	.00	.52	2.24	.27	.013	.00	.00	PIPE
667.184	3443.081	.537	3443.618	5.00	7.36	.84	3444.46	.00	.79	1.77	2.000	.000	.00	1 .0
.178	.3443					.0184	.00	.54	2.10	.27	.013	.00	.00	PIPE
667.361	3443.142	.556	3443.698	5.00	7.02	.76	3444.46	.00	.79	1.79	2.000	.000	.00	1 .0
.153	.3443					.0161	.00	.56	1.96	.27	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:34

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
667.514	3443.195	.575	3443.770	5.00	6.69	.70	3444.47	.00	.79	1.81	2.000	.000	.00	1 .0
.131	.3443					.0141	.00	.58	1.84	.27	.013	.00	.00	PIPE
667.645	3443.240	.595	3443.835	5.00	6.38	.63	3444.47	.00	.79	1.83	2.000	.000	.00	1 .0
.110	.3443					.0123	.00	.60	1.72	.27	.013	.00	.00	PIPE
667.755	3443.278	.616	3443.894	5.00	6.08	.57	3444.47	.00	.79	1.85	2.000	.000	.00	1 .0
.092	.3443					.0108	.00	.62	1.61	.27	.013	.00	.00	PIPE
667.847	3443.310	.638	3443.947	5.00	5.80	.52	3444.47	.00	.79	1.86	2.000	.000	.00	1 .0
.075	.3443					.0095	.00	.64	1.50	.27	.013	.00	.00	PIPE
667.922	3443.335	.660	3443.995	5.00	5.53	.47	3444.47	.00	.79	1.88	2.000	.000	.00	1 .0
.059	.3443					.0083	.00	.66	1.41	.27	.013	.00	.00	PIPE
667.981	3443.356	.683	3444.039	5.00	5.27	.43	3444.47	.00	.79	1.90	2.000	.000	.00	1 .0
.044	.3443					.0073	.00	.68	1.31	.27	.013	.00	.00	PIPE
668.025	3443.371	.708	3444.079	5.00	5.03	.39	3444.47	.00	.79	1.91	2.000	.000	.00	1 .0
.031	.3443					.0064	.00	.71	1.23	.27	.013	.00	.00	PIPE
668.056	3443.382	.733	3444.115	5.00	4.79	.36	3444.47	.00	.79	1.93	2.000	.000	.00	1 .0
.018	.3443					.0056	.00	.73	1.15	.27	.013	.00	.00	PIPE
668.074	3443.388	.759	3444.147	5.00	4.57	.32	3444.47	.00	.79	1.94	2.000	.000	.00	1 .0
.006	.3443					.0049	.00	.76	1.07	.27	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 5

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:34

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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	Type Ch
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall				
668.080	3443.390	.788	3444.177	5.00	4.35	.29	3444.47	.00	.79	1.95	2.000	.000	.00	1	.0	
671.080	3443.390	.788	3444.177	5.00	4.35	.29	3444.47	.00	.79	1.95	2.000	.000	.00	1	.0	

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-2  100 YEAR ULTIMATE CONDITION
SO    631.74 3431.81  55                          3434.27
R     634.74 3431.91  24      .013                                .000    00.0 0
R     640.29 3434.03  24      .013                                .000    00.0 0
SH    643.29 3434.03  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             2.000   .0
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FILE: KR_Lateral-SDDI_2.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:50

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
631.740	3431.810	2.460	3434.270	2.00	.64	.01	3434.28	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0333					.0001	.00	2.46	.00	.30	.013	.00	.00	PIPE
634.740	3431.910	2.360	3434.270	2.00	.64	.01	3434.28	.00	.49	.00	2.000	.000	.00	1 .0
.943	.3820					.0001	.00	2.36	.00	.17	.013	.00	.00	PIPE
635.683	3432.270	2.000	3434.270	2.00	.64	.01	3434.28	.00	.49	.00	2.000	.000	.00	1 .0
.481	.3820					.0001	.00	2.00	.00	.17	.013	.00	.00	PIPE
636.165	3432.454	1.815	3434.269	2.00	.67	.01	3434.28	.00	.49	1.16	2.000	.000	.00	1 .0
.280	.3820					.0001	.00	1.81	.07	.17	.013	.00	.00	PIPE
636.445	3432.561	1.707	3434.268	2.00	.70	.01	3434.28	.00	.49	1.41	2.000	.000	.00	1 .0
.231	.3820					.0001	.00	1.71	.09	.17	.013	.00	.00	PIPE
636.675	3432.649	1.618	3434.267	2.00	.73	.01	3434.28	.00	.49	1.57	2.000	.000	.00	1 .0
.202	.3820					.0001	.00	1.62	.10	.17	.013	.00	.00	PIPE
636.877	3432.726	1.540	3434.266	2.00	.77	.01	3434.28	.00	.49	1.68	2.000	.000	.00	1 .0
.181	.3820					.0001	.00	1.54	.11	.17	.013	.00	.00	PIPE
637.058	3432.795	1.470	3434.265	2.00	.81	.01	3434.28	.00	.49	1.77	2.000	.000	.00	1 .0
.165	.3820					.0001	.00	1.47	.12	.17	.013	.00	.00	PIPE
637.223	3432.858	1.406	3434.264	2.00	.85	.01	3434.28	.00	.49	1.83	2.000	.000	.00	1 .0
.152	.3820					.0001	.00	1.41	.13	.17	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:50

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
637.375	3432.916	1.347	3434.263	2.00	.89	.01	3434.28	.00	.49	1.88	2.000	.000	.00	1 .0
.142	.3820					.0001	.00	1.35	.14	.17	.013	.00	.00	PIPE
637.517	3432.970	1.292	3434.262	2.00	.93	.01	3434.28	.00	.49	1.91	2.000	.000	.00	1 .0
.132	.3820					.0001	.00	1.29	.16	.17	.013	.00	.00	PIPE
637.649	3433.021	1.240	3434.261	2.00	.98	.01	3434.28	.00	.49	1.94	2.000	.000	.00	1 .0
.124	.3820					.0002	.00	1.24	.17	.17	.013	.00	.00	PIPE
637.773	3433.068	1.191	3434.259	2.00	1.03	.02	3434.28	.00	.49	1.96	2.000	.000	.00	1 .0
.116	.3820					.0002	.00	1.19	.18	.17	.013	.00	.00	PIPE
637.889	3433.113	1.145	3434.258	2.00	1.08	.02	3434.28	.00	.49	1.98	2.000	.000	.00	1 .0
.109	.3820					.0002	.00	1.15	.20	.17	.013	.00	.00	PIPE
637.999	3433.155	1.101	3434.256	2.00	1.13	.02	3434.28	.00	.49	1.99	2.000	.000	.00	1 .0
.103	.3820					.0002	.00	1.10	.21	.17	.013	.00	.00	PIPE
638.102	3433.194	1.060	3434.254	2.00	1.18	.02	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.098	.3820					.0003	.00	1.06	.23	.17	.013	.00	.00	PIPE
638.199	3433.231	1.021	3434.252	2.00	1.24	.02	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.092	.3820					.0003	.00	1.02	.24	.17	.013	.00	.00	PIPE
638.291	3433.267	.983	3434.250	2.00	1.30	.03	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.087	.3820					.0004	.00	.98	.26	.17	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:50

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
638.378	3433.300	.947	3434.247	2.00	1.36	.03	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.082	.3820					.0004	.00	.95	.28	.17	.013	.00	.00	PIPE
638.460	3433.331	.913	3434.244	2.00	1.43	.03	3434.28	.00	.49	1.99	2.000	.000	.00	1 .0
.077	.3820					.0005	.00	.91	.30	.17	.013	.00	.00	PIPE
638.538	3433.361	.880	3434.241	2.00	1.50	.03	3434.28	.00	.49	1.99	2.000	.000	.00	1 .0
.073	.3820					.0005	.00	.88	.32	.17	.013	.00	.00	PIPE
638.611	3433.388	.849	3434.238	2.00	1.57	.04	3434.28	.00	.49	1.98	2.000	.000	.00	1 .0
.068	.3820					.0006	.00	.85	.35	.17	.013	.00	.00	PIPE
638.679	3433.415	.819	3434.234	2.00	1.65	.04	3434.28	.00	.49	1.97	2.000	.000	.00	1 .0
638.681	3433.415	.790	3434.206	2.00	1.73	.05	3434.25	.00	.49	1.96	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
638.681	3433.415	.269	3433.685	2.00	7.91	.97	3434.66	.00	.49	1.37	2.000	.000	.00	1 .0
.213	.3820					.0483	.01	.27	3.24	.17	.013	.00	.00	PIPE
638.894	3433.497	.278	3433.775	2.00	7.54	.88	3434.66	.00	.49	1.38	2.000	.000	.00	1 .0
.209	.3820					.0422	.01	.28	3.04	.17	.013	.00	.00	PIPE
639.103	3433.577	.288	3433.865	2.00	7.19	.80	3434.67	.00	.49	1.40	2.000	.000	.00	1 .0
.184	.3820					.0368	.01	.29	2.85	.17	.013	.00	.00	PIPE
639.286	3433.647	.297	3433.944	2.00	6.86	.73	3434.67	.00	.49	1.42	2.000	.000	.00	1 .0
.161	.3820					.0321	.01	.30	2.67	.17	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:50

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
639.448	3433.708	.307	3434.016	2.00	6.54	.66	3434.68	.00	.49	1.44	2.000	.000	.00	1 .0
.141	.3820					.0281	.00	.31	2.50	.17	.013	.00	.00	PIPE
639.589	3433.762	.318	3434.080	2.00	6.23	.60	3434.68	.00	.49	1.46	2.000	.000	.00	1 .0
.123	.3820					.0245	.00	.32	2.34	.17	.013	.00	.00	PIPE
639.712	3433.810	.328	3434.138	2.00	5.94	.55	3434.69	.00	.49	1.48	2.000	.000	.00	1 .0
.108	.3820					.0214	.00	.33	2.20	.17	.013	.00	.00	PIPE
639.820	3433.851	.339	3434.190	2.00	5.67	.50	3434.69	.00	.49	1.50	2.000	.000	.00	1 .0
.093	.3820					.0187	.00	.34	2.06	.17	.013	.00	.00	PIPE
639.913	3433.886	.351	3434.237	2.00	5.40	.45	3434.69	.00	.49	1.52	2.000	.000	.00	1 .0
.080	.3820					.0163	.00	.35	1.93	.17	.013	.00	.00	PIPE
639.994	3433.917	.362	3434.280	2.00	5.15	.41	3434.69	.00	.49	1.54	2.000	.000	.00	1 .0
.069	.3820					.0143	.00	.36	1.81	.17	.013	.00	.00	PIPE
640.062	3433.943	.375	3434.318	2.00	4.91	.37	3434.69	.00	.49	1.56	2.000	.000	.00	1 .0
.058	.3820					.0125	.00	.37	1.69	.17	.013	.00	.00	PIPE
640.120	3433.965	.387	3434.353	2.00	4.68	.34	3434.69	.00	.49	1.58	2.000	.000	.00	1 .0
.048	.3820					.0109	.00	.39	1.59	.17	.013	.00	.00	PIPE
640.168	3433.984	.400	3434.384	2.00	4.46	.31	3434.69	.00	.49	1.60	2.000	.000	.00	1 .0
.039	.3820					.0095	.00	.40	1.49	.17	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:33:50

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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	
640.207	3433.999	.414	3434.413	2.00	4.26	.28	3434.69	.00	.49	1.62	2.000	.000	.00	1 .0
.031	.3820					.0083	.00	.41	1.39	.17	.013	.00	.00	PIPE
640.238	3434.010	.428	3434.438	2.00	4.06	.26	3434.69	.00	.49	1.64	2.000	.000	.00	1 .0
.023	.3820					.0073	.00	.43	1.31	.17	.013	.00	.00	PIPE
640.261	3434.019	.443	3434.462	2.00	3.87	.23	3434.69	.00	.49	1.66	2.000	.000	.00	1 .0
.016	.3820					.0063	.00	.44	1.22	.17	.013	.00	.00	PIPE
640.277	3434.025	.458	3434.483	2.00	3.69	.21	3434.69	.00	.49	1.68	2.000	.000	.00	1 .0
.010	.3820					.0055	.00	.46	1.14	.17	.013	.00	.00	PIPE
640.287	3434.029	.473	3434.502	2.00	3.52	.19	3434.69	.00	.49	1.70	2.000	.000	.00	1 .0
.003	.3820					.0048	.00	.47	1.07	.17	.013	.00	.00	PIPE
640.290	3434.030	.491	3434.521	2.00	3.34	.17	3434.69	.00	.49	1.72	2.000	.000	.00	1 .0
643.290	3434.030	.491	3434.521	2.00	3.34	.17	3434.69	.00	.49	1.72	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-3  100 YEAR ULTIMATE CONDITION
SO   1041.71 3436.34  48                          3441.96
R    1044.71 3436.44  24      .013                                .000    00.0 0
R    1070.63 3449.64  24      .013                                .000    00.0 0
SH   1073.63 3449.64  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             1.000   .0
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WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34: 7

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1041.710	3436.340	5.620	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
3.000	.0333					.0000	.00	5.62	.00	.21	.013	.00	.00	PIPE
1044.710	3436.440	5.520	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
6.912	.5093					.0000	.00	5.52	.00	.11	.013	.00	.00	PIPE
1051.622	3439.960	2.000	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
.362	.5093					.0000	.00	2.00	.00	.11	.013	.00	.00	PIPE
1051.984	3440.145	1.815	3441.959	1.00	.33	.00	3441.96	.00	.34	1.16	2.000	.000	.00	1 .0
.211	.5093					.0000	.00	1.81	.04	.11	.013	.00	.00	PIPE
1052.195	3440.252	1.707	3441.959	1.00	.35	.00	3441.96	.00	.34	1.41	2.000	.000	.00	1 .0
.174	.5093					.0000	.00	1.71	.04	.11	.013	.00	.00	PIPE
1052.369	3440.341	1.618	3441.959	1.00	.37	.00	3441.96	.00	.34	1.57	2.000	.000	.00	1 .0
.152	.5093					.0000	.00	1.62	.05	.11	.013	.00	.00	PIPE
1052.522	3440.418	1.540	3441.958	1.00	.39	.00	3441.96	.00	.34	1.68	2.000	.000	.00	1 .0
.137	.5093					.0000	.00	1.54	.05	.11	.013	.00	.00	PIPE
1052.659	3440.488	1.470	3441.958	1.00	.40	.00	3441.96	.00	.34	1.77	2.000	.000	.00	1 .0
.125	.5093					.0000	.00	1.47	.06	.11	.013	.00	.00	PIPE
1052.784	3440.552	1.406	3441.958	1.00	.42	.00	3441.96	.00	.34	1.83	2.000	.000	.00	1 .0
.116	.5093					.0000	.00	1.41	.07	.11	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34: 7

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1052.900	3440.611	1.347	3441.958	1.00	.44	.00	3441.96	.00	.34	1.88	2.000	.000	.00	1 .0
.108	.5093					.0000	.00	1.35	.07	.11	.013	.00	.00	PIPE
1053.008	3440.666	1.292	3441.958	1.00	.47	.00	3441.96	.00	.34	1.91	2.000	.000	.00	1 .0
.101	.5093					.0000	.00	1.29	.08	.11	.013	.00	.00	PIPE
1053.109	3440.718	1.240	3441.957	1.00	.49	.00	3441.96	.00	.34	1.94	2.000	.000	.00	1 .0
.095	.5093					.0000	.00	1.24	.08	.11	.013	.00	.00	PIPE
1053.204	3440.766	1.191	3441.957	1.00	.51	.00	3441.96	.00	.34	1.96	2.000	.000	.00	1 .0
.089	.5093					.0000	.00	1.19	.09	.11	.013	.00	.00	PIPE
1053.294	3440.812	1.145	3441.957	1.00	.54	.00	3441.96	.00	.34	1.98	2.000	.000	.00	1 .0
.085	.5093					.0001	.00	1.15	.10	.11	.013	.00	.00	PIPE
1053.378	3440.855	1.101	3441.956	1.00	.56	.00	3441.96	.00	.34	1.99	2.000	.000	.00	1 .0
.080	.5093					.0001	.00	1.10	.11	.11	.013	.00	.00	PIPE
1053.459	3440.896	1.060	3441.956	1.00	.59	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.076	.5093					.0001	.00	1.06	.11	.11	.013	.00	.00	PIPE
1053.535	3440.935	1.021	3441.955	1.00	.62	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.073	.5093					.0001	.00	1.02	.12	.11	.013	.00	.00	PIPE
1053.607	3440.971	.983	3441.955	1.00	.65	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.069	.5093					.0001	.00	.98	.13	.11	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34: 7

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1053.676	3441.007	.947	3441.954	1.00	.68	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.066	.5093					.0001	.00	.95	.14	.11	.013	.00	.00	PIPE
1053.742	3441.040	.913	3441.953	1.00	.72	.01	3441.96	.00	.34	1.99	2.000	.000	.00	1 .0
.063	.5093					.0001	.00	.91	.15	.11	.013	.00	.00	PIPE
1053.805	3441.072	.880	3441.952	1.00	.75	.01	3441.96	.00	.34	1.99	2.000	.000	.00	1 .0
.060	.5093					.0001	.00	.88	.16	.11	.013	.00	.00	PIPE
1053.865	3441.103	.849	3441.952	1.00	.79	.01	3441.96	.00	.34	1.98	2.000	.000	.00	1 .0
.056	.5093					.0001	.00	.85	.17	.11	.013	.00	.00	PIPE
1053.921	3441.131	.819	3441.950	1.00	.83	.01	3441.96	.00	.34	1.97	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1053.921	3441.131	.113	3441.244	1.00	14.27	3.16	3444.40	.00	.34	.92	2.000	.000	.00	1 .0
1.637	.5093					.4996	.82	.11	9.12	.11	.013	.00	.00	PIPE
1055.558	3441.964	.114	3442.078	1.00	14.07	3.08	3445.15	.00	.34	.93	2.000	.000	.00	1 .0
5.443	.5093					.4586	2.50	.11	8.96	.11	.013	.00	.00	PIPE
1061.001	3444.736	.117	3444.854	1.00	13.42	2.80	3447.65	.00	.34	.94	2.000	.000	.00	1 .0
2.288	.5093					.3998	.91	.12	8.40	.11	.013	.00	.00	PIPE
1063.289	3445.901	.121	3446.022	1.00	12.79	2.54	3448.56	.00	.34	.95	2.000	.000	.00	1 .0
1.414	.5093					.3486	.49	.12	7.88	.11	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34: 7

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1064.703	3446.621	.125	3446.746	1.00	12.20	2.31	3449.06	.00	.34	.97	2.000	.000	.00	1 .0
1.004	.5093					.3041	.31	.13	7.39	.11	.013	.00	.00	PIPE
1065.707	3447.132	.129	3447.262	1.00	11.63	2.10	3449.36	.00	.34	.98	2.000	.000	.00	1 .0
.765	.5093					.2651	.20	.13	6.93	.11	.013	.00	.00	PIPE
1066.472	3447.522	.134	3447.656	1.00	11.09	1.91	3449.57	.00	.34	1.00	2.000	.000	.00	1 .0
.609	.5093					.2312	.14	.13	6.50	.11	.013	.00	.00	PIPE
1067.080	3447.832	.138	3447.970	1.00	10.57	1.74	3449.71	.00	.34	1.01	2.000	.000	.00	1 .0
.499	.5093					.2016	.10	.14	6.10	.11	.013	.00	.00	PIPE
1067.579	3448.086	.142	3448.228	1.00	10.08	1.58	3449.81	.00	.34	1.03	2.000	.000	.00	1 .0
.416	.5093					.1759	.07	.14	5.72	.11	.013	.00	.00	PIPE
1067.995	3448.298	.147	3448.445	1.00	9.61	1.43	3449.88	.00	.34	1.04	2.000	.000	.00	1 .0
.353	.5093					.1534	.05	.15	5.37	.11	.013	.00	.00	PIPE
1068.348	3448.478	.152	3448.629	1.00	9.17	1.30	3449.93	.00	.34	1.06	2.000	.000	.00	1 .0
.302	.5093					.1338	.04	.15	5.03	.11	.013	.00	.00	PIPE
1068.651	3448.632	.157	3448.789	1.00	8.74	1.19	3449.97	.00	.34	1.08	2.000	.000	.00	1 .0
.262	.5093					.1167	.03	.16	4.72	.11	.013	.00	.00	PIPE
1068.912	3448.765	.162	3448.927	1.00	8.33	1.08	3450.00	.00	.34	1.09	2.000	.000	.00	1 .0
.227	.5093					.1018	.02	.16	4.43	.11	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1069.140	3448.881	.167	3449.048	1.00	7.94	.98	3450.03	.00	.34	1.11	2.000	.000	.00	1 .0
.199	.5093					.0888	.02	.17	4.15	.11	.013	.00	.00	PIPE
1069.339	3448.982	.173	3449.155	1.00	7.57	.89	3450.05	.00	.34	1.12	2.000	.000	.00	1 .0
.174	.5093					.0775	.01	.17	3.90	.11	.013	.00	.00	PIPE
1069.513	3449.071	.179	3449.250	1.00	7.22	.81	3450.06	.00	.34	1.14	2.000	.000	.00	1 .0
.154	.5093					.0676	.01	.18	3.65	.11	.013	.00	.00	PIPE
1069.667	3449.149	.184	3449.333	1.00	6.89	.74	3450.07	.00	.34	1.16	2.000	.000	.00	1 .0
.135	.5093					.0589	.01	.18	3.43	.11	.013	.00	.00	PIPE
1069.802	3449.218	.191	3449.408	1.00	6.57	.67	3450.08	.00	.34	1.17	2.000	.000	.00	1 .0
.119	.5093					.0514	.01	.19	3.21	.11	.013	.00	.00	PIPE
1069.921	3449.279	.197	3449.475	1.00	6.26	.61	3450.08	.00	.34	1.19	2.000	.000	.00	1 .0
.105	.5093					.0449	.00	.20	3.01	.11	.013	.00	.00	PIPE
1070.026	3449.332	.203	3449.535	1.00	5.97	.55	3450.09	.00	.34	1.21	2.000	.000	.00	1 .0
.093	.5093					.0391	.00	.20	2.83	.11	.013	.00	.00	PIPE
1070.119	3449.379	.210	3449.589	1.00	5.69	.50	3450.09	.00	.34	1.23	2.000	.000	.00	1 .0
.082	.5093					.0342	.00	.21	2.65	.11	.013	.00	.00	PIPE
1070.200	3449.421	.217	3449.638	1.00	5.43	.46	3450.09	.00	.34	1.24	2.000	.000	.00	1 .0
.072	.5093					.0298	.00	.22	2.48	.11	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1070.272	3449.457	.224	3449.681	1.00	5.17	.42	3450.10	.00	.34	1.26	2.000	.000	.00	1 .0
.063	.5093					.0260	.00	.22	2.33	.11	.013	.00	.00	PIPE
1070.335	3449.489	.232	3449.721	1.00	4.93	.38	3450.10	.00	.34	1.28	2.000	.000	.00	1 .0
.055	.5093					.0227	.00	.23	2.18	.11	.013	.00	.00	PIPE
1070.390	3449.517	.239	3449.757	1.00	4.70	.34	3450.10	.00	.34	1.30	2.000	.000	.00	1 .0
.047	.5093					.0198	.00	.24	2.05	.11	.013	.00	.00	PIPE
1070.437	3449.542	.247	3449.789	1.00	4.48	.31	3450.10	.00	.34	1.32	2.000	.000	.00	1 .0
.041	.5093					.0173	.00	.25	1.92	.11	.013	.00	.00	PIPE
1070.478	3449.563	.255	3449.818	1.00	4.28	.28	3450.10	.00	.34	1.34	2.000	.000	.00	1 .0
.035	.5093					.0151	.00	.26	1.80	.11	.013	.00	.00	PIPE
1070.513	3449.580	.264	3449.844	1.00	4.08	.26	3450.10	.00	.34	1.35	2.000	.000	.00	1 .0
.030	.5093					.0132	.00	.26	1.69	.11	.013	.00	.00	PIPE
1070.543	3449.595	.273	3449.868	1.00	3.89	.23	3450.10	.00	.34	1.37	2.000	.000	.00	1 .0
.025	.5093					.0115	.00	.27	1.58	.11	.013	.00	.00	PIPE
1070.568	3449.608	.282	3449.890	1.00	3.71	.21	3450.10	.00	.34	1.39	2.000	.000	.00	1 .0
.020	.5093					.0100	.00	.28	1.48	.11	.013	.00	.00	PIPE
1070.588	3449.618	.291	3449.909	1.00	3.53	.19	3450.10	.00	.34	1.41	2.000	.000	.00	1 .0
.016	.5093					.0088	.00	.29	1.39	.11	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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	
1070.603	3449.626	.301	3449.927	1.00	3.37	.18	3450.10	.00	.34	1.43	2.000	.000	.00	1 .0
.012	.5093					.0076	.00	.30	1.30	.11	.013	.00	.00	PIPE
1070.615	3449.633	.311	3449.943	1.00	3.21	.16	3450.10	.00	.34	1.45	2.000	.000	.00	1 .0
.008	.5093					.0067	.00	.31	1.22	.11	.013	.00	.00	PIPE
1070.623	3449.637	.321	3449.958	1.00	3.06	.15	3450.10	.00	.34	1.47	2.000	.000	.00	1 .0
.005	.5093					.0058	.00	.32	1.14	.11	.013	.00	.00	PIPE
1070.628	3449.639	.332	3449.971	1.00	2.92	.13	3450.10	.00	.34	1.49	2.000	.000	.00	1 .0
.002	.5093					.0051	.00	.33	1.07	.11	.013	.00	.00	PIPE
1070.630	3449.640	.344	3449.984	1.00	2.77	.12	3450.10	.00	.34	1.51	2.000	.000	.00	1 .0
1073.630	3449.640	.344	3449.984	1.00	2.77	.12	3450.10	.00	.34	1.51	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-4  100 YEAR ULTIMATE CONDITION
SO   1041.71 3436.34  48                          3441.96
R    1044.71 3436.44  24      .013                              .000    00.0 0
R    1049.79 3440.48  24      .013                              .000    00.0 0
SH   1052.79 3440.48  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            1.000   .0
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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-4 100 YEAR ULTIMATE CONDITION

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
1041.710	3436.340	5.620	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
3.000	.0333					.0000	.00	5.62	.00	.21	.013	.00	.00	PIPE
1044.710	3436.440	5.520	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
4.426	.7953					.0000	.00	5.52	.00	.10	.013	.00	.00	PIPE
1049.136	3439.960	2.000	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
.232	.7953					.0000	.00	2.00	.00	.10	.013	.00	.00	PIPE
1049.368	3440.145	1.815	3441.959	1.00	.33	.00	3441.96	.00	.34	1.16	2.000	.000	.00	1 .0
.135	.7953					.0000	.00	1.81	.04	.10	.013	.00	.00	PIPE
1049.503	3440.252	1.707	3441.959	1.00	.35	.00	3441.96	.00	.34	1.41	2.000	.000	.00	1 .0
.111	.7953					.0000	.00	1.71	.04	.10	.013	.00	.00	PIPE
1049.615	3440.341	1.618	3441.959	1.00	.37	.00	3441.96	.00	.34	1.57	2.000	.000	.00	1 .0
.098	.7953					.0000	.00	1.62	.05	.10	.013	.00	.00	PIPE
1049.712	3440.418	1.540	3441.958	1.00	.39	.00	3441.96	.00	.34	1.68	2.000	.000	.00	1 .0
.078	.7953					.0000	.00	1.54	.05	.10	.013	.00	.00	PIPE
1049.790	3440.480	1.478	3441.958	1.00	.40	.00	3441.96	.00	.34	1.76	2.000	.000	.00	1 .0
3.000	.7953					.2446	1.24	1.48	.06	.10	.013	.00	.00	PIPE
1052.790	3440.480	1.478	3441.958	1.00	.40	.00	3441.96	.00	.34	1.76	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION
SO   1452.50 3441.05  48                          3448.51
R    1455.50 3441.15  24      .013                              .000    00.0 0
R    1475.94 3452.10  24      .013                              .000    00.0 0
SH   1478.94 3452.10  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            2.000   .0
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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1452.500	3441.050	7.460	3448.510	2.00	.64	.01	3448.52	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0333					.0001	.00	7.46	.00	.30	.013	.00	.00	PIPE
1455.500	3441.150	7.360	3448.510	2.00	.64	.01	3448.52	.00	.49	.00	2.000	.000	.00	1 .0
10.007	.5357					.0001	.00	7.36	.00	.15	.013	.00	.00	PIPE
1465.507	3446.511	2.000	3448.511	2.00	.64	.01	3448.52	.00	.49	.00	2.000	.000	.00	1 .0
.343	.5357					.0001	.00	2.00	.00	.15	.013	.00	.00	PIPE
1465.850	3446.695	1.815	3448.510	2.00	.67	.01	3448.52	.00	.49	1.16	2.000	.000	.00	1 .0
.200	.5357					.0001	.00	1.81	.07	.15	.013	.00	.00	PIPE
1466.050	3446.802	1.707	3448.509	2.00	.70	.01	3448.52	.00	.49	1.41	2.000	.000	.00	1 .0
.164	.5357					.0001	.00	1.71	.09	.15	.013	.00	.00	PIPE
1466.214	3446.890	1.618	3448.508	2.00	.73	.01	3448.52	.00	.49	1.57	2.000	.000	.00	1 .0
.144	.5357					.0001	.00	1.62	.10	.15	.013	.00	.00	PIPE
1466.358	3446.967	1.540	3448.507	2.00	.77	.01	3448.52	.00	.49	1.68	2.000	.000	.00	1 .0
.129	.5357					.0001	.00	1.54	.11	.15	.013	.00	.00	PIPE
1466.487	3447.036	1.470	3448.506	2.00	.81	.01	3448.52	.00	.49	1.77	2.000	.000	.00	1 .0
.118	.5357					.0001	.00	1.47	.12	.15	.013	.00	.00	PIPE
1466.605	3447.099	1.406	3448.505	2.00	.85	.01	3448.52	.00	.49	1.83	2.000	.000	.00	1 .0
.109	.5357					.0001	.00	1.41	.13	.15	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34:37

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1466.713	3447.157	1.347	3448.504	2.00	.89	.01	3448.52	.00	.49	1.88	2.000	.000	.00	1 .0
.101	.5357					.0001	.00	1.35	.14	.15	.013	.00	.00	PIPE
1466.814	3447.211	1.292	3448.503	2.00	.93	.01	3448.52	.00	.49	1.91	2.000	.000	.00	1 .0
.094	.5357					.0001	.00	1.29	.16	.15	.013	.00	.00	PIPE
1466.909	3447.262	1.240	3448.501	2.00	.98	.01	3448.52	.00	.49	1.94	2.000	.000	.00	1 .0
.088	.5357					.0002	.00	1.24	.17	.15	.013	.00	.00	PIPE
1466.997	3447.309	1.191	3448.500	2.00	1.03	.02	3448.52	.00	.49	1.96	2.000	.000	.00	1 .0
.083	.5357					.0002	.00	1.19	.18	.15	.013	.00	.00	PIPE
1467.080	3447.354	1.145	3448.499	2.00	1.08	.02	3448.52	.00	.49	1.98	2.000	.000	.00	1 .0
.027	.5357					.0002	.00	1.15	.20	.15	.013	.00	.00	PIPE
1467.107	3447.368	1.101	3448.469	2.00	1.13	.02	3448.49	.00	.49	1.99	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1467.107	3447.368	.171	3447.539	2.00	15.41	3.69	3451.23	.00	.49	1.12	2.000	.000	.00	1 .0
1.194	.5357					.3255	.39	.17	7.97	.15	.013	.00	.00	PIPE
1468.301	3448.007	.177	3448.184	2.00	14.70	3.35	3451.54	.00	.49	1.13	2.000	.000	.00	1 .0
1.188	.5357					.2839	.34	.18	7.48	.15	.013	.00	.00	PIPE
1469.489	3448.644	.182	3448.826	2.00	14.01	3.05	3451.87	.00	.49	1.15	2.000	.000	.00	1 .0
.941	.5357					.2476	.23	.18	7.01	.15	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34:37

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1470.430	3449.148	.188	3449.336	2.00	13.36	2.77	3452.11	.00	.49	1.17	2.000	.000	.00	1 .0
.769	.5357					.2160	.17	.19	6.58	.15	.013	.00	.00	PIPE
1471.199	3449.560	.195	3449.754	2.00	12.74	2.52	3452.27	.00	.49	1.19	2.000	.000	.00	1 .0
.641	.5357					.1885	.12	.19	6.17	.15	.013	.00	.00	PIPE
1471.840	3449.903	.201	3450.104	2.00	12.15	2.29	3452.39	.00	.49	1.20	2.000	.000	.00	1 .0
.543	.5357					.1645	.09	.20	5.78	.15	.013	.00	.00	PIPE
1472.382	3450.194	.208	3450.401	2.00	11.58	2.08	3452.48	.00	.49	1.22	2.000	.000	.00	1 .0
.465	.5357					.1435	.07	.21	5.42	.15	.013	.00	.00	PIPE
1472.848	3450.443	.214	3450.657	2.00	11.04	1.89	3452.55	.00	.49	1.24	2.000	.000	.00	1 .0
.402	.5357					.1252	.05	.21	5.09	.15	.013	.00	.00	PIPE
1473.250	3450.658	.222	3450.880	2.00	10.53	1.72	3452.60	.00	.49	1.26	2.000	.000	.00	1 .0
.350	.5357					.1092	.04	.22	4.77	.15	.013	.00	.00	PIPE
1473.599	3450.846	.229	3451.074	2.00	10.04	1.56	3452.64	.00	.49	1.27	2.000	.000	.00	1 .0
.306	.5357					.0953	.03	.23	4.47	.15	.013	.00	.00	PIPE
1473.905	3451.010	.236	3451.246	2.00	9.57	1.42	3452.67	.00	.49	1.29	2.000	.000	.00	1 .0
.268	.5357					.0832	.02	.24	4.19	.15	.013	.00	.00	PIPE
1474.173	3451.153	.244	3451.398	2.00	9.12	1.29	3452.69	.00	.49	1.31	2.000	.000	.00	1 .0
.236	.5357					.0726	.02	.24	3.93	.15	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34:37

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1474.409	3451.280	.252	3451.532	2.00	8.70	1.18	3452.71	.00	.49	1.33	2.000	.000	.00	1 .0
.208	.5357					.0634	.01	.25	3.69	.15	.013	.00	.00	PIPE
1474.618	3451.392	.261	3451.652	2.00	8.30	1.07	3452.72	.00	.49	1.35	2.000	.000	.00	1 .0
.184	.5357					.0553	.01	.26	3.46	.15	.013	.00	.00	PIPE
1474.802	3451.490	.269	3451.760	2.00	7.91	.97	3452.73	.00	.49	1.37	2.000	.000	.00	1 .0
.163	.5357					.0483	.01	.27	3.24	.15	.013	.00	.00	PIPE
1474.965	3451.577	.278	3451.856	2.00	7.54	.88	3452.74	.00	.49	1.38	2.000	.000	.00	1 .0
.144	.5357					.0422	.01	.28	3.04	.15	.013	.00	.00	PIPE
1475.109	3451.655	.288	3451.942	2.00	7.19	.80	3452.75	.00	.49	1.40	2.000	.000	.00	1 .0
.127	.5357					.0368	.00	.29	2.85	.15	.013	.00	.00	PIPE
1475.236	3451.723	.297	3452.020	2.00	6.86	.73	3452.75	.00	.49	1.42	2.000	.000	.00	1 .0
.112	.5357					.0321	.00	.30	2.67	.15	.013	.00	.00	PIPE
1475.348	3451.783	.307	3452.090	2.00	6.54	.66	3452.75	.00	.49	1.44	2.000	.000	.00	1 .0
.099	.5357					.0281	.00	.31	2.50	.15	.013	.00	.00	PIPE
1475.446	3451.835	.318	3452.153	2.00	6.23	.60	3452.76	.00	.49	1.46	2.000	.000	.00	1 .0
.086	.5357					.0245	.00	.32	2.34	.15	.013	.00	.00	PIPE
1475.533	3451.882	.328	3452.210	2.00	5.94	.55	3452.76	.00	.49	1.48	2.000	.000	.00	1 .0
.076	.5357					.0214	.00	.33	2.20	.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34:37

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1475.608	3451.922	.339	3452.261	2.00	5.67	.50	3452.76	.00	.49	1.50	2.000	.000	.00	1 .0
.066	.5357					.0187	.00	.34	2.06	.15	.013	.00	.00	PIPE
1475.674	3451.957	.351	3452.308	2.00	5.40	.45	3452.76	.00	.49	1.52	2.000	.000	.00	1 .0
.057	.5357					.0163	.00	.35	1.93	.15	.013	.00	.00	PIPE
1475.730	3451.988	.362	3452.350	2.00	5.15	.41	3452.76	.00	.49	1.54	2.000	.000	.00	1 .0
.048	.5357					.0143	.00	.36	1.81	.15	.013	.00	.00	PIPE
1475.779	3452.013	.375	3452.388	2.00	4.91	.37	3452.76	.00	.49	1.56	2.000	.000	.00	1 .0
.041	.5357					.0125	.00	.37	1.69	.15	.013	.00	.00	PIPE
1475.820	3452.035	.387	3452.423	2.00	4.68	.34	3452.76	.00	.49	1.58	2.000	.000	.00	1 .0
.034	.5357					.0109	.00	.39	1.59	.15	.013	.00	.00	PIPE
1475.854	3452.054	.400	3452.454	2.00	4.46	.31	3452.76	.00	.49	1.60	2.000	.000	.00	1 .0
.028	.5357					.0095	.00	.40	1.49	.15	.013	.00	.00	PIPE
1475.881	3452.069	.414	3452.483	2.00	4.26	.28	3452.76	.00	.49	1.62	2.000	.000	.00	1 .0
.022	.5357					.0083	.00	.41	1.39	.15	.013	.00	.00	PIPE
1475.903	3452.080	.428	3452.508	2.00	4.06	.26	3452.76	.00	.49	1.64	2.000	.000	.00	1 .0
.016	.5357					.0073	.00	.43	1.31	.15	.013	.00	.00	PIPE
1475.920	3452.089	.443	3452.532	2.00	3.87	.23	3452.76	.00	.49	1.66	2.000	.000	.00	1 .0
.011	.5357					.0063	.00	.44	1.22	.15	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34:37

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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	
1475.931	3452.095	.458	3452.553	2.00	3.69	.21	3452.76	.00	.49	1.68	2.000	.000	.00	1 .0
.007	.5357					.0055	.00	.46	1.14	.15	.013	.00	.00	PIPE
1475.938	3452.099	.473	3452.572	2.00	3.52	.19	3452.76	.00	.49	1.70	2.000	.000	.00	1 .0
.002	.5357					.0048	.00	.47	1.07	.15	.013	.00	.00	PIPE
1475.940	3452.100	.491	3452.591	2.00	3.34	.17	3452.76	.00	.49	1.72	2.000	.000	.00	1 .0
1478.940	3452.100	.491	3452.591	2.00	3.34	.17	3452.76	.00	.49	1.72	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION
SO   1452.50 3441.05  48                          3448.51
R    1455.50 3441.15  24      .013                              .000    00.0 0
R    1466.06 3447.10  24      .013                              .000    00.0 0
SH   1469.06 3447.10  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            2.000   .0
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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:34:48

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION

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
1452.500	3441.050	7.460	3448.510	2.00	.64	.01	3448.52	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0333					.0001	.00	7.46	.00	.30	.013	.00	.00	PIPE
1455.500	3441.150	7.360	3448.510	2.00	.64	.01	3448.52	.00	.49	.00	2.000	.000	.00	1 .0
9.515	.5635					.0001	.00	7.36	.00	.15	.013	.00	.00	PIPE
1465.015	3446.511	2.000	3448.511	2.00	.64	.01	3448.52	.00	.49	.00	2.000	.000	.00	1 .0
.326	.5635					.0001	.00	2.00	.00	.15	.013	.00	.00	PIPE
1465.341	3446.695	1.815	3448.510	2.00	.67	.01	3448.52	.00	.49	1.16	2.000	.000	.00	1 .0
.190	.5635					.0001	.00	1.81	.07	.15	.013	.00	.00	PIPE
1465.531	3446.802	1.707	3448.509	2.00	.70	.01	3448.52	.00	.49	1.41	2.000	.000	.00	1 .0
.156	.5635					.0001	.00	1.71	.09	.15	.013	.00	.00	PIPE
1465.687	3446.890	1.618	3448.508	2.00	.73	.01	3448.52	.00	.49	1.57	2.000	.000	.00	1 .0
.137	.5635					.0001	.00	1.62	.10	.15	.013	.00	.00	PIPE
1465.823	3446.967	1.540	3448.507	2.00	.77	.01	3448.52	.00	.49	1.68	2.000	.000	.00	1 .0
.123	.5635					.0001	.00	1.54	.11	.15	.013	.00	.00	PIPE
1465.946	3447.036	1.470	3448.506	2.00	.81	.01	3448.52	.00	.49	1.77	2.000	.000	.00	1 .0
.112	.5635					.0001	.00	1.47	.12	.15	.013	.00	.00	PIPE
1466.058	3447.099	1.406	3448.505	2.00	.85	.01	3448.52	.00	.49	1.83	2.000	.000	.00	1 .0
1466.060	3447.100	1.405	3448.505	2.00	.85	.01	3448.52	.00	.49	1.83	2.000	.000	.00	1 .0
3.000	.5635					.2016	2.13	1.41	.13	.15	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION

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	
1469.060	3447.100	1.405	3448.505	2.00	.85	.01	3448.52	.00	.49	1.83	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-7 100 YEAR ULTIMATE CONDITION
SO   1870.39 3445.83  42                          3456.64
R    1873.39 3445.93  24      .013                                .000    00.0 0
R    1899.31 3449.52  24      .013                                .000    00.0 0
SH   1902.31 3449.52  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             3.000   .0
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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-7 100 YEAR ULTIMATE CONDITION

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	
1870.390	3445.830	10.810	3456.640	3.00	.95	.01	3456.65	.00	.60	.00	2.000	.000	.00	1 .0
3.000	.0333					.0002	.00	10.81	.00	.36	.013	.00	.00	PIPE
1873.390	3445.930	10.710	3456.640	3.00	.95	.01	3456.65	.00	.60	.00	2.000	.000	.00	1 .0
25.920	.1385					.0002	.00	10.71	.00	.26	.013	.00	.00	PIPE
1899.310	3449.520	7.125	3456.645	3.00	.95	.01	3456.66	.00	.60	.00	2.000	.000	.00	1 .0
3.000	.1385					.0589	1.53	7.12	.00	.26	.013	.00	.00	PIPE
1902.310	3449.520	7.125	3456.645	3.00	.95	.01	3456.66	.00	.60	.00	2.000	.000	.00	1 .0

```
T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-8 100 YEAR ULTIMATE CONDITION
SO   1870.39 3445.83  42                          3456.64
R    1873.39 3445.93  24      .013                                .000    00.0 0
R    1878.47 3446.33  24      .013                                .000    00.0 0
SH   1881.47 3446.33  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            2.000   .0
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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-8 100 YEAR ULTIMATE CONDITION

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	Type Ch
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall				
1870.390	3445.830	10.810	3456.640	2.00	.64	.01	3456.65	.00	.49	.00	2.000	.000	.00	1	.0	
3.000	.0333					.0001	.00	10.81	.00	.30	.013	.00	.00			PIPE
1873.390	3445.930	10.710	3456.640	2.00	.64	.01	3456.65	.00	.49	.00	2.000	.000	.00	1	.0	
5.080	.0788					.0001	.00	10.71	.00	.24	.013	.00	.00			PIPE
1878.470	3446.330	10.310	3456.641	2.00	.64	.01	3456.65	.00	.49	.00	2.000	.000	.00	1	.0	
3.000	.0788					.0149	.08	10.31	.00	.24	.013	.00	.00			PIPE
1881.470	3446.330	10.310	3456.641	2.00	.64	.01	3456.65	.00	.49	.00	2.000	.000	.00	1	.0	

```
T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION
SO     991.65 3435.64  54                          3441.52
R      994.65 3435.74  24      .013                              .000    00.0 0
R     1074.57 3449.03  24      .013                              .000    00.0 0
SH    1077.57 3449.03  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            33.000   .0
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Program Package Serial Number: 7271

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION

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
991.650	3435.640	5.880	3441.520	33.00	10.50	1.71	3443.23	.00	1.90	.00	2.000	.000	.00	1 .0
3.000	.0334					.0213	.06	5.88	.00	1.35	.013	.00	.00	PIPE
994.650	3435.740	5.844	3441.584	33.00	10.50	1.71	3443.30	.00	1.90	.00	2.000	.000	.00	1 .0
.764	.1663					.0213	.02	5.84	.00	.83	.013	.00	.00	PIPE
995.414	3435.867	5.733	3441.600	33.00	10.50	1.71	3443.31	.00	1.90	.00	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
995.414	3435.867	.886	3436.753	33.00	24.56	9.37	3446.12	.00	1.90	1.99	2.000	.000	.00	1 .0
8.528	.1663					.1261	1.08	.89	5.26	.83	.013	.00	.00	PIPE
1003.942	3437.285	.900	3438.185	33.00	24.07	8.99	3447.18	.00	1.90	1.99	2.000	.000	.00	1 .0
15.349	.1663					.1152	1.77	.90	5.11	.83	.013	.00	.00	PIPE
1019.291	3439.838	.934	3440.771	33.00	22.95	8.18	3448.95	.00	1.90	2.00	2.000	.000	.00	1 .0
10.902	.1663					.1013	1.10	.93	4.76	.83	.013	.00	.00	PIPE
1030.193	3441.651	.969	3442.619	33.00	21.88	7.43	3450.05	.00	1.90	2.00	2.000	.000	.00	1 .0
8.286	.1663					.0892	.74	.97	4.44	.83	.013	.00	.00	PIPE
1038.479	3443.029	1.006	3444.034	33.00	20.86	6.76	3450.79	.00	1.90	2.00	2.000	.000	.00	1 .0
6.560	.1663					.0786	.52	1.01	4.13	.83	.013	.00	.00	PIPE
1045.039	3444.119	1.044	3445.164	33.00	19.89	6.14	3451.31	.00	1.90	2.00	2.000	.000	.00	1 .0
5.337	.1663					.0692	.37	1.04	3.85	.83	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION

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
1050.375	3445.007	1.085	3446.092	33.00	18.96	5.58	3451.68	.00	1.90	1.99	2.000	.000	.00	1 .0
4.419	.1663					.0611	.27	1.08	3.58	.83	.013	.00	.00	PIPE
1054.794	3445.742	1.128	3446.869	33.00	18.08	5.08	3451.95	.00	1.90	1.98	2.000	.000	.00	1 .0
3.708	.1663					.0540	.20	1.13	3.32	.83	.013	.00	.00	PIPE
1058.502	3446.358	1.173	3447.531	33.00	17.24	4.61	3452.15	.00	1.90	1.97	2.000	.000	.00	1 .0
3.136	.1663					.0477	.15	1.17	3.08	.83	.013	.00	.00	PIPE
1061.638	3446.880	1.220	3448.100	33.00	16.44	4.20	3452.30	.00	1.90	1.95	2.000	.000	.00	1 .0
2.668	.1663					.0423	.11	1.22	2.86	.83	.013	.00	.00	PIPE
1064.306	3447.323	1.271	3448.594	33.00	15.67	3.81	3452.41	.00	1.90	1.93	2.000	.000	.00	1 .0
2.274	.1663					.0375	.09	1.27	2.64	.83	.013	.00	.00	PIPE
1066.580	3447.701	1.325	3449.026	33.00	14.94	3.47	3452.49	.00	1.90	1.89	2.000	.000	.00	1 .0
1.937	.1663					.0333	.06	1.32	2.44	.83	.013	.00	.00	PIPE
1068.517	3448.023	1.382	3449.406	33.00	14.25	3.15	3452.56	.00	1.90	1.85	2.000	.000	.00	1 .0
1.643	.1663					.0297	.05	1.38	2.24	.83	.013	.00	.00	PIPE
1070.160	3448.297	1.444	3449.741	33.00	13.58	2.87	3452.61	.00	1.90	1.79	2.000	.000	.00	1 .0
1.381	.1663					.0266	.04	1.44	2.06	.83	.013	.00	.00	PIPE
1071.542	3448.526	1.512	3450.038	33.00	12.95	2.61	3452.64	.00	1.90	1.72	2.000	.000	.00	1 .0
1.141	.1663					.0239	.03	1.51	1.87	.83	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION

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	
1072.682	3448.716	1.586	3450.302	33.00	12.35	2.37	3452.67	.00	1.90	1.62	2.000	.000	.00	1 .0
.908	.1663					.0216	.02	1.59	1.69	.83	.013	.00	.00	PIPE
1073.591	3448.867	1.670	3450.537	33.00	11.77	2.15	3452.69	.00	1.90	1.48	2.000	.000	.00	1 .0
.663	.1663					.0198	.01	1.67	1.51	.83	.013	.00	.00	PIPE
1074.254	3448.978	1.769	3450.746	33.00	11.23	1.96	3452.70	.00	1.90	1.28	2.000	.000	.00	1 .0
.316	.1663					.0187	.01	1.77	1.31	.83	.013	.00	.00	PIPE
1074.570	3449.030	1.901	3450.931	33.00	10.70	1.78	3452.71	.00	1.90	.87	2.000	.000	.00	1 .0
1077.570	3449.030	1.901	3450.931	33.00	10.70	1.78	3452.71	.00	1.90	.87	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION
SO   1115.63 3437.28  48                          3443.40
R    1118.63 3437.38  24      .013                                .000    00.0 0
R    1198.55 3451.50  24      .013                                .000    00.0 0
SH   1201.55 3451.50  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             4.000   .0
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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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
1115.630	3437.280	6.120	3443.400	4.00	1.27	.03	3443.43	.00	.70	.00	2.000	.000	.00	1 .0
3.000	.0333					.0003	.00	6.12	.00	.42	.013	.00	.00	PIPE
1118.630	3437.380	6.021	3443.401	4.00	1.27	.03	3443.43	.00	.70	.00	2.000	.000	.00	1 .0
22.799	.1767					.0003	.01	6.02	.00	.28	.013	.00	.00	PIPE
1141.429	3441.408	2.000	3443.408	4.00	1.27	.03	3443.43	.00	.70	.00	2.000	.000	.00	1 .0
1.031	.1767					.0003	.00	2.00	.00	.28	.013	.00	.00	PIPE
1142.460	3441.590	1.815	3443.405	4.00	1.34	.03	3443.43	.00	.70	1.16	2.000	.000	.00	1 .0
.595	.1767					.0003	.00	1.81	.15	.28	.013	.00	.00	PIPE
1143.055	3441.695	1.707	3443.402	4.00	1.40	.03	3443.43	.00	.70	1.41	2.000	.000	.00	1 .0
.486	.1767					.0003	.00	1.71	.17	.28	.013	.00	.00	PIPE
1143.541	3441.781	1.618	3443.399	4.00	1.47	.03	3443.43	.00	.70	1.57	2.000	.000	.00	1 .0
.422	.1767					.0003	.00	1.62	.20	.28	.013	.00	.00	PIPE
1143.964	3441.856	1.540	3443.396	4.00	1.54	.04	3443.43	.00	.70	1.68	2.000	.000	.00	1 .0
.262	.1767					.0004	.00	1.54	.22	.28	.013	.00	.00	PIPE
1144.225	3441.902	1.492	3443.394	4.00	1.59	.04	3443.43	.00	.70	1.74	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1144.225	3441.902	.280	3442.182	4.00	14.98	3.49	3445.67	.00	.70	1.39	2.000	.000	.00	1 .0
9.117	.1767					.1731	1.58	.28	6.02	.28	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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	
1153.342	3443.513	.283	3443.795	4.00	14.77	3.39	3447.18	.00	.70	1.39	2.000	.000	.00	1 .0
16.694	.1767					.1588	2.65	.28	5.90	.28	.013	.00	.00	PIPE
1170.036	3446.462	.292	3446.754	4.00	14.08	3.08	3449.83	.00	.70	1.41	2.000	.000	.00	1 .0
7.101	.1767					.1386	.98	.29	5.53	.28	.013	.00	.00	PIPE
1177.137	3447.717	.302	3448.019	4.00	13.43	2.80	3450.82	.00	.70	1.43	2.000	.000	.00	1 .0
4.394	.1767					.1210	.53	.30	5.19	.28	.013	.00	.00	PIPE
1181.531	3448.493	.312	3448.805	4.00	12.80	2.54	3451.35	.00	.70	1.45	2.000	.000	.00	1 .0
3.111	.1767					.1057	.33	.31	4.86	.28	.013	.00	.00	PIPE
1184.641	3449.043	.322	3449.365	4.00	12.21	2.31	3451.68	.00	.70	1.47	2.000	.000	.00	1 .0
2.364	.1767					.0923	.22	.32	4.56	.28	.013	.00	.00	PIPE
1187.005	3449.460	.333	3449.793	4.00	11.64	2.10	3451.90	.00	.70	1.49	2.000	.000	.00	1 .0
1.873	.1767					.0806	.15	.33	4.27	.28	.013	.00	.00	PIPE
1188.879	3449.792	.344	3450.136	4.00	11.10	1.91	3452.05	.00	.70	1.51	2.000	.000	.00	1 .0
1.526	.1767					.0704	.11	.34	4.00	.28	.013	.00	.00	PIPE
1190.405	3450.061	.356	3450.417	4.00	10.58	1.74	3452.15	.00	.70	1.53	2.000	.000	.00	1 .0
1.268	.1767					.0615	.08	.36	3.75	.28	.013	.00	.00	PIPE
1191.673	3450.285	.368	3450.653	4.00	10.09	1.58	3452.23	.00	.70	1.55	2.000	.000	.00	1 .0
1.067	.1767					.0537	.06	.37	3.51	.28	.013	.00	.00	PIPE

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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	
1192.740	3450.474	.380	3450.854	4.00	9.62	1.44	3452.29	.00	.70	1.57	2.000	.000	.00	1 .0
.907	.1767					.0469	.04	.38	3.29	.28	.013	.00	.00	PIPE
1193.647	3450.634	.393	3451.027	4.00	9.17	1.31	3452.33	.00	.70	1.59	2.000	.000	.00	1 .0
.777	.1767					.0410	.03	.39	3.08	.28	.013	.00	.00	PIPE
1194.424	3450.771	.406	3451.177	4.00	8.74	1.19	3452.36	.00	.70	1.61	2.000	.000	.00	1 .0
.668	.1767					.0358	.02	.41	2.89	.28	.013	.00	.00	PIPE
1195.092	3450.889	.420	3451.309	4.00	8.34	1.08	3452.39	.00	.70	1.63	2.000	.000	.00	1 .0
.577	.1767					.0313	.02	.42	2.71	.28	.013	.00	.00	PIPE
1195.669	3450.991	.434	3451.425	4.00	7.95	.98	3452.41	.00	.70	1.65	2.000	.000	.00	1 .0
.498	.1767					.0274	.01	.43	2.54	.28	.013	.00	.00	PIPE
1196.167	3451.079	.449	3451.528	4.00	7.58	.89	3452.42	.00	.70	1.67	2.000	.000	.00	1 .0
.431	.1767					.0239	.01	.45	2.38	.28	.013	.00	.00	PIPE
1196.598	3451.155	.465	3451.620	4.00	7.23	.81	3452.43	.00	.70	1.69	2.000	.000	.00	1 .0
.371	.1767					.0209	.01	.46	2.22	.28	.013	.00	.00	PIPE
1196.969	3451.221	.480	3451.701	4.00	6.89	.74	3452.44	.00	.70	1.71	2.000	.000	.00	1 .0
.319	.1767					.0183	.01	.48	2.08	.28	.013	.00	.00	PIPE
1197.287	3451.277	.497	3451.774	4.00	6.57	.67	3452.44	.00	.70	1.73	2.000	.000	.00	1 .0
.273	.1767					.0160	.00	.50	1.95	.28	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_10.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:35:43

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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
1197.560	3451.325	.514	3451.839	4.00	6.26	.61	3452.45	.00	.70	1.75	2.000	.000	.00	1 .0
.232	.1767					.0140	.00	.51	1.83	.28	.013	.00	.00	PIPE
1197.792	3451.366	.532	3451.898	4.00	5.97	.55	3452.45	.00	.70	1.77	2.000	.000	.00	1 .0
.194	.1767					.0122	.00	.53	1.71	.28	.013	.00	.00	PIPE
1197.986	3451.401	.550	3451.951	4.00	5.69	.50	3452.45	.00	.70	1.79	2.000	.000	.00	1 .0
.161	.1767					.0107	.00	.55	1.60	.28	.013	.00	.00	PIPE
1198.147	3451.429	.569	3451.998	4.00	5.43	.46	3452.46	.00	.70	1.80	2.000	.000	.00	1 .0
.130	.1767					.0094	.00	.57	1.50	.28	.013	.00	.00	PIPE
1198.276	3451.452	.589	3452.041	4.00	5.18	.42	3452.46	.00	.70	1.82	2.000	.000	.00	1 .0
.103	.1767					.0082	.00	.59	1.40	.28	.013	.00	.00	PIPE
1198.379	3451.470	.610	3452.080	4.00	4.94	.38	3452.46	.00	.70	1.84	2.000	.000	.00	1 .0
.077	.1767					.0072	.00	.61	1.31	.28	.013	.00	.00	PIPE
1198.456	3451.484	.631	3452.115	4.00	4.71	.34	3452.46	.00	.70	1.86	2.000	.000	.00	1 .0
.053	.1767					.0063	.00	.63	1.23	.28	.013	.00	.00	PIPE
1198.509	3451.493	.653	3452.146	4.00	4.49	.31	3452.46	.00	.70	1.88	2.000	.000	.00	1 .0
.031	.1767					.0055	.00	.65	1.15	.28	.013	.00	.00	PIPE
1198.540	3451.498	.676	3452.175	4.00	4.28	.28	3452.46	.00	.70	1.89	2.000	.000	.00	1 .0
.010	.1767					.0048	.00	.68	1.07	.28	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_10.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 5

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:35:43

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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	
1198.550	3451.500	.701	3452.201	4.00	4.07	.26	3452.46	.00	.70	1.91	2.000	.000	.00	1 .0
1201.550	3451.500	.701	3452.201	4.00	4.07	.26	3452.46	.00	.70	1.91	2.000	.000	.00	1 .0

```
T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS - 100 YEAR ULTIMATE CONDITION
SO   1778.88 3444.71  48                        3455.33
R    1781.88 3444.81  30      .013                              .000    00.0 0
R    1865.66 3447.97  30      .013                              .000    00.0 0
SH   1868.66 3447.97  30
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q           42.000   .0
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FILE: KR_Lateral-SDDI_11.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date: 6-16-2020 Time: 1:36: 2

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - 100 YEAR ULTIMATE CONDITION

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
1778.880	3444.710	10.620	3455.330	42.00	8.56	1.14	3456.47	.00	2.17	.00	2.500	.000	.00	1	.0
3.000	.0334					.0105	.03	10.62	.00	1.34	.013	.00	.00	PIPE	
1781.880	3444.810	10.551	3455.362	42.00	8.56	1.14	3456.50	.00	2.17	.00	2.500	.000	.00	1	.0
83.780	.0377					.0105	.88	10.55	.00	1.29	.013	.00	.00	PIPE	
1865.660	3447.970	8.270	3456.240	42.00	8.56	1.14	3457.38	.00	2.17	.00	2.500	.000	.00	1	.0
3.000	.0377					.0198	1.66	8.27	.00	1.29	.013	.00	.00	PIPE	
1868.660	3447.970	8.270	3456.240	42.00	8.56	1.14	3457.38	.00	2.17	.00	2.500	.000	.00	1	.0

C.4 Riprap Calculations

KettleRidge-South Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.020
Channel Slope	0.018 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	7.00 cfs

Results	
Normal Depth	0.70 ft
Flow Area	1.5 ft²
Wetted Perimeter	4.4 ft
Hydraulic Radius	0.33 ft
Top Width	4.19 ft
Critical Depth	0.81 ft
Critical Slope	0.008 ft/ft
Velocity	4.78 ft/s
Velocity Head	0.35 ft
Specific Energy	1.05 ft
Froude Number	1.424
Flow Type	Supercritical

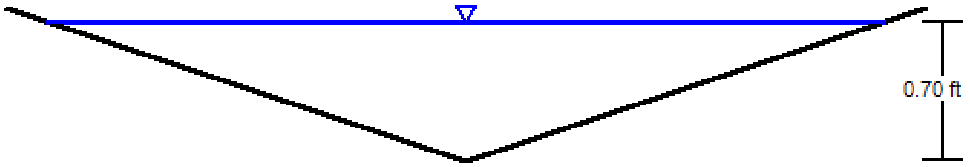
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

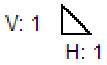
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.70 ft
Critical Depth	0.81 ft
Channel Slope	0.018 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for KettleRidge-South Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.020
Channel Slope	0.018 ft/ft
Normal Depth	0.70 ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	7.00 cfs





KettleRidge-North Flight Edge to Flight Range Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	23.00 cfs

Results	
Normal Depth	1.30 ft
Flow Area	5.1 ft²
Wetted Perimeter	8.2 ft
Hydraulic Radius	0.62 ft
Top Width	7.82 ft
Critical Depth	1.30 ft
Critical Slope	0.007 ft/ft
Velocity	4.51 ft/s
Velocity Head	0.32 ft
Specific Energy	1.62 ft
Froude Number	0.985
Flow Type	Subcritical

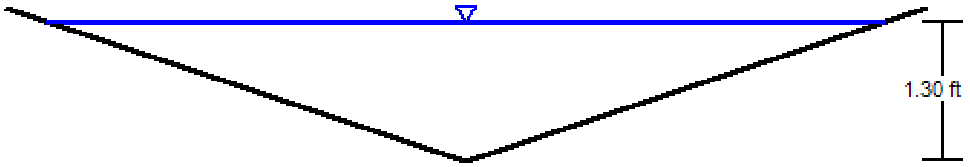
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

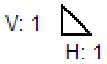
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.30 ft
Critical Depth	1.30 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for KettleRidge-North Flight Edge to Flight Range Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Normal Depth	1.30 ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	23.00 cfs





KettleRidge-North Flight Range to Kindle Rise Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.040
Channel Slope	0.068 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	58.00 cfs

Results	
Normal Depth	1.56 ft
Flow Area	7.3 ft²
Wetted Perimeter	9.9 ft
Hydraulic Radius	0.74 ft
Top Width	9.37 ft
Critical Depth	1.88 ft
Critical Slope	0.026 ft/ft
Velocity	7.93 ft/s
Velocity Head	0.98 ft
Specific Energy	2.54 ft
Froude Number	1.582
Flow Type	Supercritical

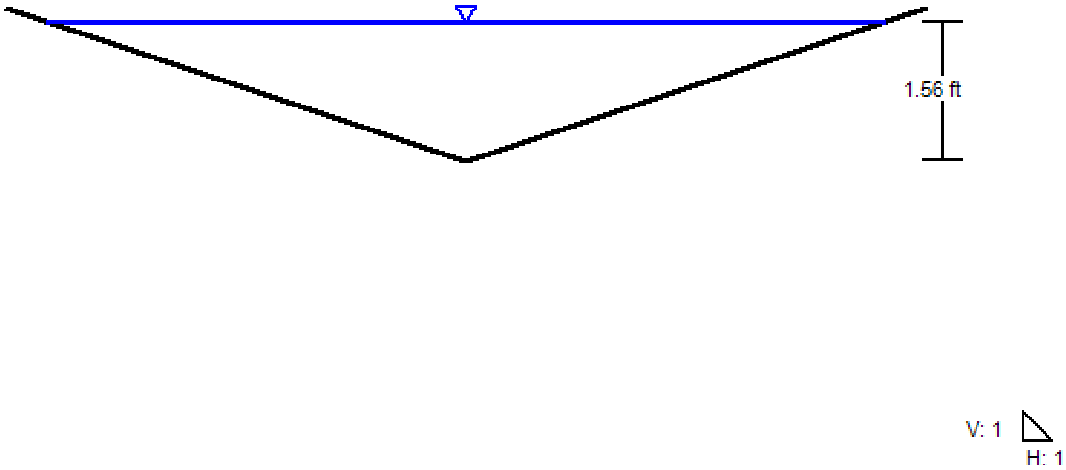
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	1.56 ft
Critical Depth	1.88 ft
Channel Slope	0.068 ft/ft
Critical Slope	0.026 ft/ft

Cross Section for KettleRidge-North Flight Range to Kindle Rise Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.040
Channel Slope	0.068 ft/ft
Normal Depth	1.56 ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	58.00 cfs



HEC-11 RIPRAP SIZING CALCULATIONS

Location: Summerlin West Village 22 Kettle Ridge: Flight Range to Kindle Rise Interim Triangular Roadside Swale
Conditions: Q=58 cfs

Equations:

$K_1 = [1-(\sin^2\theta/\sin^2\Phi)]^{0.5}$ (eq. 7, pg. 30)

d_{avg}= Flow Area/ Top Width

$n=0.39S_f^{0.38} R^{-0.16}$ (eq. 4, pg. 23)

(slopes > 0.002 ft/ft and D50 > 0.2 ft)

Bank & Bed $D_{50} = 0.001V_a^3/(d_{avg}^{0.5}K_1^{1.5})$ (eq. 6, pg. 30)

$C_{sg} = 2.12/(S_g-1)^{1.5}$ (eq. 8, pg. 31)

$C_{sf} = (SF/1.2)^{1.5}$ (eq. 9, pg. 31)

Stability Factor = 1.3 (Table 1 pg 31)

Gradually Varying Flow; Moderate Bed Curvature (30 > curve radius/channel width > 10)
Impact from waves or floating debris moderate

$C = C_{sg}C_{sf}$

$D'_{50} = CD_{50}$

Input Variables:

Channel BW =	0	ft	
Enery Grade Slope "S_f" =	0.068	ft/ft	
Hydraulic Radius "R" =	0.74	ft	
Flow area =	7.3	sqft	Balance w/ Manning's n until
Wetted perimeter =	9.9	ft	results match input FlowMaster
Top width =	9.37	ft	
Average channel velocity =	7.93	fps	
Depth of flow =	1.56	ft	
Side slope horizontal (H:1) =	3		
Riprap angle of repose "Φ" =	41	degrees	(Chart 4, pg. 129 HEC-11)
Rock riprap specific gravity =	2.65		
Stability Factor =	1.3		
D_{50} =	1.00	ft	

Calculations:

θ =	18.4	degrees
K_1 =	0.876	
d_{avg} =	0.78	ft
Manning's n =	0.147	
Bank D_{50} =	0.46	ft
Bed D_{50} =	0.56	
C_{sf} =	1.128	
C_{sg} =	1.000	
C =	1.128	
Bank D'_{50} =	0.52	ft
Bed D'_{50} =	0.64	ft
Stable?	**Yes**	
t_o =	3.1	lb/ft^2 (average shear stress on channel)
t_c =	4.2	lb/ft^2 (critical shear stress-resistance to movement)
Stable?	**Yes**	

CCRFCD Equations (d_{50} Eq.s use Eq. 732 for Manning's n)

R_h =	0.74	ft (Eq. 732 for $R_h > 2d_{50}$)
n =	0.040	Formula Under Predicts n Value
Y/d_{50} =	1.6	(Eq. 733 for $1.5 < Y/d_{50} < 185$)
n =	0.087	Yes
d_{50} =	1.03	ft (Eq. 734)
d_{50} =	1.56	ft (Eq. 735, generally larger sizes)
d_{50} =	2.24	ft (Eq. 736 for S_e=S)

Stability Factor:

1.0 - 1.2 Uniform flow; straight or mildly curving reach (curve radius/channel width > 30); impact from wave action and floating debris is minimal; little or no uncertainty in design parameters.

1.3 - 1.6 Gradually varying flow; moderate bend curvature (30 > curve radius/channel width > 10); impact from waves or floating debris moderate.

1.6 - 2.0 Approaching rapidly varying flow; sharp bend curvature (10 > curve radius/channel width); significant impact potential from floating debris and/or ice; significant wind and/or boat generated waves (1-2 ft); high flow turbulence; turbulently mixing flow at bridge abutments; significant uncertainty in design parameters.

= Values referenced in flow master

Spreadsheet not for pier scour or wave action

Appendix D. CD-ROM

2270 Corporate Circle
Suite 200
Henderson NV 89074-7755
Tel: 702.263.7275
www.atkinsglobal.com/northamerica

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SUMMERLIN®

Summerlin West Village 22

Kettle Ridge Drive (Street J): Sunset Run Drive to Kindle Rise Way

November 2020

Addendum #1

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Kettle Ridge Drive: Sunset Run Drive to Kindle Rise Way Date: August 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Kindle Rise Way/Sunset Run Drive

East/West: Desert Foothills Drive/Scurry Bend Drive

b) Section: 23 and 14 Township: 20S Range: 59E

c) APN : 137-23-210-001

Name of Owner: Howard Hughes Company, LLC

Telephone No.: (702) 791-4000 Fax No.: (702) 791-4450 E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 West Charleston Blvd, Ste 300, Las Vegas, NV 89135

Contact Person-Name: Molly Anderson, PE **Telephone No.:** (702) 551-0330

* **E-Mail Address:** molly.anderson@atkinsglobal.com **Fax No.:** (702) 263-7200

Firm: Atkins

Address: 2270 Corporate Circle, Ste 200, Henderson, NV 89074

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 446 acres Being Developed/Disturbed:
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.): Public - Roadway Improvements
5. Approximate upstream land area which drains to the subject site: 0 acres
6. Has the site drainage been evaluated in the past? ✔ **YES** **NO** If yes, please identify documentation: Master Conceptual Drainage Study for Summerlin West Village 22 Update #2
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing CC-215 Western Beltway Channel
8. Briefly describe your proposed schedule for the subject project: ASAP

Engineer's Seal

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

***New Required Field**

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

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Kettle Ridge Drive: Sunset Run Drive to Kindle Rise Way	Map ID:
Firm Name: Atkins	Engineer: Molly Anderson, PE
Address: 2270 Corporate Circle, Ste 200 City: Henderson State: NV Zip: 89074	
Phone Number: (702) 551-0330	Fax Number: (702) 263-7200
Property Owner: Howard Hughes Company, LLC	
Address: 10801 West Charleston Blvd, Ste 300 City: Las Vegas State: NV Zip: 89135	

Reviewed By:	Date Received:	Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT

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

II. MAPS AND EXHIBITS

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

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

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

III. DRAINAGE PLAN

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

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

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

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
X		For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
X		Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.
X		Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
X		Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes	No	
x		Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
x		Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
x		Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
x		Use of correct precipitation values in and around the McCarran Airport rainfall area.
x		A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
x		A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.
x		Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
x		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
	N/A	Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
	N/A	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
x		Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. Q_{100} d x v $\leq$ 8. Q_{10} d x v $\leq$ 6 and 12 foot dry lane for rights-of-way $\geq$ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
x		A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
	N/A	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
	N/A	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
	N/A	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
	N/A	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
x		Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
x		Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
X		The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
	N/A	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

Engineer's Certification

Atkins certifies that the information contained herein has been prepared in accordance with generally accepted engineering principles and practices, and to the best of our knowledge, is true and correct.

This letter certifies that all items in the **Addendum #1 to the Technical Drainage Study for Kettle Ridge Drive (Street J): Kindle Rise Way to Sunset Run Drive** electronic submittal matches the paper version bound into the study.

_____

Molly M. Anderson, PE (NV #24365)
Senior Engineer

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Comment Response Letter

Your reference: DS #5278A

Albert Sung
City of Las Vegas Public Works
333 N. Rancho Dr, 7th Floor
Las Vegas, NV 89106

November 2020

RE: ADDENDUM #1 TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22
Kettle Ridge Drive (Street J): Kindle Rise Way to Sunset Run Drive

Dear Albert,

This letter and the attached documents have been prepared as an Addendum #1 to the *Technical Drainage Study (TDS) for Summerlin West Village Kettle Ridge Drive (Street J): Kindle Rise Way to Sunset Run Drive*

Comment #1: The subject street improvement of *Kettle Ridge Drive (Street J)* is premised on the existence of *Sunset Run Drive, Kindle Rise Way* and the associated storm drain facilities are in place for downstream flood perpetuation. The subject drainage study will not be approved prior to the posting of the construction bonds of the above stated street improvements projects.

Comment response: Understood. We understand that the construction bonds for Sunset Run Drive and Kindle Rise Way must post before the TDS for Summerlin West Village Kettle Ridge Drive: Kindle Rise Way to Sunset Run Drive, can be approved.

Comment #2: The subject project is also premised on the existence of roadway networks to the west for flood protection. Roadways to the west such as *Scurry Bend Drive* and *Lake Mead Boulevard* are all non-existing relative to the subject *Kettle Ridge Drive (Street J)*. In the next submittal, address whether any interim berm/swales will be provided for flood protection.

Comment response: There is a proposed interim swale included in the Scurry Bend Drive Rough Grade package. This swale will cut of the majority of offsite flows upstream of the proposed Kettle Ridge Drive improvements. The exception to this is that an interim culvert will be in place that will pass through 22 cfs in a 100-yr event in the interim condition. This 22 cfs will combine with the interim flow of subbasin INT-1 (See Figure 3), and flow through the northernmost interim roadside swale of Kettle Ridge Drive. However, the flows from the Scurry Bend bypass culvert (22 cfs) and Subbasin INT-1 will drain to the Kindle Rise Way storm drain facilities and will not be captured by the Kettle Ridge Drive storm drain.

The rough grading of Sunset Run as part of VTN's rough grading of the Grand Park Detention Basin will cut off flows to the west of the Kettle Ridge Drive improvements project.

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

Comment response: Understood. The proposed report will be submitted to CCRFCD for concurrence.

Comment #4: Sheet 5/24: The project proposes to build temporary drainage facilities, i.e., berms/swales along the sides of Kettle Ridge Drive (Street J) for interim flood protection. Prior to final plan approval the developer must complete a maintenance and liability agreement for the interim drainage improvements (berms or channels) 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 facility and an exhibit that adequately shows the location and limits of the drainage facility 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.

Comment response: It is acknowledged that Atkins will contact the City's Land Development Section to begin the agreement process for the interim drainage improvements upon conditional approval of this study.

Comment #5: All storm drain inlets that are more than 10'-deep require a special structural detail and calculations. Submit structural design and calculations to City Building & Safety Department for review and approval prior to the final approval of the drainage study.

Comment response: The structural detail is located on Sheet 27 and will be submitted to the Building Department for approval following drainage study conditional approval.

Comment #6: Provide elevations for the contours shown on Figure 3: Hydrology Workmap.

Comment response: Elevation labels for the contours have been added.

Comment #7: ST-3E, ST-3W, ST-4E, and ST-4W have inconsistent basin areas in the Interim and Ultimate Conditions. They are shown as the same basins in Figure 3, explain the discrepancy.

Comment response: The tributary area displayed in acres was consistent between the interim and ultimate street subbasins. However, the tributary area displayed in square miles had not been updated accordingly. This discrepancy has been resolved in this submittal.

Comment #8: SDDI #7 is shown to intercept 2.0 cfs with 0.2 cfs of bypass. This does not add up to the 3 cfs calculated at the inlet. The table on Figure 4 should show the 2.8 cfs of intercepted flow. Review and revise accordingly.

Comment response: SDDI #7 will intercept 2 cfs in the interim condition and 2.8 cfs in the ultimate condition, which results in 0 cfs and 0.2 cfs bypass for the interim and ultimate conditions accordingly. The table on Figure 4 has been revised.

Comment #9: The swale and rip-rap calculations for Flight Range Avenue to Kindle Rise Way use 58 cfs this does not match Figure 3 basin flows, explain the discrepancy.

Comment response: The rip-rap calculation for the northernmost swale in the Kettle Ridge Drive improvements (Flight Range Avenue to Kindle Rise Way) has been designed to accommodate a total peak flow of 58 cfs. The interim subbasin INT-1 has a total peak 100-yr flow of 36 cfs, which will combine with 22 cfs from the interim Scurry Bend Drive culvert, resulting in a total peak flow of 58 cfs. Figure 3 has been revised to make this distinction clearer.

Due to minor changes in the storm drain alignment (SDDI #9 & #10 have moved downstream), interim subbasin INT-4 has been revised to encompass a larger area. The total flow in INT-4 has increased from 7

cfs to 9 cfs. This has resulted in the velocity of the southernmost swale (Flight Edge Way to Sunset Drive) increasing above 5 ft/s in an unlined condition. Rip-rap calculations are now included for this southernmost swale. The portion of the swale in the middle of the Kettle Ridge Drive improvements (Flight Edge Way to Flight Range Avenue) still does not need to be lined.

Comment #10: Sheet 8/26 & Sheet 9/26: SDDI #1 appears to be at a local low point. Address in the next submittal during a worst-case scenario that the inlet is totally clogged, what is the maximum ponding depth at the inlet before it overflows. Note that the maximum allowable ponding depth is six inches. Provide enough grade elevations in the plan & profile to verify that the criterion will be met.

Comment response: A drop inlet calculation for SDDI #1 with a 100% clogging rate has been analyzed in FlowMaster and the maximum ponding depth is calculated to be 0.3 ft. This calculation has been included in Appendix D.

Comment #11: Sheet 20/26 & Sheet 21/26: In general, the HGL shown on the profiles for the laterals do not match the calculations. For example: SDDI #2: Calculation shows a lower water surface while the profile shows a much higher water surface. SDDI #5: The HGL is even lower than the base of the inlet. Same for SDDI #10. Review and revise all the laterals and DIs calculations to match the plotted profiles on the plan in the next submittal

Comment response: Due to minor changes in the storm drain alignment (SDDI #9 & #10 have moved downstream), WSPG-W has been re-run for the mainline and all laterals. Updated and accurate HGLs are included on the revised plans.

_____

Molly M. Anderson, PE (NV #24365)

Senior Engineer

Additional Design Changes

The storm drain alignment has been modified slightly for the Kettle Ridge Drive Addendum #1 improvement plans:

- Portions of the mainline have been upsized. In the previous submittal 54" RCP was used only from the downstream end of the SD network up to SDMH#1. The 54" RCP now extends from the downstream end up to SDMH#4, replacing what was previously 48" RCP.
- SDDI#10 and the attached lateral have been moved approximately 40 ft downstream.
- SDDI#9 and the attached lateral have been moved approximately 260 ft downstream.

Due to the changes in the locations of SDDI#9 and #10, the interim subbasins INT-3, INT-4, and ST-5W have been re-delineated. Revised hydrologic calculations are located in Appendix C. An increase in total area to interim subbasin INT-4 resulted in an increased in flow from 7 cfs to 9 cfs. This has resulted in the velocity of the southernmost swale (Flight Edge Way to Sunset Drive) increasing above 5 ft/s from the previous proposed unlined condition. Rip-rap is now included for this southernmost swale to mitigate erosive velocities (Appendix D). The portion of the swale in the middle of the Kettle Ridge Drive improvements (Flight Edge Way to Flight Range Avenue) still does not need to be lined.

Appendices

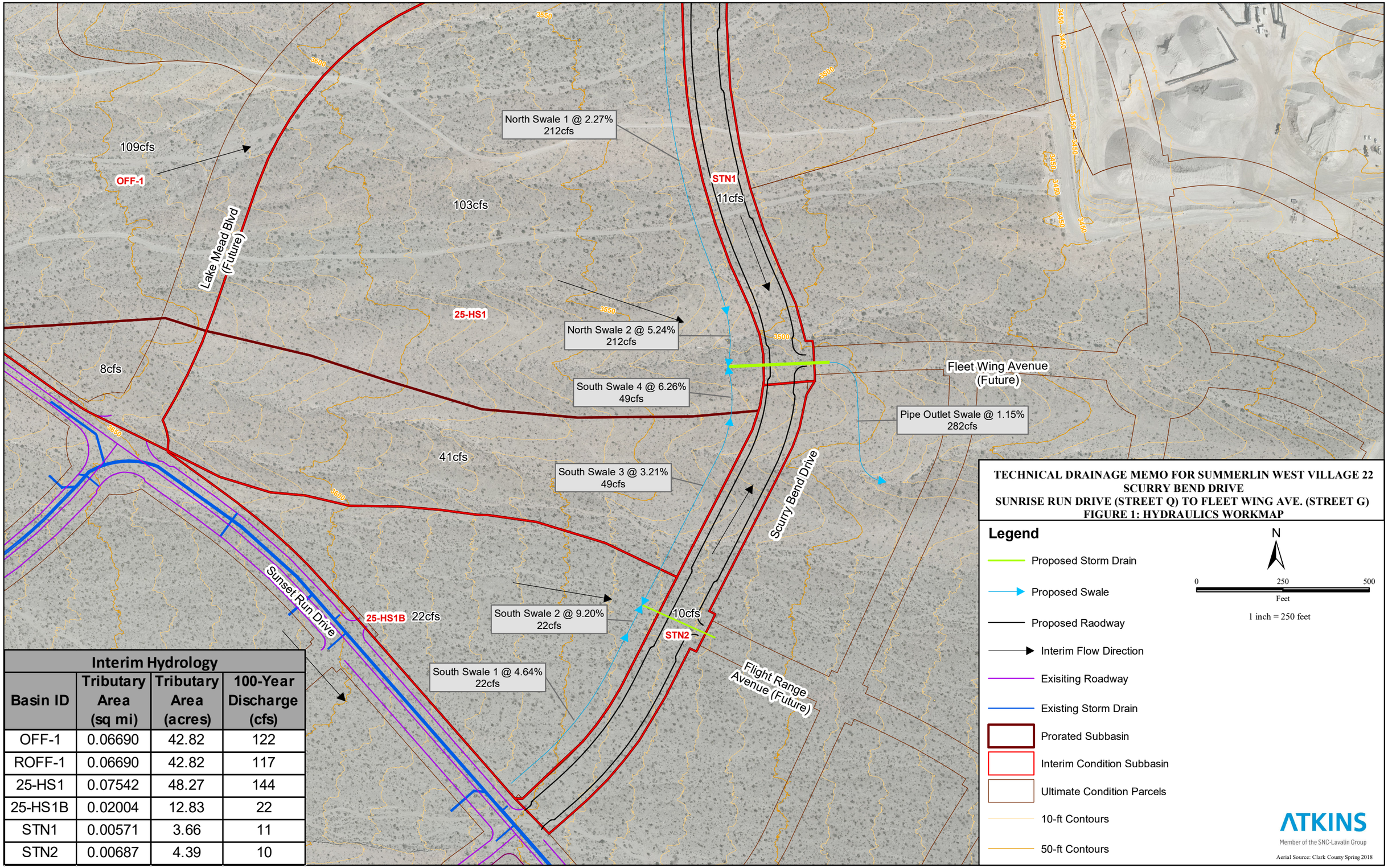
Appendix A. Reference Information

A.1. Summerlin West Village 22 Scurry Bend Drive Rough Grade Technical Drainage Memo

A.2. Summerlin West Village 22 Scurry Bend Drive Rough Grade Plans

A.3. Summerlin West Grand Park Detention Basin Addendum #1 Update #2 (DS #5163) (By VTN)

A.1 Summerlin West Village 22 Scurry Bend Drive Rough Grade Technical Drainage Memo



Interim Hydrology			
Basin ID	Tributary Area (sq mi)	Tributary Area (acres)	100-Year Discharge (cfs)
OFF-1	0.06690	42.82	122
ROFF-1	0.06690	42.82	117
25-HS1	0.07542	48.27	144
25-HS1B	0.02004	12.83	22
STN1	0.00571	3.66	11
STN2	0.00687	4.39	10

TECHNICAL DRAINAGE MEMO FOR SUMMERLIN WEST VILLAGE 22
SCURRY BEND DRIVE
SUNRISE RUN DRIVE (STREET Q) TO FLEET WING AVE. (STREET G)
FIGURE 1: HYDRAULICS WORKMAP

Legend

- Proposed Storm Drain
- Proposed Swale
- Proposed Raodway
- Interim Flow Direction
- Exisiting Roadway
- Existing Storm Drain
- Prorated Subbasin
- Interim Condition Subbasin
- Ultimate Condition Parcels
- 10-ft Contours
- 50-ft Contours

N

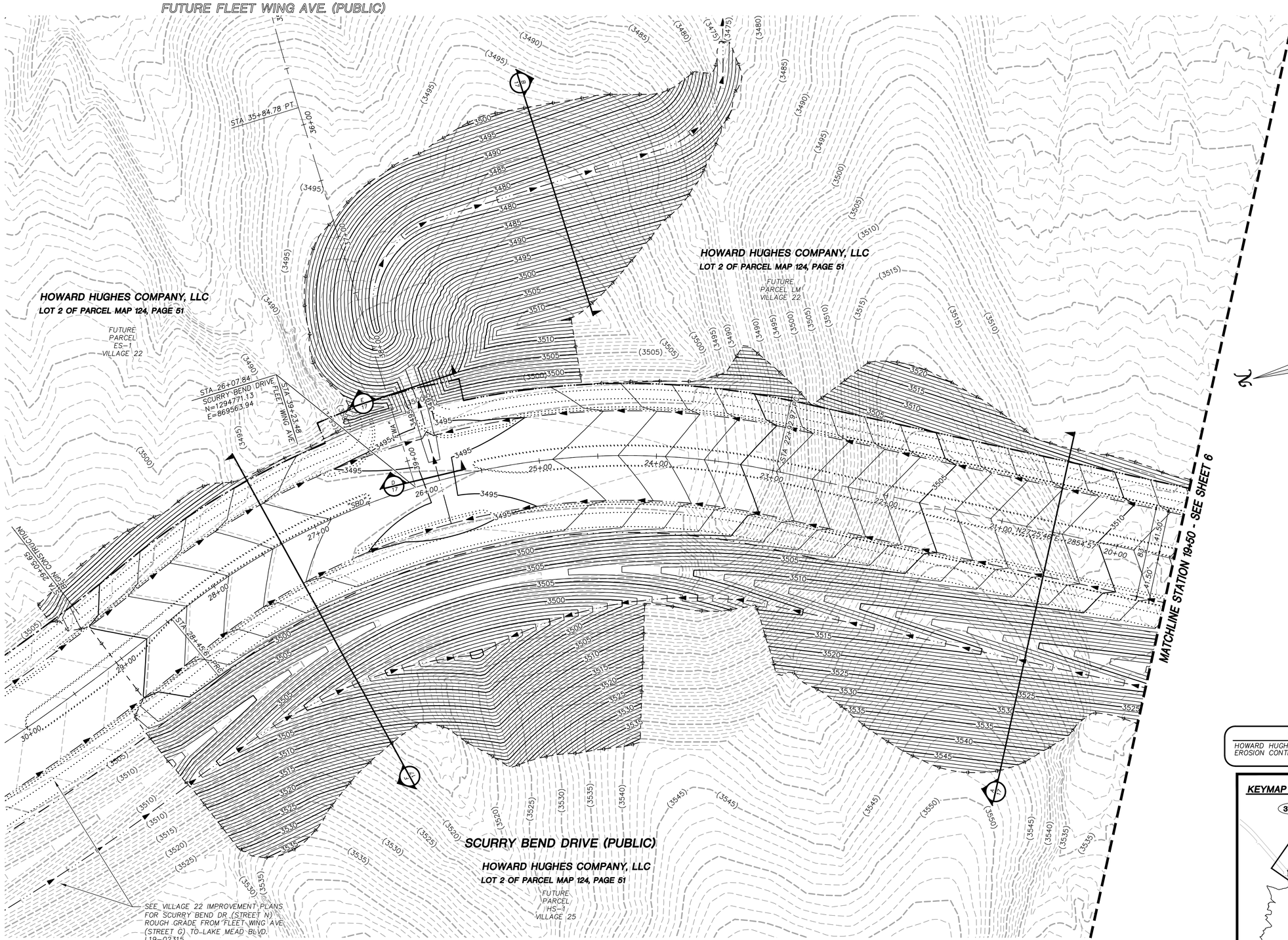
0 250 500
Feet

1 inch = 250 feet

ATKINS
Member of the SNC-Lavalin Group

Aerial Source: Clark County Spring 2018

A.2 Summerlin West Village 22 Scurry Bend Drive Rough Grade Plans



SUMMARY OF QUANTITIES

DESCRIPTION	QUANTITY	UNIT
DRAINAGE		
48" RCP CLASS III	285	LF
36" RCP CLASS III	259	LF
RIP-RAP (D50=8", 16" THICKNESS)	2,935	CY
RIP-RAP (D50=12", 24" THICKNESS)	544	CY
EARTHWORK		
CUT	125,500	CY
FILL	144,500	CY
NET	19,000	CY

MASTER PLAN NOTE

THIS SHEET IS FOR INFORMATIONAL PURPOSES ONLY. IT IS AN OVERALL REPRESENTATION OF THE UTILITY FOR REVIEW AND COORDINATION WITH OTHER PROJECT DETAILS WITHIN THIS PLAN SET.

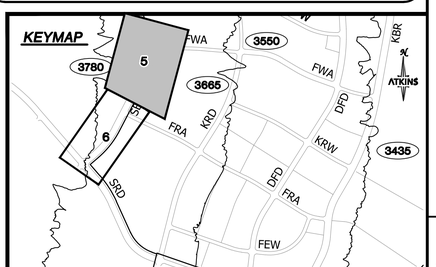
STORM DRAIN NOTES

1. SEE ROUGH GRADING PLAN AND PROFILE SHEETS FOR CONSTRUCTION DETAILS.
2. ALL STORM DRAIN MATERIAL TO BE CLASS III REINFORCED CONCRETE PIPE, UNLESS OTHERWISE NOTED IN PROFILES.
3. CONTRACTOR TO PROVIDE 6" MINIMUM OF CLEARANCE BETWEEN OUTSIDE OF PIPE TO INSIDE WALL OF STORM DRAIN STRUCTURES.

MAINTENANCE NOTE

HOWARD HUGHES IS SOLELY RESPONSIBLE FOR THE MAINTENANCE AND EROSION CONTROL OF THE INTERIM FACILITIES

KEYMAP



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GRAPHIC SCALE
40 0 20 40 80
HORIZONTAL: 1"=40'

SOILS REPORT

BY NOVA
PROJECT NO. G-18-176
DATED 12/03/18 AND
SUBSEQUENT UPDATE LETTER
DATED 12/30/19
EARTHWORK QUANTITIES (RAW):
CUT= 125,500 CU YDS
FILL= 144,500 CU YDS

GRADING PLAN CERTIFICATION

ANTHONY J. ORTIZ PE#18849 — 10/15/2020 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT. DS#5253

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

Call before you Dig UNDERGROUND UTILITY LOCATION SERVICE. Call 811 or 1-800-642-2444

FAST Call before you UnderGround 1-702-432-5300 NEVADA'S NOTIFICATION SYSTEM OF UNDERGROUND FACILITIES

JIBOOM HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA ANTHONY ORTIZ No. 18849 CIVIL

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
SCURRY BEND DRIVE (STREET N) ROUGH GRADE
SUNSET RUN DRIVE TO FLEET WING AVENUE (STREET G)

MASTER DRAINAGE PLAN
STA 19+50 TO END

DESIGNED BY: D. BANTA
DRAWN BY: C. DANIELS
CHECKED BY: P. BATES
HORIZ.: 1"=40'
VERT.: 1"=8'

107YB560
L20-01966
DATE: OCTOBER, 2020
DRAWING NO. 5 /18
JOB NO. 100068040

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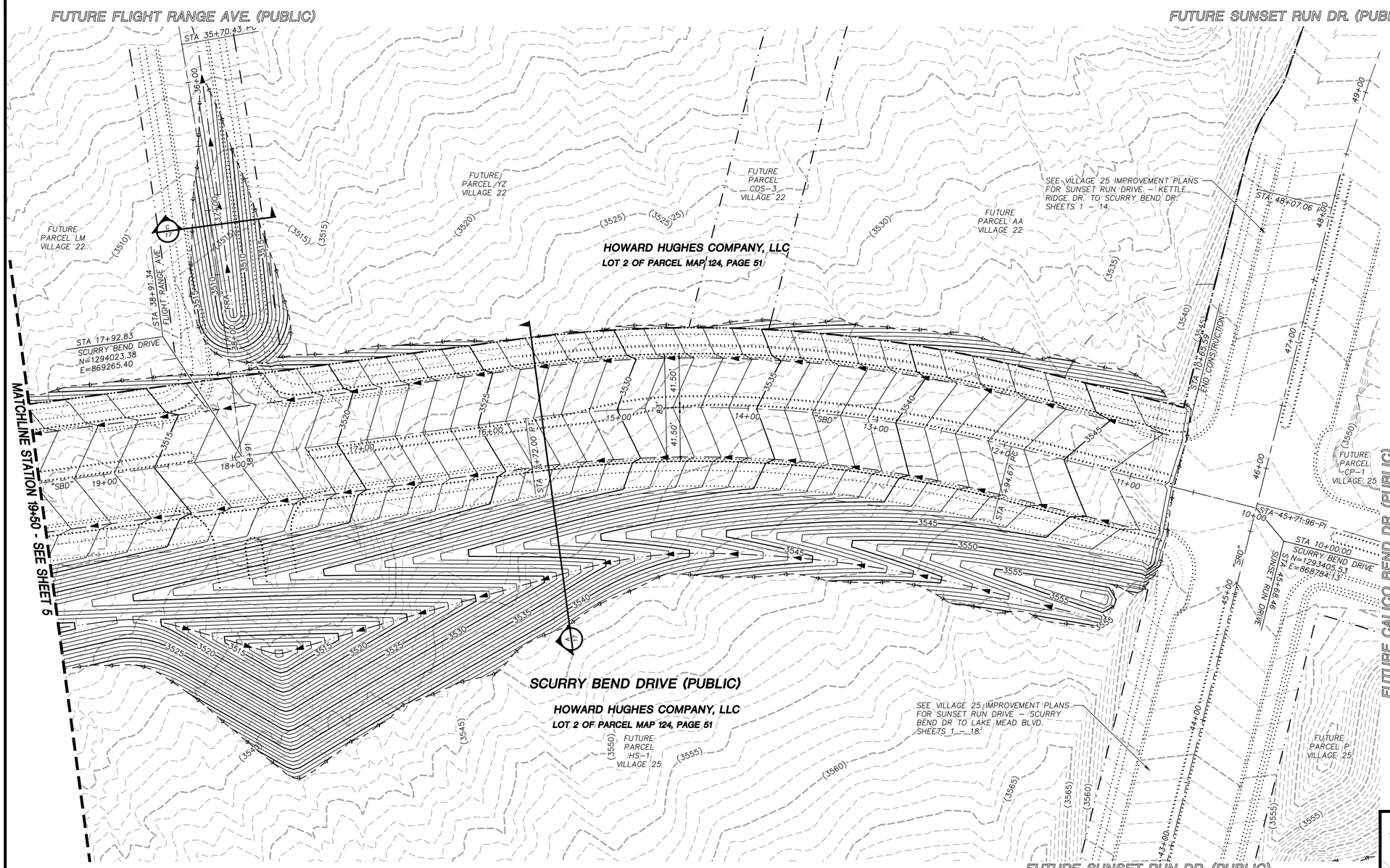

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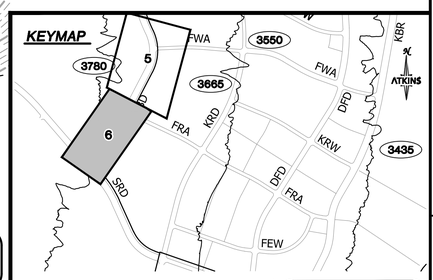

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PROFESSIONAL ENGINEER-STATE OF NEVADA ANTHONY ORTIZ EXP. 6-30-21 CIVIL No. 18849

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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Telephone: +1702.263.7275
Fax: +1702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
SCURRY BEND DRIVE (STREET N) ROUGH GRADE
SUNSET RUN DRIVE TO FLEET WING AVENUE (STREET G)

MASTER DRAINAGE PLAN
BEGIN TO STA 19+50

107V8560	DESIGNED BY: N. BARCOS
L20-01966	DRAWN BY: L. MAMACLAY
DATE: OCTOBER, 2020	CHECKED BY: P. BATES
DRAWING NO. 6 /18	HORIZ.: 1"=40' VERT.: 1"=8'

JOB NO. 100068040

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A.3 Summerlin West Grand Park Detention Basin Addendum #1 Update #2 (DS #5163) (By VTN)

LA MADRE PEAKS
VILLAGE 27

SUNSET RUN
(STREET Q)

PARK DRIFT
(STREET K)

LAKE MEAD

LAKE MEAD

HIGHLAND PRIDE
(STREET P)

SUNSET RUN
(STREET Q)

SCURRY BEND
(STREET N)

WEST TOWN
VILLAGE 22

Storm drain improvements
to come after Mass Grading

CALICO BEND
(STREET O)

SUNSET RUN
(STREET Q)

Embankment not included
in Mass Grading

FOX HILL

Storm drain improvements
to come after Mass Grading

Roadway and storm drain
improvements to come after
Mass Grading

PARK DRIFT
(STREET K)

GRAND PARK
VILLAGE 25

GRAND PARK
(STREET L)

FOX HILL

SKY VISTA

WEST
TOWN
VILLAGE
21

LEGEND

P1 MASS GRADING OF GRAND PARK DETENTION BASIN, FUTURE PARK, ADJACENT ROADWAYS, AND SUMMERLIN PARKWAY EXTENSION PER VTN STUDY MASS GRADING - V21 & V25 (DS4926)

P2 FOX HILL AND SKY VISTA ROADWAY AND STORM DRAIN IMPROVEMENTS. PER GCW STUDIES SKY VISTA IMPROVEMENTS (DS5187) AND FOX HILL DRIVE IMPROVEMENTS (DS5218)

P3 GRAND PARK DETENTION BASIN AND STORM DRAIN INLET/OUTLET OUTSIDE OF ROADWAY. PER VTN STUDY GRAND PARK DETENTION BASIN (DS5163)

P4 ROUGH GRADING AND STORM DRAIN OF UPSTREAM ROADWAYS. PER VTN STUDY GRAND PARK DETENTION BASIN - INLET PIPE (DS5226)

FUTURE PARK BOUNDARY.

VILLAGE BOUNDARY

NORTH

GRAPHIC SCALE

500 0 250 500 1000

1" = 500'

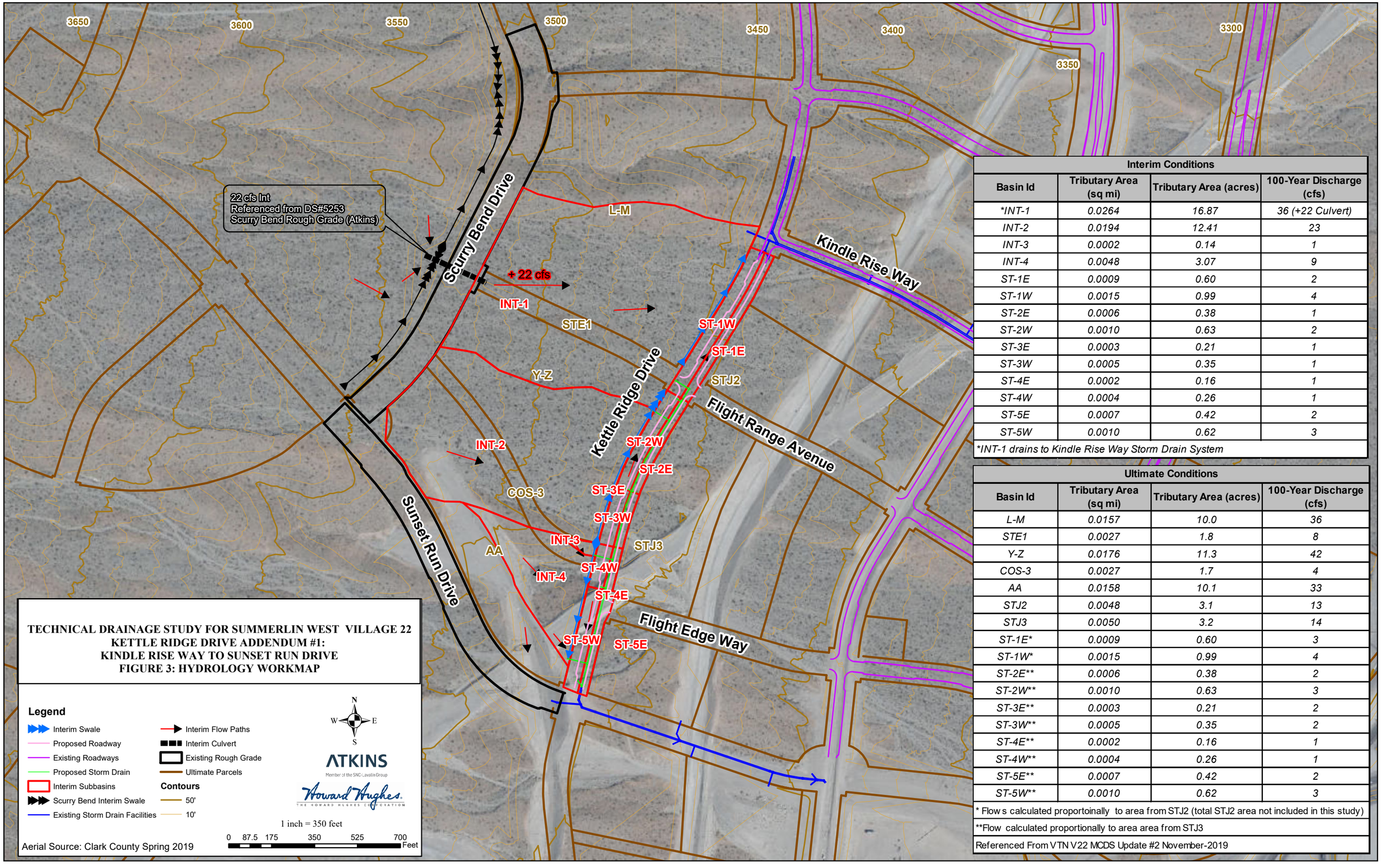
W.O.#:	7809-GPDB
DATE:	JAN 2020
BY:	PLM
SCALE:	1" = 500'
SHEET	OF

FIGURE 13:
GRAND PARK DETENTION BASIN
PHASING EXHIBIT

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\A_Figures\Figure 13 Basin Phasing Exhibit.dwg;paulm; Jan 21 , 2020 - 4:13pm

Appendix B. Revised Figures



TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE ADDENDUM #1:
KINDLE RISE WAY TO SUNSET RUN DRIVE
FIGURE 3: HYDROLOGY WORKMAP

Legend

- Interim Swale
- Proposed Roadway
- Existing Roadways
- Proposed Storm Drain
- Interim Subbasins
- Scurry Bend Interim Swale
- Existing Storm Drain Facilities
- Interim Flow Paths
- Interim Culvert
- Existing Rough Grade
- Ultimate Parcels

Contours

- 50'
- 10'

N W E S

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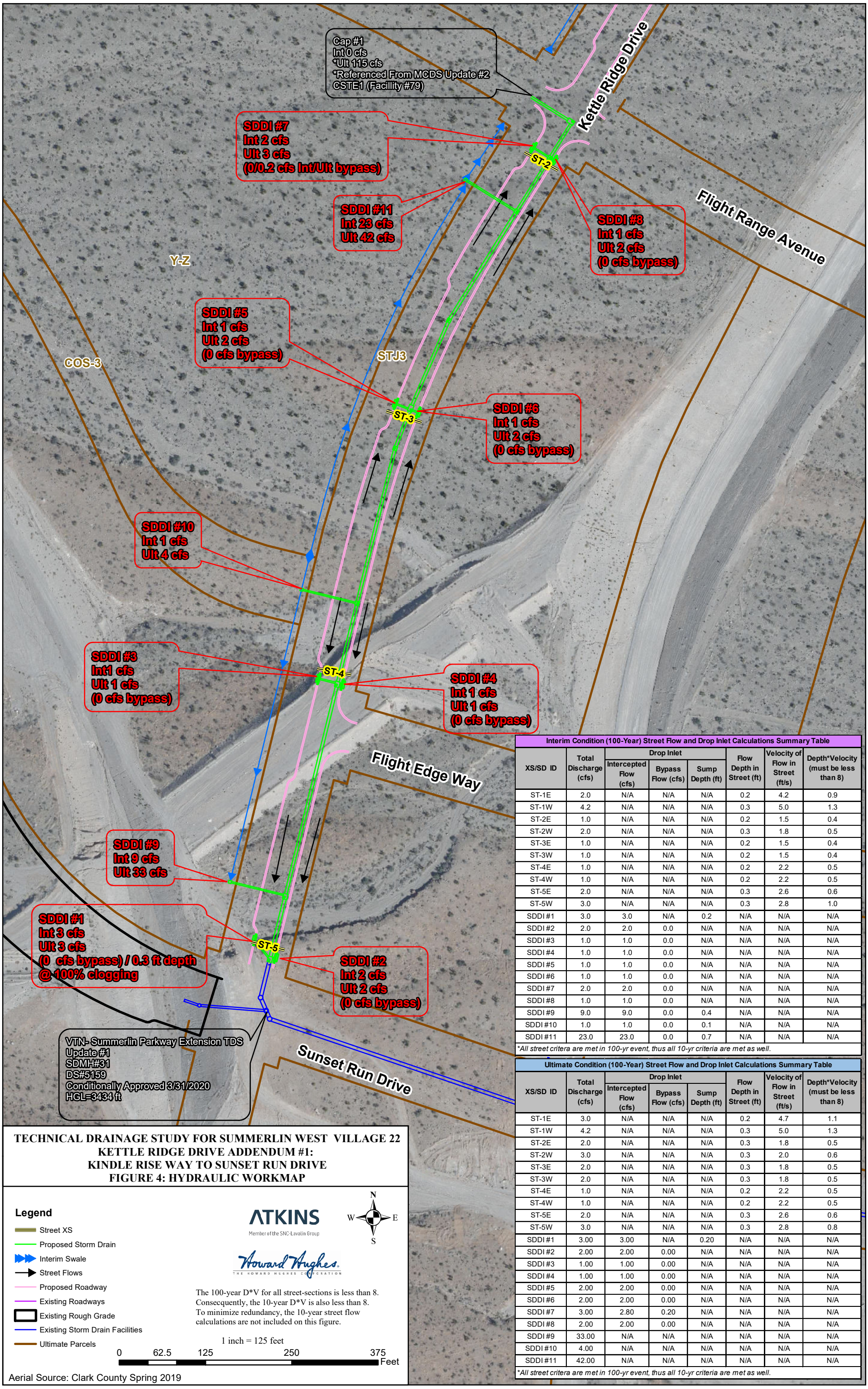
1 inch = 350 feet

0 87.5 175 350 525 700 Feet

Aerial Source: Clark County Spring 2019

Interim Conditions			
Basin Id	Tributary Area (sq mi)	Tributary Area (acres)	100-Year Discharge (cfs)
*INT-1	0.0264	16.87	36 (+22 Culvert)
INT-2	0.0194	12.41	23
INT-3	0.0002	0.14	1
INT-4	0.0048	3.07	9
ST-1E	0.0009	0.60	2
ST-1W	0.0015	0.99	4
ST-2E	0.0006	0.38	1
ST-2W	0.0010	0.63	2
ST-3E	0.0003	0.21	1
ST-3W	0.0005	0.35	1
ST-4E	0.0002	0.16	1
ST-4W	0.0004	0.26	1
ST-5E	0.0007	0.42	2
ST-5W	0.0010	0.62	3
*INT-1 drains to Kindle Rise Way Storm Drain System			

Ultimate Conditions			
Basin Id	Tributary Area (sq mi)	Tributary Area (acres)	100-Year Discharge (cfs)
L-M	0.0157	10.0	36
STE1	0.0027	1.8	8
Y-Z	0.0176	11.3	42
COS-3	0.0027	1.7	4
AA	0.0158	10.1	33
STJ2	0.0048	3.1	13
STJ3	0.0050	3.2	14
ST-1E*	0.0009	0.60	3
ST-1W*	0.0015	0.99	4
ST-2E**	0.0006	0.38	2
ST-2W**	0.0010	0.63	3
ST-3E**	0.0003	0.21	2
ST-3W**	0.0005	0.35	2
ST-4E**	0.0002	0.16	1
ST-4W**	0.0004	0.26	1
ST-5E**	0.0007	0.42	2
ST-5W**	0.0010	0.62	3
* Flows calculated proportionally to area from STJ2 (total STJ2 area not included in this study)			
**Flow calculated proportionally to area area from STJ3			
Referenced From VTN V22 MCDS Update #2 November-2019			



Interim Condition (100-Year) Street Flow and Drop Inlet Calculations Summary Table

XS/SD ID	Total Discharge (cfs)	Drop Inlet			Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 8)
		Intercepted Flow (cfs)	Bypass Flow (cfs)	Sump Depth (ft)			
ST-1E	2.0	N/A	N/A	N/A	0.2	4.2	0.9
ST-1W	4.2	N/A	N/A	N/A	0.3	5.0	1.3
ST-2E	1.0	N/A	N/A	N/A	0.2	1.5	0.4
ST-2W	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-3E	1.0	N/A	N/A	N/A	0.2	1.5	0.4
ST-3W	1.0	N/A	N/A	N/A	0.2	1.5	0.4
ST-4E	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-4W	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-5E	2.0	N/A	N/A	N/A	0.3	2.6	0.6
ST-5W	3.0	N/A	N/A	N/A	0.3	2.8	1.0
SDDI #1	3.0	3.0	N/A	0.2	N/A	N/A	N/A
SDDI #2	2.0	2.0	0.0	N/A	N/A	N/A	N/A
SDDI #3	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #4	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #5	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #6	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #7	2.0	2.0	0.0	N/A	N/A	N/A	N/A
SDDI #8	1.0	1.0	0.0	N/A	N/A	N/A	N/A
SDDI #9	9.0	9.0	0.0	0.4	N/A	N/A	N/A
SDDI #10	1.0	1.0	0.0	0.1	N/A	N/A	N/A
SDDI #11	23.0	23.0	0.0	0.7	N/A	N/A	N/A

*All street critera are met in 100-yr event, thus all 10-yr criteria are met as well.

Ultimate Condition (100-Year) Street Flow and Drop Inlet Calculations Summary Table

XS/SD ID	Total Discharge (cfs)	Drop Inlet			Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 8)
		Intercepted Flow (cfs)	Bypass Flow (cfs)	Sump Depth (ft)			
ST-1E	3.0	N/A	N/A	N/A	0.2	4.7	1.1
ST-1W	4.2	N/A	N/A	N/A	0.3	5.0	1.3
ST-2E	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-2W	3.0	N/A	N/A	N/A	0.3	2.0	0.6
ST-3E	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-3W	2.0	N/A	N/A	N/A	0.3	1.8	0.5
ST-4E	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-4W	1.0	N/A	N/A	N/A	0.2	2.2	0.5
ST-5E	2.0	N/A	N/A	N/A	0.3	2.6	0.6
ST-5W	3.0	N/A	N/A	N/A	0.3	2.8	0.8
SDDI #1	3.00	3.00	N/A	0.20	N/A	N/A	N/A
SDDI #2	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #3	1.00	1.00	0.00	N/A	N/A	N/A	N/A
SDDI #4	1.00	1.00	0.00	N/A	N/A	N/A	N/A
SDDI #5	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #6	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #7	3.00	2.80	0.20	N/A	N/A	N/A	N/A
SDDI #8	2.00	2.00	0.00	N/A	N/A	N/A	N/A
SDDI #9	33.00	N/A	N/A	N/A	N/A	N/A	N/A
SDDI #10	4.00	N/A	N/A	N/A	N/A	N/A	N/A
SDDI #11	42.00	N/A	N/A	N/A	N/A	N/A	N/A

*All street critera are met in 100-yr event, thus all 10-yr criteria are met as well.

TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE ADDENDUM #1:
KINDLE RISE WAY TO SUNSET RUN DRIVE
FIGURE 4: HYDRAULIC WORKMAP

Legend

- Street XS
- Proposed Storm Drain
- Interim Swale
- Street Flows
- Proposed Roadway
- Existing Roadways
- Existing Rough Grade
- Existing Storm Drain Facilities
- Ultimate Parcels

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N W E S

The 100-year D*V for all street-sections is less than 8. Consecquently, the 10-year D*V is also less than 8. To minimize redundancy, the 10-year street flow calculations are not included on this figure.

1 inch = 125 feet

0 62.5 125 250 375 Feet

Aerial Source: Clark County Spring 2019

Appendix C. Revised Interim Condition Hydrology Calculations

C.1. CN Calculations Summary

C.2. Standard Form 4

C.3. Interim Condition HEC-1

C.1 CN Calculation Summary

C.1. CN Calculations Summary

Kettle Ridge Drive

Interim Subbasins

CN Calculation Summary

BASIN ID	LAND USE INDEX NUMBER	LAND USE DESCRIPTION	SOIL MAP UNIT #	SUBREGION CN	SUBREGION AREA (SQ FT)	SUBBASIN AREA (SQ FT)	PERCENT OF SUBBASIN	CUMULATIVE PERCENT	AREAL WEIGHTED CN	CUMULATIVE CN	COMPOSITE CN
INT-1	1	Undeveloped Land, Open Desert	1155	88	300093	735055	40.8%	**40.8%**	35.93	35.93	
INT-1	1	Undeveloped Land, Open Desert	1502	73	434965	735055	59.2%	**100.0%**	43.20	79.12	**79.1**
INT-2	1	Undeveloped Land, Open Desert	1156	87	135791	540759	25.1%	**25.1%**	21.85	21.85	
INT-2	1	Undeveloped Land, Open Desert	1502	73	404933	540759	74.9%	**100.0%**	54.66	76.51	**76.5**
INT-3	1	Undeveloped Land, Open Desert	1156	87	6029	6029	100.0%	**100.0%**	87.00	87.00	**87.0**
INT-4	1	Undeveloped Land, Open Desert	1156	87	133773	133773	100.0%	**100.0%**	87.00	87.00	**87.0**
ST-1E	7	Public Facility and Residential, 8-12 units/acre	1155	94	6047	26253	23.0%	**23.0%**	21.65	21.65	
ST-1E	7	Public Facility and Residential, 8-12 units/acre	1502	88	20206	26253	77.0%	**100.0%**	67.73	89.38	**89.4**
ST-1W	7	Public Facility and Residential, 8-12 units/acre	1155	94	11455	43053	26.6%	**26.6%**	25.01	25.01	
ST-1W	7	Public Facility and Residential, 8-12 units/acre	1502	88	31591	43053	73.4%	**100.0%**	64.57	89.58	**89.6**
ST-2E	7	Public Facility and Residential, 8-12 units/acre	1502	88	16748	16749	100.0%	**100.0%**	88.00	88.00	**88.0**
ST-2W	7	Public Facility and Residential, 8-12 units/acre	1502	88	27474	27462	100.0%	**100.0%**	88.04	88.04	**88.0**
ST-3E	7	Public Facility and Residential, 8-12 units/acre	1156	93	3088	9119	33.9%	**33.9%**	31.49	31.49	
ST-3E	7	Public Facility and Residential, 8-12 units/acre	1502	88	6027	9119	66.1%	**100.0%**	58.16	89.65	**89.6**
ST-3W	7	Public Facility and Residential, 8-12 units/acre	1156	93	5891	15039	39.2%	**39.2%**	36.43	36.43	
ST-3W	7	Public Facility and Residential, 8-12 units/acre	1502	88	9142	15039	60.8%	**100.0%**	53.49	89.92	**89.9**
ST-4E	7	Public Facility and Residential, 8-12 units/acre	1156	93	6863	6863	100.0%	**100.0%**	93.00	93.00	**93.0**
ST-4W	7	Public Facility and Residential, 8-12 units/acre	1156	93	11339	11341	100.0%	**100.0%**	92.98	92.98	**93.0**
ST-5E	7	Public Facility and Residential, 8-12 units/acre	1156	93	27004	27004	100.0%	**100.0%**	93.00	93.00	**93.0**
ST-5W	7	Public Facility and Residential, 8-12 units/acre	1156	93	53788	53834	99.9%	**99.9%**	92.92	92.92	**92.9**

C.2 Standard Form 4

C.2. Standard Form 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Summerlin West Village 22 Kettle Ridge Drive (Street J) (Kindle Rise to Sunset Run) **DATE: 10/29/20**

INTERIM CONDITION

SUB-BASIN DATA							INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag
DESIG: (1)	DEV./EX. (D or E)	Rain 100-yr 6-hr (inch)	CN	K (2)	AREA Ac (3)	AREA Mi^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Min (13)	Min (14)	Tlag= 0.6Tc/60 Hours
INT-1	E	3.43	79.1	0.654	16.87	0.0264	100.0	5.0	4.7	1600	6.00	3.6	7.2	4.8	9.5	N/A	**0.10****
INT-2	E	3.43	76.5	0.620	12.41	0.0194	100.0	5.0	5.1	1400	4.00	3.0	5.9	5.4	10.4	N/A	**0.104**
INT-3	E	3.43	87.0	0.758	0.14	0.0002	100.0	10.0	2.9	150	15.00	5.7	11.4	0.4	3.3	N/A	**0.10****
INT-4	E	3.43	87.0	0.758	3.07	0.0048	100.0	5.0	3.6	750	7.50	4.1	8.1	2.6	6.2	N/A	**0.10****
ST-1E	D	3.43	89.4	0.790	0.60	0.0009	20.0	2.0	2.0	650	6.77	5.3	8.0	1.9	3.9	13.7	**0.05***
ST-1W	D	3.43	89.6	0.792	0.99	0.0015	20.0	2.0	2.0	650	6.77	5.3	8.0	1.9	3.9	13.7	**0.05***
ST-2E	D	3.43	88.0	0.772	0.38	0.0006	20.0	2.0	2.1	400	0.72	1.7	2.6	3.9	6.0	12.3	**0.060**
ST-2W	D	3.43	88.0	0.772	0.63	0.0010	20.0	2.0	2.1	400	0.72	1.7	2.6	3.9	6.0	12.3	**0.060**
ST-3E	D	3.43	89.6	0.793	0.21	0.0003	20.0	2.0	2.0	225	0.72	1.7	2.6	2.2	4.1	11.4	**0.05***
ST-3W	D	3.43	89.9	0.797	0.35	0.0005	20.0	2.0	1.9	225	0.72	1.7	2.6	2.2	4.1	11.4	**0.05***
ST-4E	D	3.43	93.1	0.838	0.16	0.0002	20.0	2.0	1.7	175	1.81	2.7	4.1	1.1	2.7	11.1	**0.05***
ST-4W	D	3.43	93.0	0.837	0.26	0.0004	20.0	2.0	1.7	175	1.81	2.7	4.1	1.1	2.8	11.1	**0.05***
ST-5E	D	3.43	92.8	0.835	0.42	0.0007	20.0	2.0	1.7	400	1.81	2.7	4.1	2.5	4.1	12.3	**0.05***
ST-5W	D	3.43	92.9	0.837	0.62	0.0010	20.0	2.0	1.7	400	1.81	2.7	4.1	2.5	4.1	12.3	**0.05***

Tc = Ti + Tt Tlag = 0.6 Tc

Ti = 1.8 (1.1 - K) L^1/2 / S^1/3

K = 0.0132 (CN) - 0.39

Tc Check = L/180+10

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

V1 = 14.8*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2

V2 = 29.4*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2

REFERENCE : **STANDARD FORM 4**

*Minimum recommended Tc for developed subbasins is 5 mins. A value of 0.05 was use for the Tlag where the calculated Tc was less than 5 mins.

**Minimum recommended Tc for undeveloped subbasins is 10 mins. A value of 0.10 was use for the Tlag where the calculated Tc was less than 10 mins.

C.3 Interim Condition HEC-1

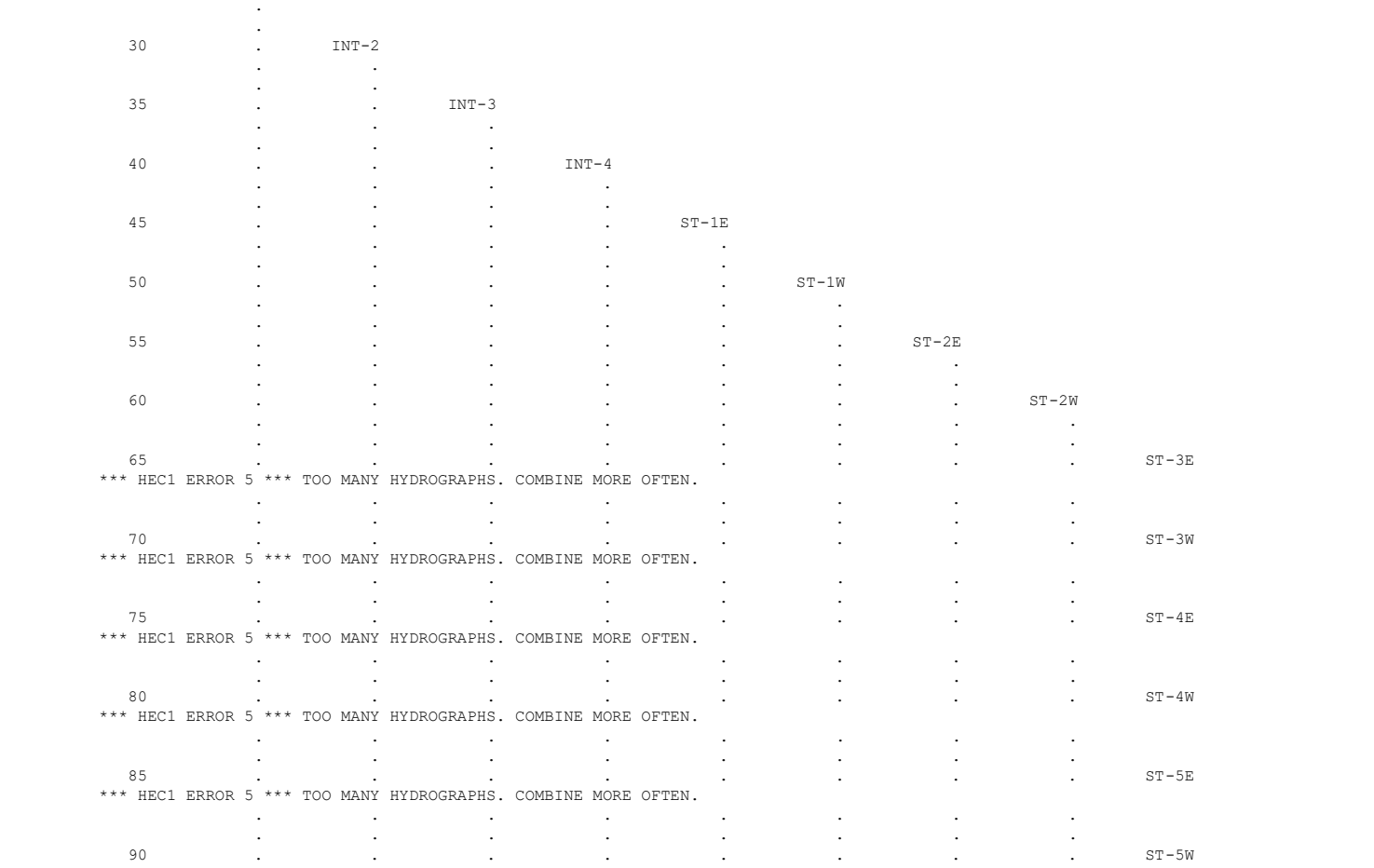
```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1                *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27OCT20  TIME  14:35:21   *                    *           (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


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

                         *DIAGRAM
 *** FREE ***
              1          ID  TECHNICAL DRAINAGE STUDY
              2          ID  SUMMERLIN VILLAGE 22 WEST
              3          ID  STREET J (Kettle Ridge Couplet) Addendum #1
              4          ID  DESIGN STORM 100-YEAR 6 HOUR
              5          ID  JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES
              6          ID
              7          ID    AREA (SQUARE MILES)           DARF
              8          ID
              9          ID          0 - 0.5                 0.99
             10          ID          Estimated 10-year       0.57
             11          ID
             12          IT       5       0       0     300
             13          IO       5       0       0
             14          IN       5       0       0
             15          JR    PREC    0.99    0.57
                         *
             16          KK   INT-1
             17          BA 0.02637
             18          PB    3.43
             19          PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
             20          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
             21          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
             22          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
             23          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
             24          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
             25          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
             26          PC   0.998   0.999   1.000
             27          LS       0    79.1
             28          UD   0.100
                         *
             29          KK   INT-2
             30          BA 0.01940
             31          PB    3.43
             32          LS       0    76.5
             33          UD   0.104
                         *
             34          KK   INT-3
             35          BA  0.0002
             36          PB    3.43
             37          LS       0    87.0
             38          UD   0.100
                         *
             39          KK   INT-4
             40          BA  0.0048
             41          PB    3.43
```

```
          43          LS       0    87.0
          44          UD   0.100
                      *
1                                                HEC-1 INPUT                                                  PAGE  2

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


          45          KK   ST-1E
          46          BA 0.00094
          47          PB    3.43
          48          LS       0    89.4
          49          UD   0.050
                      *

          50          KK   ST-1W
          51          BA 0.00154
          52          PB    3.43
          53          LS       0    89.6
          54          UD   0.050
                      *

          55          KK   ST-2E
          56          BA 0.00060
          57          PB    3.43
          58          LS       0    88.0
          59          UD   0.060
                      *

          60          KK   ST-2W
          61          BA 0.00099
          62          PB    3.43
          63          LS       0    88.0
          64          UD   0.060
                      *

          65          KK   ST-3E
          66          BA 0.00033
          67          PB    3.43
          68          LS       0    89.6
          69          UD   0.050
                      *

          70          KK   ST-3W
          71          BA 0.00054
          72          PB    3.43
          73          LS       0    89.9
          74          UD   0.050
                      *

          75          KK   ST-4E
          76          BA 0.00025
          77          PB    3.43
          78          LS       0    93.1
          79          UD   0.050
                      *
1                                                HEC-1 INPUT                                                  PAGE  3

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


          80          KK   ST-4W
          81          BA 0.00041
          82          PB    3.43
          83          LS       0    93.0
          84          UD   0.050
                      *

          85          KK   ST-5E
          86          BA 0.00066
          87          PB    3.43
          88          LS       0    92.8
          89          UD   0.050
                      *

          90          KK   ST-5W
          91          BA  0.0010
          92          PB    3.43
          93          LS       0    92.9
          94          UD   0.050
                      *
          95          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    17       INT-1
```



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                .
                .
   30           .       INT-2
                .           .
                .           .
   35           .           .       INT-3
                .           .           .
                .           .           .
   40           .           .           .       INT-4
                .           .           .           .
                .           .           .           .
   45           .           .           .           .       ST-1E
                .           .           .           .           .
                .           .           .           .           .
   50           .           .           .           .           .       ST-1W
                .           .           .           .           .           .
                .           .           .           .           .           .
   55           .           .           .           .           .           .       ST-2E
                .           .           .           .           .           .           .
                .           .           .           .           .           .           .
   60           .           .           .           .           .           .           .       ST-2W
                .           .           .           .           .           .           .           .
                .           .           .           .           .           .           .           .
   65           .           .           .           .           .           .           .           .       ST-3E
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
                .           .           .           .           .           .           .           .
                .           .           .           .           .           .           .           .
   70           .           .           .           .           .           .           .           .       ST-3W
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
                .           .           .           .           .           .           .           .
                .           .           .           .           .           .           .           .
   75           .           .           .           .           .           .           .           .       ST-4E
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
                .           .           .           .           .           .           .           .
                .           .           .           .           .           .           .           .
   80           .           .           .           .           .           .           .           .       ST-4W
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
                .           .           .           .           .           .           .           .
                .           .           .           .           .           .           .           .
   85           .           .           .           .           .           .           .           .       ST-5E
*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.
                .           .           .           .           .           .           .           .
                .           .           .           .           .           .           .           .
   90           .           .           .           .           .           .           .           .       ST-5W

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

        5 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   27OCT20  TIME  14:35:21   *                                                  *           (916) 756-1104             *
*                                       *                                                  *                                      *
****************************************                                                  ****************************************


                         TECHNICAL DRAINAGE STUDY
                         SUMMERLIN VILLAGE 22 WEST
                         STREET J (Kettle Ridge Couplet)
                         DESIGN STORM 100-YEAR 6 HOUR

                         JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES

                           AREA (SQUARE MILES)           DARF

                                 0 - 0.5                 0.99
                                 Estimated 10-year       0.57


  14 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 .57
1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .99	RATIO 2 .57
HYDROGRAPH AT						
+	INT-1	.03	1	FLOW	36.	12.
				TIME	3.50	3.58
HYDROGRAPH AT						
+	INT-2	.02	1	FLOW	23.	7.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	INT-3	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	INT-4	.00	1	FLOW	9.	4.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-1E	.00	1	FLOW	2.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-1W	.00	1	FLOW	4.	2.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-2E	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-2W	.00	1	FLOW	2.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-3E	.00	1	FLOW	1.	0.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-3W	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-4E	.00	1	FLOW	1.	0.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-4W	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-5E	.00	1	FLOW	2.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ST-5W	.00	1	FLOW	3.	1.
				TIME	3.50	3.50

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

Appendix D. Revised Hydraulics Calculations

D.1. Drop Inlet Calculations

D.2. Normal Depth Calculations

D.3. Ultimate Condition WSPG-W Models

D.4. Rip-Rap Calculations

D.1 Drop Inlet Calculations

Combination Inlet In Sag - SDDI#1

Project Description	
Solve For	Spread

Input Data	
Discharge	3.0 cfs
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft
Opening Height	0.5 ft
Curb Throat Type	Horizontal
Throat Incline Angle	90.00 degrees

Options	
Calculation Option	Use Both

Results	
Spread	4.6 ft
Depth	0.2 ft
Gutter Depression	1.1 in
Total Depression	5.1 in
Open Grate Area	4.5 ft²
Active Grate Weir Length	9.0 ft

Combination Inlet In Sag - SDDI#1- 100% Clogged

Project Description	
Solve For	Spread

Input Data	
Discharge	3.0 cfs
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	100.0 %
Curb Opening Length	10.0 ft
Opening Height	0.5 ft
Curb Throat Type	Horizontal
Throat Incline Angle	90.00 degrees

Options	
Calculation Option	Use Both

Results	
Spread	11.0 ft
Depth	0.3 ft
Gutter Depression	1.1 in
Total Depression	5.1 in
Open Grate Area	0.0 ft²
Active Grate Weir Length	7.5 ft

Combination Inlet On Grade - SDDI#7

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.0 cfs
Slope	0.068 ft/ft
Gutter Width	1.50 ft
Gutter Cross Slope	0.080 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.015
Local Depression	4.0 in
Local Depression Width	24.0 in
Grate Width	1.50 ft
Grate Length	7.5 ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %
Curb Opening Length	10.0 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results	
Efficiency	94.63 %
Intercepted Flow	2.8 cfs
Bypass Flow	0.2 cfs
Spread	6.6 ft
Depth	0.2 ft
Flow Area	0.5 ft²
Gutter Depression	1.1 in
Total Depression	5.1 in
Velocity	5.98 ft/s
Splash Over Velocity	7.09 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.100
Grate Flow Ratio	0.636
Equivalent Cross Slope	0.155 ft/ft
Active Grate Length	3.8 ft
Length Factor	0.386
Total Interception Length	16.2 ft

Messages

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

Ditch Inlet In Sag - SDDII#9-INT

Project Description	
Solve For	Spread

Input Data	
Discharge	9.0 cfs
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	0.00 ft
Grate Width	4.00 ft
Grate Length	4.0 ft
Local Depression	0.0 in
Local Depression Width	24.0 in
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")
Clogging	50.0 %

Results	
Spread	2.4 ft
Depth	0.4 ft
Wetted Perimeter	2.5 ft
Top Width	2.38 ft
Open Grate Area	6.4 ft²
Active Grate Weir Length	12.0 ft

D.2. Normal Depth Calculations

Worksheet for KettleRidge-5W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.10
0+20	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+02, 0.10)	0.013
(0+02, 0.10)	(0+20, 0.46)	0.016

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

Results	
Normal Depth	0.28 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.1 ft²
Wetted Perimeter	10.5 ft
Hydraulic Radius	0.10 ft
Top Width	10.17 ft
Normal Depth	0.28 ft
Critical Depth	0.32 ft
Critical Slope	0.007 ft/ft
Velocity	2.79 ft/s
Velocity Head	0.12 ft
Specific Energy	0.40 ft
Froude Number	1.516
Flow Type	Supercritical

GVF Input Data

Worksheet for KettleRidge-5W-100yr

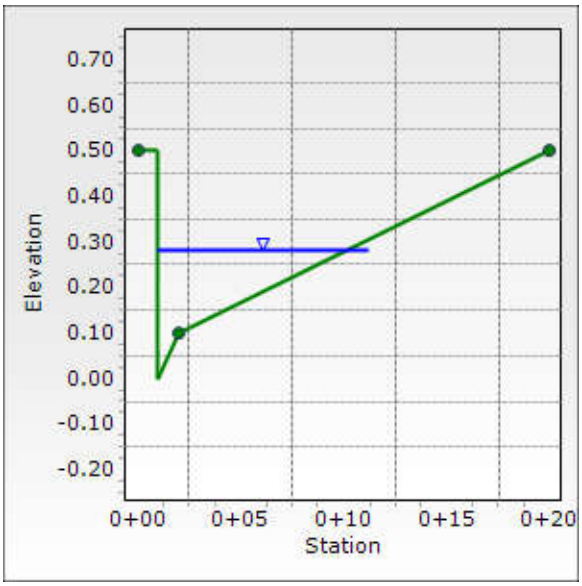
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.32 ft
Channel Slope	0.018 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for KettleRidge-5W-100yr

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Normal Depth	0.28 ft
Discharge	3.00 cfs



D.3. Ultimate Condition WSPG-W Model

FILE: KR3.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
552.780	3430.850	2.683	3433.533	210.00	15.65	3.80	3437.34	.00	3.80	5.00	5.000	5.000	.00	0 .0
3.000	.0333					.0131	.04	2.68	1.68	1.91	.013	.00	.00	BOX
555.780	3430.950	2.717	3433.667	210.00	15.46	3.71	3437.38	.00	3.80	5.00	5.000	5.000	.00	0 .0
17.620	.0080					.0132	.23	2.72	1.65	3.27	.013	.00	.00	BOX
573.400	3431.090	2.666	3433.756	210.00	15.75	3.85	3437.61	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0135	.01	2.67	1.70	2.99	.013	.00	.00	BOX
574.400	3431.100	2.664	3433.764	210.00	15.77	3.86	3437.62	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0136	.01	2.66	1.70	2.99	.013	.00	.00	BOX
575.400	3431.110	2.662	3433.772	210.00	15.78	3.87	3437.64	.00	3.80	5.00	5.000	5.000	.00	0 .0
TRANS STR	.0100					.0136	.01	2.66	1.70		.013	.00	.00	BOX
576.400	3431.120	2.659	3433.779	210.00	15.79	3.87	3437.65	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0098					.0136	.01	2.66	1.71	3.02	.013	.00	.00	BOX
577.400	3431.130	2.657	3433.787	210.00	15.81	3.88	3437.67	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0137	.01	2.66	1.71	2.99	.013	.00	.00	BOX
578.400	3431.140	2.655	3433.795	210.00	15.82	3.89	3437.68	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0100					.0137	.01	2.66	1.71	2.99	.013	.00	.00	BOX
579.400	3431.150	2.653	3433.803	210.00	15.83	3.89	3437.69	.00	3.80	5.00	5.000	5.000	.00	0 .0
49.340	.0114					.0142	.70	2.65	1.71	2.85	.013	.00	.00	BOX

FILE: KR3.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
628.740	3431.710	2.584	3434.294	210.00	16.25	4.10	3438.40	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0300					.0146	.01	2.58	1.78	1.98	.013	.00	.00	BOX
629.740	3431.740	2.591	3434.331	210.00	16.21	4.08	3438.41	.00	3.80	5.00	5.000	5.000	.00	0 .0
1.000	.0400					.0145	.01	2.59	1.77	1.79	.013	.00	.00	BOX
630.740	3431.780	2.603	3434.383	210.00	16.14	4.04	3438.43	.00	3.80	5.00	5.000	5.000	.00	0 .0
JUNCT STR	.0300					.0154	.02	2.60	1.76		.013	.00	.00	BOX
631.740	3431.810	2.438	3434.248	205.00	16.82	4.39	3438.64	.00	3.74	5.00	5.000	5.000	.00	0 .0
TRANS STR	.0400					.0137	.01	2.44	1.90		.013	.00	.00	BOX
632.740	3431.850	3.666	3435.516	205.00	14.78	3.39	3438.91	.00	4.07	3.50	4.500	.000	.00	1 .0
1.000	.0298					.0109	.01	3.67	1.31	2.52	.013	.00	.00	PIPE
633.740	3431.880	3.694	3435.573	205.00	14.67	3.34	3438.92	.00	4.07	3.45	4.500	.000	.00	1 .0
1.000	.0300					.0108	.01	3.69	1.29	2.52	.013	.00	.00	PIPE
634.740	3431.910	3.724	3435.635	205.00	14.56	3.29	3438.93	.00	4.07	3.40	4.500	.000	.00	1 .0
87.580	.0111					.0104	.91	3.72	1.26	3.65	.013	.00	.00	PIPE
722.320	3432.880	3.844	3436.724	205.00	14.17	3.12	3439.84	.00	4.07	3.18	4.500	.000	.00	1 .0
1.000	.0300					.0100	.01	3.84	1.17	2.52	.013	.00	.00	PIPE
723.320	3432.910	3.908	3436.818	205.00	13.97	3.03	3439.85	.00	4.07	3.04	4.500	.000	.00	1 .0
1.000	.0300					.0097	.01	3.91	1.12	2.52	.013	.00	.00	PIPE

FILE: KR3.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
724.320	3432.940	4.069	3437.009	205.00	13.55	2.85	3439.86	.00	4.07	2.65	4.500	.000	.00	1 .0
JUNCT STR	.0400					.0086	.01	4.07	1.00		.013	.00	.00	PIPE
725.320	3432.980	5.875	3438.855	172.00	10.81	1.82	3440.67	.00	3.81	.00	4.500	.000	.00	1 .0
TRANS STR	.0300					.0077	.01	5.87	.00		.013	.00	.00	PIPE
726.320	3433.010	5.853	3438.863	172.00	10.81	1.82	3440.68	.00	3.81	.00	4.500	.000	.00	1 .0
1.000	.0300					.0077	.01	5.85	.00	2.26	.013	.00	.00	PIPE
727.320	3433.040	5.830	3438.870	172.00	10.81	1.82	3440.69	.00	3.81	.00	4.500	.000	.00	1 .0
1.000	.0400					.0077	.01	5.83	.00	2.08	.013	.00	.00	PIPE
728.320	3433.080	5.798	3438.878	172.00	10.81	1.82	3440.69	.00	3.81	.00	4.500	.000	.00	1 .0
310.380	.0102					.0077	2.37	5.80	.00	3.24	.013	.00	.00	PIPE
1038.700	3436.240	5.012	3441.252	172.00	10.81	1.82	3443.07	.00	3.81	.00	4.500	.000	.00	1 .0
1.000	.0400					.0077	.01	5.01	.00	2.08	.013	.00	.00	PIPE
1039.700	3436.280	4.980	3441.260	172.00	10.81	1.82	3443.08	.00	3.81	.00	4.500	.000	.00	1 .0
1.000	.0300					.0077	.01	4.98	.00	2.26	.013	.00	.00	PIPE
1040.700	3436.310	5.048	3441.358	172.00	10.81	1.82	3443.17	.00	3.81	.00	4.500	.000	.00	1 .0
JUNCT STR	.0300					.0076	.01	5.05	.00		.013	.00	.00	PIPE
1041.700	3436.340	5.110	3441.450	170.00	10.69	1.77	3443.22	.00	3.80	.00	4.500	.000	.00	1 .0
1.000	.0398					.0075	.01	5.11	.00	2.07	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1042.700	3436.380	5.077	3441.457	170.00	10.69	1.77	3443.23	.00	3.80	.00	4.500	.000	.00	1 .0
1.000	.0300					.0075	.01	5.08	.00	2.25	.013	.00	.00	PIPE
1043.700	3436.410	5.055	3441.465	170.00	10.69	1.77	3443.24	.00	3.80	.00	4.500	.000	.00	1 .0
1.000	.0300					.0075	.01	5.05	.00	2.25	.013	.00	.00	PIPE
1044.700	3436.440	5.032	3441.472	170.00	10.69	1.77	3443.25	.00	3.80	.00	4.500	.000	.00	1 .0
113.420	.0105					.0075	.85	5.03	.00	3.17	.013	.00	.00	PIPE
1158.120	3437.630	4.690	3442.320	170.00	10.69	1.77	3444.09	.00	3.80	.00	4.500	.000	.00	1 .0
1.000	.0400					.0075	.01	4.69	.00	2.07	.013	.00	.00	PIPE
1159.120	3437.670	4.658	3442.328	170.00	10.69	1.77	3444.10	.00	3.80	.00	4.500	.000	.00	1 .0
1.000	.0300					.0075	.01	4.66	.00	2.25	.013	.00	.00	PIPE
1160.120	3437.700	4.724	3442.424	170.00	10.69	1.77	3444.20	.00	3.80	.00	4.500	.000	.00	1 .0
JUNCT STR	.0300					.0073	.01	4.72	.00		.013	.00	.00	PIPE
1161.120	3437.730	4.866	3442.596	166.00	10.44	1.69	3444.29	.00	3.76	.00	4.500	.000	.00	1 .0
TRANS STR	.0300					.0102	.01	4.87	.00		.013	.00	.00	PIPE
1162.120	3437.760	4.337	3442.097	166.00	13.21	2.71	3444.81	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0400					.0134	.01	4.34	.00	2.18	.013	.00	.00	PIPE
1163.120	3437.800	4.311	3442.111	166.00	13.21	2.71	3444.82	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	4.31	.00	2.39	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1164.120	3437.830	4.294	3442.124	166.00	13.21	2.71	3444.83	.00	3.70	.00	4.000	.000	.00	1 .0
225.040	.0103					.0134	3.01	4.29	.00	4.00	.013	.00	.00	PIPE
1389.160	3440.140	4.990	3445.130	166.00	13.21	2.71	3447.84	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0400					.0134	.01	4.99	.00	2.18	.013	.00	.00	PIPE
1390.160	3440.180	4.963	3445.143	166.00	13.21	2.71	3447.85	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	4.96	.00	2.39	.013	.00	.00	PIPE
1391.160	3440.210	4.982	3445.192	166.00	13.21	2.71	3447.90	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	4.98	.00	2.39	.013	.00	.00	PIPE
1392.160	3440.240	5.101	3445.341	166.00	13.21	2.71	3448.05	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	5.10	.00	2.39	.013	.00	.00	PIPE
1393.160	3440.270	5.120	3445.390	166.00	13.21	2.71	3448.10	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	5.12	.00	2.39	.013	.00	.00	PIPE
1394.160	3440.300	5.103	3445.404	166.00	13.21	2.71	3448.11	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0400					.0134	.01	5.10	.00	2.18	.013	.00	.00	PIPE
1395.160	3440.340	5.077	3445.417	166.00	13.21	2.71	3448.13	.00	3.70	.00	4.000	.000	.00	1 .0
54.330	.0112					.0134	.73	5.08	.00	4.00	.013	.00	.00	PIPE
1449.490	3440.950	5.193	3446.143	166.00	13.21	2.71	3448.85	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	5.19	.00	2.39	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1450.490	3440.980	5.176	3446.156	166.00	13.21	2.71	3448.87	.00	3.70	.00	4.000	.000	.00	1 .0
1.000	.0300					.0134	.01	5.18	.00	2.39	.013	.00	.00	PIPE
1451.490	3441.010	5.304	3446.314	166.00	13.21	2.71	3449.02	.00	3.70	.00	4.000	.000	.00	1 .0
JUNCT STR	.0400					.0130	.01	5.30	.00		.013	.00	.00	PIPE
1452.490	3441.050	5.535	3446.585	162.00	12.89	2.58	3449.17	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	5.53	.00	2.35	.013	.00	.00	PIPE
1453.490	3441.080	5.526	3446.606	162.00	12.89	2.58	3449.19	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	5.53	.00	2.35	.013	.00	.00	PIPE
1454.490	3441.110	5.509	3446.619	162.00	12.89	2.58	3449.20	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0398					.0127	.01	5.51	.00	2.15	.013	.00	.00	PIPE
1455.490	3441.150	5.482	3446.632	162.00	12.89	2.58	3449.21	.00	3.68	.00	4.000	.000	.00	1 .0
134.640	.0104					.0127	1.71	5.48	.00	4.00	.013	.00	.00	PIPE
1590.130	3442.550	5.794	3448.344	162.00	12.89	2.58	3450.92	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	5.79	.00	2.35	.013	.00	.00	PIPE
1591.130	3442.580	5.777	3448.357	162.00	12.89	2.58	3450.94	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	5.78	.00	2.35	.013	.00	.00	PIPE
1592.130	3442.610	5.793	3448.404	162.00	12.89	2.58	3450.98	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0398					.0127	.01	5.79	.00	2.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1593.130	3442.650	5.895	3448.545	162.00	12.89	2.58	3451.13	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	5.90	.00	2.35	.013	.00	.00	PIPE
1594.130	3442.680	5.912	3448.592	162.00	12.89	2.58	3451.17	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	5.91	.00	2.35	.013	.00	.00	PIPE
1595.130	3442.710	5.895	3448.605	162.00	12.89	2.58	3451.19	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0400					.0127	.01	5.90	.00	2.15	.013	.00	.00	PIPE
1596.130	3442.750	5.868	3448.618	162.00	12.89	2.58	3451.20	.00	3.68	.00	4.000	.000	.00	1 .0
179.740	.0103					.0127	2.29	5.87	.00	4.00	.013	.00	.00	PIPE
1775.870	3444.610	6.294	3450.904	162.00	12.89	2.58	3453.48	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0298					.0127	.01	6.29	.00	2.36	.013	.00	.00	PIPE
1776.870	3444.640	6.277	3450.917	162.00	12.89	2.58	3453.50	.00	3.68	.00	4.000	.000	.00	1 .0
1.000	.0300					.0127	.01	6.28	.00	2.35	.013	.00	.00	PIPE
1777.870	3444.670	6.388	3451.058	162.00	12.89	2.58	3453.64	.00	3.68	.00	4.000	.000	.00	1 .0
JUNCT STR	.0400					.0098	.01	6.39	.00		.013	.00	.00	PIPE
1778.870	3444.710	8.687	3453.397	120.00	12.47	2.42	3455.81	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0300					.0142	.01	8.69	.00	2.13	.013	.00	.00	PIPE
1779.870	3444.740	8.672	3453.412	120.00	12.47	2.42	3455.83	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0300					.0142	.01	8.67	.00	2.13	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1780.870	3444.770	8.656	3453.426	120.00	12.47	2.42	3455.84	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0400					.0142	.01	8.66	.00	1.95	.013	.00	.00	PIPE
1781.870	3444.810	8.630	3453.440	120.00	12.47	2.42	3455.86	.00	3.25	.00	3.500	.000	.00	1 .0
85.510	.0108					.0142	1.22	8.63	.00	3.50	.013	.00	.00	PIPE
1867.380	3445.730	8.926	3454.656	120.00	12.47	2.42	3457.07	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0300					.0142	.01	8.93	.00	2.13	.013	.00	.00	PIPE
1868.380	3445.760	8.911	3454.671	120.00	12.47	2.42	3457.09	.00	3.25	.00	3.500	.000	.00	1 .0
1.000	.0400					.0142	.01	8.91	.00	1.95	.013	.00	.00	PIPE
1869.380	3445.800	9.006	3454.806	120.00	12.47	2.42	3457.22	.00	3.25	.00	3.500	.000	.00	1 .0
JUNCT STR	.0300					.0136	.01	9.01	.00		.013	.00	.00	PIPE
1870.380	3445.830	9.383	3455.214	115.00	11.95	2.22	3457.43	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0300					.0131	.01	9.38	.00	2.08	.013	.00	.00	PIPE
1871.380	3445.860	9.367	3455.227	115.00	11.95	2.22	3457.45	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0398					.0131	.01	9.37	.00	1.90	.013	.00	.00	PIPE
1872.380	3445.900	9.340	3455.240	115.00	11.95	2.22	3457.46	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0300					.0131	.01	9.34	.00	2.08	.013	.00	.00	PIPE
1873.380	3445.930	9.323	3455.253	115.00	11.95	2.22	3457.47	.00	3.21	.00	3.500	.000	.00	1 .0
54.510	.0110					.0131	.71	9.32	.00	3.50	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time:11:58:57

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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
1927.890	3446.530	9.545	3456.075	115.00	11.95	2.22	3458.29	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0300					.0131	.01	9.55	.00	2.08	.013	.00	.00	PIPE
1928.890	3446.560	9.638	3456.198	115.00	11.95	2.22	3458.42	.00	3.21	.00	3.500	.000	.00	1 .0
1.000	.0400					.0131	.01	9.64	.00	1.90	.013	.00	.00	PIPE
1929.890	3446.600	9.721	3456.321	115.00	11.95	2.22	3458.54	.00	3.21	.00	3.500	.000	.00	1 .0
TRANS STR	.0298					.0214	.02	9.72	.00		.013	.00	.00	PIPE
1930.890	3446.630	8.767	3455.396	115.00	16.27	4.11	3459.51	.00	2.94	.00	3.000	.000	.00	1 .0
1.000	.0300					.0297	.03	8.77	.00	2.45	.013	.00	.00	PIPE
1931.890	3446.660	8.970	3455.630	115.00	16.27	4.11	3459.74	.00	2.94	.00	3.000	.000	.00	1 .0
1.000	.0400					.0297	.03	8.97	.00	2.15	.013	.00	.00	PIPE
1932.890	3446.700	9.163	3455.863	115.00	16.27	4.11	3459.97	.00	2.94	.00	3.000	.000	.00	1 .0
1.000	.0300					.0297	.03	9.16	.00	2.45	.013	.00	.00	PIPE
1933.890	3446.730	9.366	3456.096	115.00	16.27	4.11	3460.21	.00	2.94	.00	3.000	.000	.00	1 .0
66.090	.0103					.0297	1.96	9.37	.00	3.00	.013	.00	.00	PIPE
1999.980	3447.410	10.854	3458.264	115.00	16.27	4.11	3462.37	.00	2.94	.00	3.000	.000	.00	1 .0
.010	.0103					.0149	29.73	10.85	.00	3.00	.013	.00	.00	PIPE
1999.990	3447.420	10.854	3458.274	115.00	16.27	4.11	3462.38	.00	2.94	.00	3.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS - 100 YEAR ULTIMATE CONDITION
SO    552.78 3430.85  55                        3434.00
R     555.78 3430.95  55      .013                                .000    00.0 0
REM****       VTN
R     573.40 3431.09  55      .013                                .000    00.0 0
R     574.40 3431.10  55      .013                                .000    00.0 0
R     575.40 3431.11  55      .013                                .000    15.0 0
TS    576.40 3431.12  55      .013                                .000    07.0 1
R     577.40 3431.13  55      .013                                .000    15.0 0
R     578.40 3431.14  55      .013                                .000    00.0 0
R     579.40 3431.15  55      .013                                .000    00.0 0
REM*****     ATKINS     SDMH#1 DI #1,2
R     628.74 3431.71  55      .013                                .000    00.0 0
R     629.74 3431.74  55      .013                                .000    00.0 0
R     630.74 3431.78  55      .013                                .000    00.0 1
JX    631.74 3431.81  55 24 24.013     3.0     2.0  3431.91 3431.91  45.0-80.0    .000
TS    632.74 3431.85  54      .013                                .000    00.0 0
R     633.74 3431.88  54      .013                                .000    00.0 0
R     634.74 3431.91  54      .013                                .000    00.0 0
REM*****     ATKINS     SDMH#2  DI#9
R     722.32 3432.88  54      .013                                .000    00.0 0
R     723.32 3432.91  54      .013                                .000    00.0 0
R     724.32 3432.94  54      .013                                .000    00.0 1
JX    725.32 3432.98  54 24   .013   33.0           3435.74        -90.0        .000
TS    726.32 3433.01  54      .013                                .000    00.0 0
R     727.32 3433.04  54      .013                                .000    00.0 0
R     728.32 3433.08  54      .013                                .000    00.0 0
REM*****     ATKINS     SDMH#3 DI#3,4
R    1038.70 3436.24  54      .013                                .000    00.0 0
R    1039.70 3436.28  54      .013                                .000    00.0 0
R    1040.70 3436.31  54      .013                                .000    00.0 1
JX   1041.70 3436.34  54 24 24.013     1.0     1.0  3436.44 3436.44  90.0-90.0    .000
R    1042.70 3436.38  54      .013                                .000    00.0 0
R    1043.70 3436.41  54      .013                                .000    00.0 0
R    1044.70 3436.44  54      .013                                .000    00.0 0
REM*****     ATKINS     SDMH#4   DI#10
R    1158.12 3437.63  54      .013                                .000    00.0 0
R    1159.12 3437.67  54      .013                                .000    00.0 0
R    1160.12 3437.70  54      .013                                .000    00.0 1
JX   1161.12 3437.73  54 24   .013    4.0           3437.83        -90.0        .000
TS   1162.12 3437.76  48      .013                                .000    00.0 0
R    1163.12 3437.80  48      .013                                .000    00.0 0
R    1164.12 3437.83  48      .013                                .000    00.0 0
REM*****     ATKINS     SDMH#5
R    1389.16 3440.14  48      .013                                .000    00.0 0
R    1390.16 3440.18  48      .013                                .000    00.0 0
R    1391.16 3440.21  48      .013                                .000    04.0 0
R    1392.16 3440.24  48      .013                                .000    00.0 1
R    1393.16 3440.27  48      .013                                .000    04.0 0
R    1394.16 3440.30  48      .013                                .000    00.0 0
R    1395.16 3440.34  48      .013                                .000    00.0 0
REM*****     ATKINS     SDMH#6 DI#5,6
R    1449.49 3440.95  48      .013                                .000    00.0 0
R    1450.49 3440.98  48      .013                                .000    00.0 0
R    1451.49 3441.01  48      .013                                .000    01.0 1
JX   1452.49 3441.05  48 24 24.013     2.0     2.0  3441.15 3441.15  90.0-90.0    .000
R    1453.49 3441.08  48      .013                                .000    01.0 0
R    1454.49 3441.11  48      .013                                .000    00.0 0
R    1455.49 3441.15  48      .013                                .000    00.0 0
REM*****     ATKINS     SDMH#7
R    1590.13 3442.55  48      .013                                .000    00.0 0
R    1591.13 3442.58  48      .013                                .000    00.0 0
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R    1592.13 3442.61  48      .013                                  .000    04.0 0
R    1593.13 3442.65  48      .013                                  .000    00.0 1
R    1594.13 3442.68  48      .013                                  .000    04.0 0
R    1595.13 3442.71  48      .013                                  .000    00.0 0
R    1596.13 3442.75  48      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#8
R    1775.87 3444.61  48      .013                                  .000    00.0 0
R    1776.87 3444.64  48      .013                                  .000    00.0 0
R    1777.87 3444.67  48      .013                                  .000    00.0 1
JX   1778.87 3444.71  48 30   .013   42.000         3444.810        -90.0         .000
R    1779.87 3444.74  42      .013                                  .000    00.0 0
R    1780.87 3444.77  42      .013                                  .000    00.0 0
R    1781.87 3444.81  42      .013                                  .000    00.0 0
REM*****     ATKINS     SDMH#9 DI#7,8
R    1867.38 3445.73  42      .013                                  .000    00.0 0
R    1868.38 3445.76  42      .013                                  .000    00.0 0
R    1869.38 3445.80  42      .013                                  .000    00.0 1
JX   1870.38 3445.83  42 24 24.013     3.0     2.0  3435.93 3435.93  90.0-90.0    .000
R    1871.38 3445.86  42      .013                                  .000    00.0 0
R    1872.38 3445.90  42      .013                                  .000    00.0 0
R    1873.38 3445.93  42      .013                                  .000    00.0 0
REM*****      ATKINS     SDMH#10
R    1927.89 3446.53  42      .013                                  .000    15.0 0
R    1928.89 3446.56  42      .013                                  .000    15.0 0
R    1929.89 3446.60  42      .013                                  .000    15.0 0
TS   1930.89 3446.63  36      .013                                  .000    15.0 1
R    1931.89 3446.66  36      .013                                  .000    15.0 0
R    1932.89 3446.70  36      .013                                  .000    15.0 0
R    1933.89 3446.73  36      .013                                  .000    15.0 0
REM*****     ATKINS     STUB TO FUTURE FLIGHT RANGE AVENUE
R    1999.98 3447.41  36      .013                                  .000    15.0 0
SH   1999.99 3447.42  36
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q           115.000   .0
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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25: 5

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
631.740	3431.810	2.460	3434.270	5.00	1.59	.04	3434.31	.00	.79	.00	2.000	.000	.00	1 .0
3.000	.0333					.0005	.00	2.46	.00	.47	.013	.00	.00	PIPE
634.740	3431.910	2.362	3434.271	5.00	1.59	.04	3434.31	.00	.79	.00	2.000	.000	.00	1 .0
1.052	.3443					.0005	.00	2.36	.00	.27	.013	.00	.00	PIPE
635.792	3432.272	2.000	3434.272	5.00	1.59	.04	3434.31	.00	.79	.00	2.000	.000	.00	1 .0
.337	.3443					.0005	.00	2.00	.00	.27	.013	.00	.00	PIPE
636.129	3432.388	1.882	3434.270	5.00	1.63	.04	3434.31	.00	.79	.94	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
636.129	3432.388	.273	3432.661	5.00	19.43	5.86	3438.52	.00	.79	1.37	2.000	.000	.00	1 .0
2.946	.3443					.2990	.88	.27	7.91	.27	.013	.00	.00	PIPE
639.075	3433.403	.276	3433.679	5.00	19.09	5.66	3439.34	.00	.79	1.38	2.000	.000	.00	1 .0
7.092	.3443					.2731	1.94	.28	7.72	.27	.013	.00	.00	PIPE
646.167	3435.845	.285	3436.130	5.00	18.20	5.15	3441.28	.00	.79	1.40	2.000	.000	.00	1 .0
4.326	.3443					.2384	1.03	.29	7.24	.27	.013	.00	.00	PIPE
650.493	3437.334	.295	3437.629	5.00	17.36	4.68	3442.31	.00	.79	1.42	2.000	.000	.00	1 .0
3.050	.3443					.2081	.63	.29	6.79	.27	.013	.00	.00	PIPE
653.542	3438.384	.305	3438.689	5.00	16.55	4.25	3442.94	.00	.79	1.44	2.000	.000	.00	1 .0
2.315	.3443					.1817	.42	.30	6.36	.27	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
655.857	3439.181	.315	3439.496	5.00	15.78	3.87	3443.36	.00	.79	1.46	2.000	.000	.00	1 .0
1.837	.3443					.1587	.29	.31	5.96	.27	.013	.00	.00	PIPE
657.694	3439.814	.325	3440.139	5.00	15.04	3.51	3443.65	.00	.79	1.48	2.000	.000	.00	1 .0
1.500	.3443					.1386	.21	.33	5.59	.27	.013	.00	.00	PIPE
659.194	3440.330	.336	3440.666	5.00	14.34	3.19	3443.86	.00	.79	1.50	2.000	.000	.00	1 .0
1.250	.3443					.1210	.15	.34	5.24	.27	.013	.00	.00	PIPE
660.444	3440.760	.348	3441.108	5.00	13.68	2.90	3444.01	.00	.79	1.52	2.000	.000	.00	1 .0
1.057	.3443					.1057	.11	.35	4.91	.27	.013	.00	.00	PIPE
661.501	3441.125	.359	3441.484	5.00	13.04	2.64	3444.12	.00	.79	1.54	2.000	.000	.00	1 .0
.904	.3443					.0923	.08	.36	4.60	.27	.013	.00	.00	PIPE
662.406	3441.436	.371	3441.807	5.00	12.43	2.40	3444.21	.00	.79	1.56	2.000	.000	.00	1 .0
.780	.3443					.0807	.06	.37	4.31	.27	.013	.00	.00	PIPE
663.185	3441.705	.384	3442.088	5.00	11.85	2.18	3444.27	.00	.79	1.58	2.000	.000	.00	1 .0
.677	.3443					.0705	.05	.38	4.04	.27	.013	.00	.00	PIPE
663.862	3441.938	.397	3442.335	5.00	11.30	1.98	3444.32	.00	.79	1.60	2.000	.000	.00	1 .0
.590	.3443					.0616	.04	.40	3.78	.27	.013	.00	.00	PIPE
664.453	3442.141	.410	3442.552	5.00	10.78	1.80	3444.35	.00	.79	1.62	2.000	.000	.00	1 .0
.516	.3443					.0538	.03	.41	3.54	.27	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
664.969	3442.319	.424	3442.743	5.00	10.28	1.64	3444.38	.00	.79	1.64	2.000	.000	.00	1 .0
.453	.3443					.0470	.02	.42	3.32	.27	.013	.00	.00	PIPE
665.422	3442.475	.439	3442.913	5.00	9.80	1.49	3444.40	.00	.79	1.66	2.000	.000	.00	1 .0
.398	.3443					.0411	.02	.44	3.11	.27	.013	.00	.00	PIPE
665.820	3442.612	.454	3443.065	5.00	9.34	1.35	3444.42	.00	.79	1.68	2.000	.000	.00	1 .0
.349	.3443					.0359	.01	.45	2.91	.27	.013	.00	.00	PIPE
666.169	3442.732	.469	3443.201	5.00	8.91	1.23	3444.43	.00	.79	1.69	2.000	.000	.00	1 .0
.306	.3443					.0314	.01	.47	2.73	.27	.013	.00	.00	PIPE
666.475	3442.837	.485	3443.322	5.00	8.49	1.12	3444.44	.00	.79	1.71	2.000	.000	.00	1 .0
.269	.3443					.0275	.01	.49	2.55	.27	.013	.00	.00	PIPE
666.744	3442.930	.502	3443.432	5.00	8.10	1.02	3444.45	.00	.79	1.73	2.000	.000	.00	1 .0
.235	.3443					.0240	.01	.50	2.39	.27	.013	.00	.00	PIPE
666.979	3443.010	.519	3443.530	5.00	7.72	.93	3444.46	.00	.79	1.75	2.000	.000	.00	1 .0
.205	.3443					.0210	.00	.52	2.24	.27	.013	.00	.00	PIPE
667.184	3443.081	.537	3443.618	5.00	7.36	.84	3444.46	.00	.79	1.77	2.000	.000	.00	1 .0
.178	.3443					.0184	.00	.54	2.10	.27	.013	.00	.00	PIPE
667.361	3443.142	.556	3443.698	5.00	7.02	.76	3444.46	.00	.79	1.79	2.000	.000	.00	1 .0
.153	.3443					.0161	.00	.56	1.96	.27	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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
667.514	3443.195	.575	3443.770	5.00	6.69	.70	3444.47	.00	.79	1.81	2.000	.000	.00	1 .0
.131	.3443					.0141	.00	.58	1.84	.27	.013	.00	.00	PIPE
667.645	3443.240	.595	3443.835	5.00	6.38	.63	3444.47	.00	.79	1.83	2.000	.000	.00	1 .0
.110	.3443					.0123	.00	.60	1.72	.27	.013	.00	.00	PIPE
667.755	3443.278	.616	3443.894	5.00	6.08	.57	3444.47	.00	.79	1.85	2.000	.000	.00	1 .0
.092	.3443					.0108	.00	.62	1.61	.27	.013	.00	.00	PIPE
667.847	3443.310	.638	3443.947	5.00	5.80	.52	3444.47	.00	.79	1.86	2.000	.000	.00	1 .0
.075	.3443					.0095	.00	.64	1.50	.27	.013	.00	.00	PIPE
667.922	3443.335	.660	3443.995	5.00	5.53	.47	3444.47	.00	.79	1.88	2.000	.000	.00	1 .0
.059	.3443					.0083	.00	.66	1.41	.27	.013	.00	.00	PIPE
667.981	3443.356	.683	3444.039	5.00	5.27	.43	3444.47	.00	.79	1.90	2.000	.000	.00	1 .0
.044	.3443					.0073	.00	.68	1.31	.27	.013	.00	.00	PIPE
668.025	3443.371	.708	3444.079	5.00	5.03	.39	3444.47	.00	.79	1.91	2.000	.000	.00	1 .0
.031	.3443					.0064	.00	.71	1.23	.27	.013	.00	.00	PIPE
668.056	3443.382	.733	3444.115	5.00	4.79	.36	3444.47	.00	.79	1.93	2.000	.000	.00	1 .0
.018	.3443					.0056	.00	.73	1.15	.27	.013	.00	.00	PIPE
668.074	3443.388	.759	3444.147	5.00	4.57	.32	3444.47	.00	.79	1.94	2.000	.000	.00	1 .0
.006	.3443					.0049	.00	.76	1.07	.27	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS - SDDI-1 100 YEAR INTERIM 5 cfs /ULTIMATE 3 cfs (Modeled with U

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	Type Ch
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall				
668.080	3443.390	.788	3444.177	5.00	4.35	.29	3444.47	.00	.79	1.95	2.000	.000	.00	1	.0	
671.080	3443.390	.788	3444.177	5.00	4.35	.29	3444.47	.00	.79	1.95	2.000	.000	.00	1	.0	

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS - SDDI-1 100 ULTIMATE 3 CONDITION
SO    631.74 3431.81  55                        3434.28
R     634.74 3431.91  24      .013                              .000    00.0 0
R     668.08 3443.39  24      .013                              .000    00.0 0
SH    671.08 3443.39  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             3.000   .0
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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
631.740	3431.810	2.460	3434.270	2.00	.64	.01	3434.28	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0333					.0001	.00	2.46	.00	.30	.013	.00	.00	PIPE
634.740	3431.910	2.360	3434.270	2.00	.64	.01	3434.28	.00	.49	.00	2.000	.000	.00	1 .0
.943	.3820					.0001	.00	2.36	.00	.17	.013	.00	.00	PIPE
635.683	3432.270	2.000	3434.270	2.00	.64	.01	3434.28	.00	.49	.00	2.000	.000	.00	1 .0
.481	.3820					.0001	.00	2.00	.00	.17	.013	.00	.00	PIPE
636.165	3432.454	1.815	3434.269	2.00	.67	.01	3434.28	.00	.49	1.16	2.000	.000	.00	1 .0
.280	.3820					.0001	.00	1.81	.07	.17	.013	.00	.00	PIPE
636.445	3432.561	1.707	3434.268	2.00	.70	.01	3434.28	.00	.49	1.41	2.000	.000	.00	1 .0
.231	.3820					.0001	.00	1.71	.09	.17	.013	.00	.00	PIPE
636.675	3432.649	1.618	3434.267	2.00	.73	.01	3434.28	.00	.49	1.57	2.000	.000	.00	1 .0
.202	.3820					.0001	.00	1.62	.10	.17	.013	.00	.00	PIPE
636.877	3432.726	1.540	3434.266	2.00	.77	.01	3434.28	.00	.49	1.68	2.000	.000	.00	1 .0
.181	.3820					.0001	.00	1.54	.11	.17	.013	.00	.00	PIPE
637.058	3432.795	1.470	3434.265	2.00	.81	.01	3434.28	.00	.49	1.77	2.000	.000	.00	1 .0
.165	.3820					.0001	.00	1.47	.12	.17	.013	.00	.00	PIPE
637.223	3432.858	1.406	3434.264	2.00	.85	.01	3434.28	.00	.49	1.83	2.000	.000	.00	1 .0
.152	.3820					.0001	.00	1.41	.13	.17	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
637.375	3432.916	1.347	3434.263	2.00	.89	.01	3434.28	.00	.49	1.88	2.000	.000	.00	1 .0
.142	.3820					.0001	.00	1.35	.14	.17	.013	.00	.00	PIPE
637.517	3432.970	1.292	3434.262	2.00	.93	.01	3434.28	.00	.49	1.91	2.000	.000	.00	1 .0
.132	.3820					.0001	.00	1.29	.16	.17	.013	.00	.00	PIPE
637.649	3433.021	1.240	3434.261	2.00	.98	.01	3434.28	.00	.49	1.94	2.000	.000	.00	1 .0
.124	.3820					.0002	.00	1.24	.17	.17	.013	.00	.00	PIPE
637.773	3433.068	1.191	3434.259	2.00	1.03	.02	3434.28	.00	.49	1.96	2.000	.000	.00	1 .0
.116	.3820					.0002	.00	1.19	.18	.17	.013	.00	.00	PIPE
637.889	3433.113	1.145	3434.258	2.00	1.08	.02	3434.28	.00	.49	1.98	2.000	.000	.00	1 .0
.109	.3820					.0002	.00	1.15	.20	.17	.013	.00	.00	PIPE
637.999	3433.155	1.101	3434.256	2.00	1.13	.02	3434.28	.00	.49	1.99	2.000	.000	.00	1 .0
.103	.3820					.0002	.00	1.10	.21	.17	.013	.00	.00	PIPE
638.102	3433.194	1.060	3434.254	2.00	1.18	.02	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.098	.3820					.0003	.00	1.06	.23	.17	.013	.00	.00	PIPE
638.199	3433.231	1.021	3434.252	2.00	1.24	.02	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.092	.3820					.0003	.00	1.02	.24	.17	.013	.00	.00	PIPE
638.291	3433.267	.983	3434.250	2.00	1.30	.03	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.087	.3820					.0004	.00	.98	.26	.17	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25:18

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
638.378	3433.300	.947	3434.247	2.00	1.36	.03	3434.28	.00	.49	2.00	2.000	.000	.00	1 .0
.082	.3820					.0004	.00	.95	.28	.17	.013	.00	.00	PIPE
638.460	3433.331	.913	3434.244	2.00	1.43	.03	3434.28	.00	.49	1.99	2.000	.000	.00	1 .0
.077	.3820					.0005	.00	.91	.30	.17	.013	.00	.00	PIPE
638.538	3433.361	.880	3434.241	2.00	1.50	.03	3434.28	.00	.49	1.99	2.000	.000	.00	1 .0
.073	.3820					.0005	.00	.88	.32	.17	.013	.00	.00	PIPE
638.611	3433.388	.849	3434.238	2.00	1.57	.04	3434.28	.00	.49	1.98	2.000	.000	.00	1 .0
.068	.3820					.0006	.00	.85	.35	.17	.013	.00	.00	PIPE
638.679	3433.415	.819	3434.234	2.00	1.65	.04	3434.28	.00	.49	1.97	2.000	.000	.00	1 .0
638.681	3433.415	.790	3434.206	2.00	1.73	.05	3434.25	.00	.49	1.96	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
638.681	3433.415	.269	3433.685	2.00	7.91	.97	3434.66	.00	.49	1.37	2.000	.000	.00	1 .0
.213	.3820					.0483	.01	.27	3.24	.17	.013	.00	.00	PIPE
638.894	3433.497	.278	3433.775	2.00	7.54	.88	3434.66	.00	.49	1.38	2.000	.000	.00	1 .0
.209	.3820					.0422	.01	.28	3.04	.17	.013	.00	.00	PIPE
639.103	3433.577	.288	3433.865	2.00	7.19	.80	3434.67	.00	.49	1.40	2.000	.000	.00	1 .0
.184	.3820					.0368	.01	.29	2.85	.17	.013	.00	.00	PIPE
639.286	3433.647	.297	3433.944	2.00	6.86	.73	3434.67	.00	.49	1.42	2.000	.000	.00	1 .0
.161	.3820					.0321	.01	.30	2.67	.17	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25:18

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
639.448	3433.708	.307	3434.016	2.00	6.54	.66	3434.68	.00	.49	1.44	2.000	.000	.00	1 .0
.141	.3820					.0281	.00	.31	2.50	.17	.013	.00	.00	PIPE
639.589	3433.762	.318	3434.080	2.00	6.23	.60	3434.68	.00	.49	1.46	2.000	.000	.00	1 .0
.123	.3820					.0245	.00	.32	2.34	.17	.013	.00	.00	PIPE
639.712	3433.810	.328	3434.138	2.00	5.94	.55	3434.69	.00	.49	1.48	2.000	.000	.00	1 .0
.108	.3820					.0214	.00	.33	2.20	.17	.013	.00	.00	PIPE
639.820	3433.851	.339	3434.190	2.00	5.67	.50	3434.69	.00	.49	1.50	2.000	.000	.00	1 .0
.093	.3820					.0187	.00	.34	2.06	.17	.013	.00	.00	PIPE
639.913	3433.886	.351	3434.237	2.00	5.40	.45	3434.69	.00	.49	1.52	2.000	.000	.00	1 .0
.080	.3820					.0163	.00	.35	1.93	.17	.013	.00	.00	PIPE
639.994	3433.917	.362	3434.280	2.00	5.15	.41	3434.69	.00	.49	1.54	2.000	.000	.00	1 .0
.069	.3820					.0143	.00	.36	1.81	.17	.013	.00	.00	PIPE
640.062	3433.943	.375	3434.318	2.00	4.91	.37	3434.69	.00	.49	1.56	2.000	.000	.00	1 .0
.058	.3820					.0125	.00	.37	1.69	.17	.013	.00	.00	PIPE
640.120	3433.965	.387	3434.353	2.00	4.68	.34	3434.69	.00	.49	1.58	2.000	.000	.00	1 .0
.048	.3820					.0109	.00	.39	1.59	.17	.013	.00	.00	PIPE
640.168	3433.984	.400	3434.384	2.00	4.46	.31	3434.69	.00	.49	1.60	2.000	.000	.00	1 .0
.039	.3820					.0095	.00	.40	1.49	.17	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-2 100 YEAR ULTIMATE CONDITION

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
640.207	3433.999	.414	3434.413	2.00	4.26	.28	3434.69	.00	.49	1.62	2.000	.000	.00	1 .0
.031	.3820					.0083	.00	.41	1.39	.17	.013	.00	.00	PIPE
640.238	3434.010	.428	3434.438	2.00	4.06	.26	3434.69	.00	.49	1.64	2.000	.000	.00	1 .0
.023	.3820					.0073	.00	.43	1.31	.17	.013	.00	.00	PIPE
640.261	3434.019	.443	3434.462	2.00	3.87	.23	3434.69	.00	.49	1.66	2.000	.000	.00	1 .0
.016	.3820					.0063	.00	.44	1.22	.17	.013	.00	.00	PIPE
640.277	3434.025	.458	3434.483	2.00	3.69	.21	3434.69	.00	.49	1.68	2.000	.000	.00	1 .0
.010	.3820					.0055	.00	.46	1.14	.17	.013	.00	.00	PIPE
640.287	3434.029	.473	3434.502	2.00	3.52	.19	3434.69	.00	.49	1.70	2.000	.000	.00	1 .0
.003	.3820					.0048	.00	.47	1.07	.17	.013	.00	.00	PIPE
640.290	3434.030	.491	3434.521	2.00	3.34	.17	3434.69	.00	.49	1.72	2.000	.000	.00	1 .0
643.290	3434.030	.491	3434.521	2.00	3.34	.17	3434.69	.00	.49	1.72	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-2  100 YEAR ULTIMATE CONDITION
SO    631.74 3431.81  55                          3434.28
R     634.74 3431.91  24      .013                              .000    00.0 0
R     640.29 3434.03  24      .013                              .000    00.0 0
SH    643.29 3434.03  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             2.000   .0
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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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	
1041.710	3436.340	5.620	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
3.000	.0333					.0000	.00	5.62	.00	.21	.013	.00	.00	PIPE
1044.710	3436.440	5.520	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
6.912	.5093					.0000	.00	5.52	.00	.11	.013	.00	.00	PIPE
1051.622	3439.960	2.000	3441.960	1.00	.32	.00	3441.96	.00	.34	.00	2.000	.000	.00	1 .0
.362	.5093					.0000	.00	2.00	.00	.11	.013	.00	.00	PIPE
1051.984	3440.145	1.815	3441.959	1.00	.33	.00	3441.96	.00	.34	1.16	2.000	.000	.00	1 .0
.211	.5093					.0000	.00	1.81	.04	.11	.013	.00	.00	PIPE
1052.195	3440.252	1.707	3441.959	1.00	.35	.00	3441.96	.00	.34	1.41	2.000	.000	.00	1 .0
.174	.5093					.0000	.00	1.71	.04	.11	.013	.00	.00	PIPE
1052.369	3440.341	1.618	3441.959	1.00	.37	.00	3441.96	.00	.34	1.57	2.000	.000	.00	1 .0
.152	.5093					.0000	.00	1.62	.05	.11	.013	.00	.00	PIPE
1052.522	3440.418	1.540	3441.958	1.00	.39	.00	3441.96	.00	.34	1.68	2.000	.000	.00	1 .0
.137	.5093					.0000	.00	1.54	.05	.11	.013	.00	.00	PIPE
1052.659	3440.488	1.470	3441.958	1.00	.40	.00	3441.96	.00	.34	1.77	2.000	.000	.00	1 .0
.125	.5093					.0000	.00	1.47	.06	.11	.013	.00	.00	PIPE
1052.784	3440.552	1.406	3441.958	1.00	.42	.00	3441.96	.00	.34	1.83	2.000	.000	.00	1 .0
.116	.5093					.0000	.00	1.41	.07	.11	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1052.900	3440.611	1.347	3441.958	1.00	.44	.00	3441.96	.00	.34	1.88	2.000	.000	.00	1 .0
.108	.5093					.0000	.00	1.35	.07	.11	.013	.00	.00	PIPE
1053.008	3440.666	1.292	3441.958	1.00	.47	.00	3441.96	.00	.34	1.91	2.000	.000	.00	1 .0
.101	.5093					.0000	.00	1.29	.08	.11	.013	.00	.00	PIPE
1053.109	3440.718	1.240	3441.957	1.00	.49	.00	3441.96	.00	.34	1.94	2.000	.000	.00	1 .0
.095	.5093					.0000	.00	1.24	.08	.11	.013	.00	.00	PIPE
1053.204	3440.766	1.191	3441.957	1.00	.51	.00	3441.96	.00	.34	1.96	2.000	.000	.00	1 .0
.089	.5093					.0000	.00	1.19	.09	.11	.013	.00	.00	PIPE
1053.294	3440.812	1.145	3441.957	1.00	.54	.00	3441.96	.00	.34	1.98	2.000	.000	.00	1 .0
.085	.5093					.0001	.00	1.15	.10	.11	.013	.00	.00	PIPE
1053.378	3440.855	1.101	3441.956	1.00	.56	.00	3441.96	.00	.34	1.99	2.000	.000	.00	1 .0
.080	.5093					.0001	.00	1.10	.11	.11	.013	.00	.00	PIPE
1053.459	3440.896	1.060	3441.956	1.00	.59	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.076	.5093					.0001	.00	1.06	.11	.11	.013	.00	.00	PIPE
1053.535	3440.935	1.021	3441.955	1.00	.62	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.073	.5093					.0001	.00	1.02	.12	.11	.013	.00	.00	PIPE
1053.607	3440.971	.983	3441.955	1.00	.65	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.069	.5093					.0001	.00	.98	.13	.11	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25:33

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1053.676	3441.007	.947	3441.954	1.00	.68	.01	3441.96	.00	.34	2.00	2.000	.000	.00	1 .0
.066	.5093					.0001	.00	.95	.14	.11	.013	.00	.00	PIPE
1053.742	3441.040	.913	3441.953	1.00	.72	.01	3441.96	.00	.34	1.99	2.000	.000	.00	1 .0
.063	.5093					.0001	.00	.91	.15	.11	.013	.00	.00	PIPE
1053.805	3441.072	.880	3441.952	1.00	.75	.01	3441.96	.00	.34	1.99	2.000	.000	.00	1 .0
.060	.5093					.0001	.00	.88	.16	.11	.013	.00	.00	PIPE
1053.865	3441.103	.849	3441.952	1.00	.79	.01	3441.96	.00	.34	1.98	2.000	.000	.00	1 .0
.056	.5093					.0001	.00	.85	.17	.11	.013	.00	.00	PIPE
1053.921	3441.131	.819	3441.950	1.00	.83	.01	3441.96	.00	.34	1.97	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1053.921	3441.131	.113	3441.244	1.00	14.27	3.16	3444.40	.00	.34	.92	2.000	.000	.00	1 .0
1.637	.5093					.4996	.82	.11	9.12	.11	.013	.00	.00	PIPE
1055.558	3441.964	.114	3442.078	1.00	14.07	3.08	3445.15	.00	.34	.93	2.000	.000	.00	1 .0
5.443	.5093					.4586	2.50	.11	8.96	.11	.013	.00	.00	PIPE
1061.001	3444.736	.117	3444.854	1.00	13.42	2.80	3447.65	.00	.34	.94	2.000	.000	.00	1 .0
2.288	.5093					.3998	.91	.12	8.40	.11	.013	.00	.00	PIPE
1063.289	3445.901	.121	3446.022	1.00	12.79	2.54	3448.56	.00	.34	.95	2.000	.000	.00	1 .0
1.414	.5093					.3486	.49	.12	7.88	.11	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25:33

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1064.703	3446.621	.125	3446.746	1.00	12.20	2.31	3449.06	.00	.34	.97	2.000	.000	.00	1 .0
1.004	.5093					.3041	.31	.13	7.39	.11	.013	.00	.00	PIPE
1065.707	3447.132	.129	3447.262	1.00	11.63	2.10	3449.36	.00	.34	.98	2.000	.000	.00	1 .0
.765	.5093					.2651	.20	.13	6.93	.11	.013	.00	.00	PIPE
1066.472	3447.522	.134	3447.656	1.00	11.09	1.91	3449.57	.00	.34	1.00	2.000	.000	.00	1 .0
.609	.5093					.2312	.14	.13	6.50	.11	.013	.00	.00	PIPE
1067.080	3447.832	.138	3447.970	1.00	10.57	1.74	3449.71	.00	.34	1.01	2.000	.000	.00	1 .0
.499	.5093					.2016	.10	.14	6.10	.11	.013	.00	.00	PIPE
1067.579	3448.086	.142	3448.228	1.00	10.08	1.58	3449.81	.00	.34	1.03	2.000	.000	.00	1 .0
.416	.5093					.1759	.07	.14	5.72	.11	.013	.00	.00	PIPE
1067.995	3448.298	.147	3448.445	1.00	9.61	1.43	3449.88	.00	.34	1.04	2.000	.000	.00	1 .0
.353	.5093					.1534	.05	.15	5.37	.11	.013	.00	.00	PIPE
1068.348	3448.478	.152	3448.629	1.00	9.17	1.30	3449.93	.00	.34	1.06	2.000	.000	.00	1 .0
.302	.5093					.1338	.04	.15	5.03	.11	.013	.00	.00	PIPE
1068.651	3448.632	.157	3448.789	1.00	8.74	1.19	3449.97	.00	.34	1.08	2.000	.000	.00	1 .0
.262	.5093					.1167	.03	.16	4.72	.11	.013	.00	.00	PIPE
1068.912	3448.765	.162	3448.927	1.00	8.33	1.08	3450.00	.00	.34	1.09	2.000	.000	.00	1 .0
.227	.5093					.1018	.02	.16	4.43	.11	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25:33

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1069.140	3448.881	.167	3449.048	1.00	7.94	.98	3450.03	.00	.34	1.11	2.000	.000	.00	1 .0
.199	.5093					.0888	.02	.17	4.15	.11	.013	.00	.00	PIPE
1069.339	3448.982	.173	3449.155	1.00	7.57	.89	3450.05	.00	.34	1.12	2.000	.000	.00	1 .0
.174	.5093					.0775	.01	.17	3.90	.11	.013	.00	.00	PIPE
1069.513	3449.071	.179	3449.250	1.00	7.22	.81	3450.06	.00	.34	1.14	2.000	.000	.00	1 .0
.154	.5093					.0676	.01	.18	3.65	.11	.013	.00	.00	PIPE
1069.667	3449.149	.184	3449.333	1.00	6.89	.74	3450.07	.00	.34	1.16	2.000	.000	.00	1 .0
.135	.5093					.0589	.01	.18	3.43	.11	.013	.00	.00	PIPE
1069.802	3449.218	.191	3449.408	1.00	6.57	.67	3450.08	.00	.34	1.17	2.000	.000	.00	1 .0
.119	.5093					.0514	.01	.19	3.21	.11	.013	.00	.00	PIPE
1069.921	3449.279	.197	3449.475	1.00	6.26	.61	3450.08	.00	.34	1.19	2.000	.000	.00	1 .0
.105	.5093					.0449	.00	.20	3.01	.11	.013	.00	.00	PIPE
1070.026	3449.332	.203	3449.535	1.00	5.97	.55	3450.09	.00	.34	1.21	2.000	.000	.00	1 .0
.093	.5093					.0391	.00	.20	2.83	.11	.013	.00	.00	PIPE
1070.119	3449.379	.210	3449.589	1.00	5.69	.50	3450.09	.00	.34	1.23	2.000	.000	.00	1 .0
.082	.5093					.0342	.00	.21	2.65	.11	.013	.00	.00	PIPE
1070.200	3449.421	.217	3449.638	1.00	5.43	.46	3450.09	.00	.34	1.24	2.000	.000	.00	1 .0
.072	.5093					.0298	.00	.22	2.48	.11	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25:33

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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
1070.272	3449.457	.224	3449.681	1.00	5.17	.42	3450.10	.00	.34	1.26	2.000	.000	.00	1 .0
.063	.5093					.0260	.00	.22	2.33	.11	.013	.00	.00	PIPE
1070.335	3449.489	.232	3449.721	1.00	4.93	.38	3450.10	.00	.34	1.28	2.000	.000	.00	1 .0
.055	.5093					.0227	.00	.23	2.18	.11	.013	.00	.00	PIPE
1070.390	3449.517	.239	3449.757	1.00	4.70	.34	3450.10	.00	.34	1.30	2.000	.000	.00	1 .0
.047	.5093					.0198	.00	.24	2.05	.11	.013	.00	.00	PIPE
1070.437	3449.542	.247	3449.789	1.00	4.48	.31	3450.10	.00	.34	1.32	2.000	.000	.00	1 .0
.041	.5093					.0173	.00	.25	1.92	.11	.013	.00	.00	PIPE
1070.478	3449.563	.255	3449.818	1.00	4.28	.28	3450.10	.00	.34	1.34	2.000	.000	.00	1 .0
.035	.5093					.0151	.00	.26	1.80	.11	.013	.00	.00	PIPE
1070.513	3449.580	.264	3449.844	1.00	4.08	.26	3450.10	.00	.34	1.35	2.000	.000	.00	1 .0
.030	.5093					.0132	.00	.26	1.69	.11	.013	.00	.00	PIPE
1070.543	3449.595	.273	3449.868	1.00	3.89	.23	3450.10	.00	.34	1.37	2.000	.000	.00	1 .0
.025	.5093					.0115	.00	.27	1.58	.11	.013	.00	.00	PIPE
1070.568	3449.608	.282	3449.890	1.00	3.71	.21	3450.10	.00	.34	1.39	2.000	.000	.00	1 .0
.020	.5093					.0100	.00	.28	1.48	.11	.013	.00	.00	PIPE
1070.588	3449.618	.291	3449.909	1.00	3.53	.19	3450.10	.00	.34	1.41	2.000	.000	.00	1 .0
.016	.5093					.0088	.00	.29	1.39	.11	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-3 100 YEAR ULTIMATE CONDITION

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	
1070.603	3449.626	.301	3449.927	1.00	3.37	.18	3450.10	.00	.34	1.43	2.000	.000	.00	1 .0
.012	.5093					.0076	.00	.30	1.30	.11	.013	.00	.00	PIPE
1070.615	3449.633	.311	3449.943	1.00	3.21	.16	3450.10	.00	.34	1.45	2.000	.000	.00	1 .0
.008	.5093					.0067	.00	.31	1.22	.11	.013	.00	.00	PIPE
1070.623	3449.637	.321	3449.958	1.00	3.06	.15	3450.10	.00	.34	1.47	2.000	.000	.00	1 .0
.005	.5093					.0058	.00	.32	1.14	.11	.013	.00	.00	PIPE
1070.628	3449.639	.332	3449.971	1.00	2.92	.13	3450.10	.00	.34	1.49	2.000	.000	.00	1 .0
.002	.5093					.0051	.00	.33	1.07	.11	.013	.00	.00	PIPE
1070.630	3449.640	.344	3449.984	1.00	2.77	.12	3450.10	.00	.34	1.51	2.000	.000	.00	1 .0
1073.630	3449.640	.344	3449.984	1.00	2.77	.12	3450.10	.00	.34	1.51	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-3  100 YEAR ULTIMATE CONDITION
SO   1041.70 3436.34  54                          3441.45
R    1044.70 3436.44  24      .013                                .000    00.0 0
R    1070.62 3449.64  24      .013                                .000    00.0 0
SH   1073.62 3449.64  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             1.000   .0
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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-4 100 YEAR ULTIMATE CONDITION

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
1041.700	3436.340	5.110	3441.450	1.00	.32	.00	3441.45	.00	.34	.00	2.000	.000	.00	1 .0
3.000	.0333					.0000	.00	5.11	.00	.21	.013	.00	.00	PIPE
1044.700	3436.440	5.010	3441.450	1.00	.32	.00	3441.45	.00	.34	.00	2.000	.000	.00	1 .0
3.785	.7953					.0000	.00	5.01	.00	.10	.013	.00	.00	PIPE
1048.485	3439.450	2.000	3441.450	1.00	.32	.00	3441.45	.00	.34	.00	2.000	.000	.00	1 .0
.232	.7953					.0000	.00	2.00	.00	.10	.013	.00	.00	PIPE
1048.717	3439.635	1.815	3441.449	1.00	.33	.00	3441.45	.00	.34	1.16	2.000	.000	.00	1 .0
.135	.7953					.0000	.00	1.81	.04	.10	.013	.00	.00	PIPE
1048.852	3439.742	1.707	3441.449	1.00	.35	.00	3441.45	.00	.34	1.41	2.000	.000	.00	1 .0
.111	.7953					.0000	.00	1.71	.04	.10	.013	.00	.00	PIPE
1048.963	3439.831	1.618	3441.449	1.00	.37	.00	3441.45	.00	.34	1.57	2.000	.000	.00	1 .0
.098	.7953					.0000	.00	1.62	.05	.10	.013	.00	.00	PIPE
1049.061	3439.908	1.540	3441.448	1.00	.39	.00	3441.45	.00	.34	1.68	2.000	.000	.00	1 .0
.088	.7953					.0000	.00	1.54	.05	.10	.013	.00	.00	PIPE
1049.149	3439.978	1.470	3441.448	1.00	.40	.00	3441.45	.00	.34	1.77	2.000	.000	.00	1 .0
.080	.7953					.0000	.00	1.47	.06	.10	.013	.00	.00	PIPE
1049.229	3440.042	1.406	3441.448	1.00	.42	.00	3441.45	.00	.34	1.83	2.000	.000	.00	1 .0
.074	.7953					.0000	.00	1.41	.07	.10	.013	.00	.00	PIPE

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SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-4 100 YEAR ULTIMATE CONDITION

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
1049.303	3440.101	1.347	3441.448	1.00	.44	.00	3441.45	.00	.34	1.88	2.000	.000	.00	1 .0
.069	.7953					.0000	.00	1.35	.07	.10	.013	.00	.00	PIPE
1049.372	3440.156	1.292	3441.448	1.00	.47	.00	3441.45	.00	.34	1.91	2.000	.000	.00	1 .0
.065	.7953					.0000	.00	1.29	.08	.10	.013	.00	.00	PIPE
1049.437	3440.208	1.240	3441.447	1.00	.49	.00	3441.45	.00	.34	1.94	2.000	.000	.00	1 .0
.061	.7953					.0000	.00	1.24	.08	.10	.013	.00	.00	PIPE
1049.498	3440.256	1.191	3441.447	1.00	.51	.00	3441.45	.00	.34	1.96	2.000	.000	.00	1 .0
.057	.7953					.0000	.00	1.19	.09	.10	.013	.00	.00	PIPE
1049.555	3440.302	1.145	3441.447	1.00	.54	.00	3441.45	.00	.34	1.98	2.000	.000	.00	1 .0
.054	.7953					.0001	.00	1.15	.10	.10	.013	.00	.00	PIPE
1049.610	3440.345	1.101	3441.446	1.00	.56	.00	3441.45	.00	.34	1.99	2.000	.000	.00	1 .0
.051	.7953					.0001	.00	1.10	.11	.10	.013	.00	.00	PIPE
1049.661	3440.386	1.060	3441.446	1.00	.59	.01	3441.45	.00	.34	2.00	2.000	.000	.00	1 .0
.049	.7953					.0001	.00	1.06	.11	.10	.013	.00	.00	PIPE
1049.710	3440.425	1.021	3441.445	1.00	.62	.01	3441.45	.00	.34	2.00	2.000	.000	.00	1 .0
.046	.7953					.0001	.00	1.02	.12	.10	.013	.00	.00	PIPE
1049.756	3440.461	.983	3441.445	1.00	.65	.01	3441.45	.00	.34	2.00	2.000	.000	.00	1 .0
.024	.7953					.0001	.00	.98	.13	.10	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:25:59

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-4 100 YEAR ULTIMATE CONDITION

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	Type Ch
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall					
1049.780	3440.480	.964	3441.444	1.00	.67	.01	3441.45	.00	.34	2.00	2.000	.000	.00	.00	1	.0
3.000	.7953				.2446	1.24	.96	.14	.10	.013		.00	.00		PIPE	
1052.780	3440.480	.964	3441.444	1.00	.67	.01	3441.45	.00	.34	2.00	2.000	.000	.00	.00	1	.0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-4  100 YEAR ULTIMATE CONDITION
SO   1041.71 3436.34  48                          3441.96
R    1044.71 3436.44  24      .013                              .000    00.0 0
R    1049.79 3440.48  24      .013                              .000    00.0 0
SH   1052.79 3440.48  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            1.000   .0
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SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1452.490	3441.050	5.540	3446.590	2.00	.64	.01	3446.60	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0333					.0001	.00	5.54	.00	.30	.013	.00	.00	PIPE
1455.490	3441.150	5.440	3446.590	2.00	.64	.01	3446.60	.00	.49	.00	2.000	.000	.00	1 .0
6.423	.5357					.0001	.00	5.44	.00	.15	.013	.00	.00	PIPE
1461.913	3444.591	2.000	3446.591	2.00	.64	.01	3446.60	.00	.49	.00	2.000	.000	.00	1 .0
.343	.5357					.0001	.00	2.00	.00	.15	.013	.00	.00	PIPE
1462.256	3444.775	1.815	3446.589	2.00	.67	.01	3446.60	.00	.49	1.16	2.000	.000	.00	1 .0
.200	.5357					.0001	.00	1.81	.07	.15	.013	.00	.00	PIPE
1462.456	3444.882	1.707	3446.589	2.00	.70	.01	3446.60	.00	.49	1.41	2.000	.000	.00	1 .0
.164	.5357					.0001	.00	1.71	.09	.15	.013	.00	.00	PIPE
1462.620	3444.970	1.618	3446.588	2.00	.73	.01	3446.60	.00	.49	1.57	2.000	.000	.00	1 .0
.144	.5357					.0001	.00	1.62	.10	.15	.013	.00	.00	PIPE
1462.764	3445.047	1.540	3446.587	2.00	.77	.01	3446.60	.00	.49	1.68	2.000	.000	.00	1 .0
.129	.5357					.0001	.00	1.54	.11	.15	.013	.00	.00	PIPE
1462.893	3445.116	1.470	3446.586	2.00	.81	.01	3446.60	.00	.49	1.77	2.000	.000	.00	1 .0
.118	.5357					.0001	.00	1.47	.12	.15	.013	.00	.00	PIPE
1463.010	3445.179	1.406	3446.585	2.00	.85	.01	3446.60	.00	.49	1.83	2.000	.000	.00	1 .0
.109	.5357					.0001	.00	1.41	.13	.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:10

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1463.119	3445.237	1.347	3446.584	2.00	.89	.01	3446.60	.00	.49	1.88	2.000	.000	.00	1 .0
.101	.5357					.0001	.00	1.35	.14	.15	.013	.00	.00	PIPE
1463.220	3445.291	1.292	3446.583	2.00	.93	.01	3446.60	.00	.49	1.91	2.000	.000	.00	1 .0
.094	.5357					.0001	.00	1.29	.16	.15	.013	.00	.00	PIPE
1463.314	3445.342	1.240	3446.581	2.00	.98	.01	3446.60	.00	.49	1.94	2.000	.000	.00	1 .0
.088	.5357					.0002	.00	1.24	.17	.15	.013	.00	.00	PIPE
1463.403	3445.389	1.191	3446.580	2.00	1.03	.02	3446.60	.00	.49	1.96	2.000	.000	.00	1 .0
.040	.5357					.0002	.00	1.19	.18	.15	.013	.00	.00	PIPE
1463.442	3445.410	1.145	3446.555	2.00	1.08	.02	3446.57	.00	.49	1.98	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1463.442	3445.410	.160	3445.570	2.00	16.95	4.46	3450.03	.00	.49	1.09	2.000	.000	.00	1 .0
1.047	.5357					.4277	.45	.16	9.06	.15	.013	.00	.00	PIPE
1464.489	3445.970	.165	3446.136	2.00	16.17	4.06	3450.19	.00	.49	1.10	2.000	.000	.00	1 .0
2.234	.5357					.3731	.83	.17	8.50	.15	.013	.00	.00	PIPE
1466.723	3447.167	.171	3447.338	2.00	15.41	3.69	3451.03	.00	.49	1.12	2.000	.000	.00	1 .0
1.568	.5357					.3255	.51	.17	7.97	.15	.013	.00	.00	PIPE
1468.291	3448.007	.177	3448.184	2.00	14.70	3.35	3451.54	.00	.49	1.13	2.000	.000	.00	1 .0
1.188	.5357					.2839	.34	.18	7.48	.15	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:10

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1469.479	3448.644	.182	3448.826	2.00	14.01	3.05	3451.87	.00	.49	1.15	2.000	.000	.00	1 .0
.941	.5357					.2476	.23	.18	7.01	.15	.013	.00	.00	PIPE
1470.420	3449.148	.188	3449.336	2.00	13.36	2.77	3452.11	.00	.49	1.17	2.000	.000	.00	1 .0
.769	.5357					.2160	.17	.19	6.58	.15	.013	.00	.00	PIPE
1471.189	3449.560	.195	3449.754	2.00	12.74	2.52	3452.27	.00	.49	1.19	2.000	.000	.00	1 .0
.641	.5357					.1885	.12	.19	6.17	.15	.013	.00	.00	PIPE
1471.830	3449.903	.201	3450.104	2.00	12.15	2.29	3452.39	.00	.49	1.20	2.000	.000	.00	1 .0
.543	.5357					.1645	.09	.20	5.78	.15	.013	.00	.00	PIPE
1472.373	3450.194	.208	3450.401	2.00	11.58	2.08	3452.48	.00	.49	1.22	2.000	.000	.00	1 .0
.465	.5357					.1435	.07	.21	5.42	.15	.013	.00	.00	PIPE
1472.838	3450.443	.214	3450.657	2.00	11.04	1.89	3452.55	.00	.49	1.24	2.000	.000	.00	1 .0
.402	.5357					.1252	.05	.21	5.09	.15	.013	.00	.00	PIPE
1473.240	3450.658	.222	3450.880	2.00	10.53	1.72	3452.60	.00	.49	1.26	2.000	.000	.00	1 .0
.350	.5357					.1092	.04	.22	4.77	.15	.013	.00	.00	PIPE
1473.589	3450.846	.229	3451.074	2.00	10.04	1.56	3452.64	.00	.49	1.27	2.000	.000	.00	1 .0
.306	.5357					.0953	.03	.23	4.47	.15	.013	.00	.00	PIPE
1473.895	3451.010	.236	3451.246	2.00	9.57	1.42	3452.67	.00	.49	1.29	2.000	.000	.00	1 .0
.268	.5357					.0832	.02	.24	4.19	.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:10

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1474.163	3451.153	.244	3451.398	2.00	9.12	1.29	3452.69	.00	.49	1.31	2.000	.000	.00	1 .0
.236	.5357					.0726	.02	.24	3.93	.15	.013	.00	.00	PIPE
1474.400	3451.280	.252	3451.532	2.00	8.70	1.18	3452.71	.00	.49	1.33	2.000	.000	.00	1 .0
.208	.5357					.0634	.01	.25	3.69	.15	.013	.00	.00	PIPE
1474.608	3451.392	.261	3451.652	2.00	8.30	1.07	3452.72	.00	.49	1.35	2.000	.000	.00	1 .0
.184	.5357					.0553	.01	.26	3.46	.15	.013	.00	.00	PIPE
1474.792	3451.490	.269	3451.760	2.00	7.91	.97	3452.73	.00	.49	1.37	2.000	.000	.00	1 .0
.163	.5357					.0483	.01	.27	3.24	.15	.013	.00	.00	PIPE
1474.955	3451.577	.278	3451.856	2.00	7.54	.88	3452.74	.00	.49	1.38	2.000	.000	.00	1 .0
.144	.5357					.0422	.01	.28	3.04	.15	.013	.00	.00	PIPE
1475.099	3451.655	.288	3451.942	2.00	7.19	.80	3452.75	.00	.49	1.40	2.000	.000	.00	1 .0
.127	.5357					.0368	.00	.29	2.85	.15	.013	.00	.00	PIPE
1475.226	3451.723	.297	3452.020	2.00	6.86	.73	3452.75	.00	.49	1.42	2.000	.000	.00	1 .0
.112	.5357					.0321	.00	.30	2.67	.15	.013	.00	.00	PIPE
1475.338	3451.783	.307	3452.090	2.00	6.54	.66	3452.75	.00	.49	1.44	2.000	.000	.00	1 .0
.099	.5357					.0281	.00	.31	2.50	.15	.013	.00	.00	PIPE
1475.436	3451.835	.318	3452.153	2.00	6.23	.60	3452.76	.00	.49	1.46	2.000	.000	.00	1 .0
.086	.5357					.0245	.00	.32	2.34	.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:10

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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
1475.523	3451.882	.328	3452.210	2.00	5.94	.55	3452.76	.00	.49	1.48	2.000	.000	.00	1 .0
.076	.5357					.0214	.00	.33	2.20	.15	.013	.00	.00	PIPE
1475.598	3451.922	.339	3452.261	2.00	5.67	.50	3452.76	.00	.49	1.50	2.000	.000	.00	1 .0
.066	.5357					.0187	.00	.34	2.06	.15	.013	.00	.00	PIPE
1475.664	3451.957	.351	3452.308	2.00	5.40	.45	3452.76	.00	.49	1.52	2.000	.000	.00	1 .0
.057	.5357					.0163	.00	.35	1.93	.15	.013	.00	.00	PIPE
1475.720	3451.988	.362	3452.350	2.00	5.15	.41	3452.76	.00	.49	1.54	2.000	.000	.00	1 .0
.048	.5357					.0143	.00	.36	1.81	.15	.013	.00	.00	PIPE
1475.769	3452.013	.375	3452.388	2.00	4.91	.37	3452.76	.00	.49	1.56	2.000	.000	.00	1 .0
.041	.5357					.0125	.00	.37	1.69	.15	.013	.00	.00	PIPE
1475.810	3452.035	.387	3452.423	2.00	4.68	.34	3452.76	.00	.49	1.58	2.000	.000	.00	1 .0
.034	.5357					.0109	.00	.39	1.59	.15	.013	.00	.00	PIPE
1475.844	3452.054	.400	3452.454	2.00	4.46	.31	3452.76	.00	.49	1.60	2.000	.000	.00	1 .0
.028	.5357					.0095	.00	.40	1.49	.15	.013	.00	.00	PIPE
1475.871	3452.069	.414	3452.483	2.00	4.26	.28	3452.76	.00	.49	1.62	2.000	.000	.00	1 .0
.022	.5357					.0083	.00	.41	1.39	.15	.013	.00	.00	PIPE
1475.893	3452.080	.428	3452.508	2.00	4.06	.26	3452.76	.00	.49	1.64	2.000	.000	.00	1 .0
.016	.5357					.0073	.00	.43	1.31	.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:10

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION

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	
1475.910	3452.089	.443	3452.532	2.00	3.87	.23	3452.76	.00	.49	1.66	2.000	.000	.00	1 .0
.011	.5357					.0063	.00	.44	1.22	.15	.013	.00	.00	PIPE
1475.921	3452.095	.458	3452.553	2.00	3.69	.21	3452.76	.00	.49	1.68	2.000	.000	.00	1 .0
.007	.5357					.0055	.00	.46	1.14	.15	.013	.00	.00	PIPE
1475.928	3452.099	.473	3452.572	2.00	3.52	.19	3452.76	.00	.49	1.70	2.000	.000	.00	1 .0
.002	.5357					.0048	.00	.47	1.07	.15	.013	.00	.00	PIPE
1475.930	3452.100	.491	3452.591	2.00	3.34	.17	3452.76	.00	.49	1.72	2.000	.000	.00	1 .0
1478.930	3452.100	.491	3452.591	2.00	3.34	.17	3452.76	.00	.49	1.72	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-5 100 YEAR ULTIMATE CONDITION
SO   1452.50 3441.05  48                          3448.51
R    1455.50 3441.15  24      .013                              .000    00.0 0
R    1475.94 3452.10  24      .013                              .000    00.0 0
SH   1478.94 3452.10  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            2.000   .0
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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:24

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION

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
1452.490	3441.050	5.540	3446.590	2.00	.64	.01	3446.60	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0333					.0001	.00	5.54	.00	.30	.013	.00	.00	PIPE
1455.490	3441.150	5.440	3446.590	2.00	.64	.01	3446.60	.00	.49	.00	2.000	.000	.00	1 .0
6.107	.5635					.0001	.00	5.44	.00	.15	.013	.00	.00	PIPE
1461.597	3444.591	2.000	3446.591	2.00	.64	.01	3446.60	.00	.49	.00	2.000	.000	.00	1 .0
.326	.5635					.0001	.00	2.00	.00	.15	.013	.00	.00	PIPE
1461.923	3444.775	1.815	3446.589	2.00	.67	.01	3446.60	.00	.49	1.16	2.000	.000	.00	1 .0
.190	.5635					.0001	.00	1.81	.07	.15	.013	.00	.00	PIPE
1462.113	3444.882	1.707	3446.589	2.00	.70	.01	3446.60	.00	.49	1.41	2.000	.000	.00	1 .0
.156	.5635					.0001	.00	1.71	.09	.15	.013	.00	.00	PIPE
1462.269	3444.970	1.618	3446.588	2.00	.73	.01	3446.60	.00	.49	1.57	2.000	.000	.00	1 .0
.137	.5635					.0001	.00	1.62	.10	.15	.013	.00	.00	PIPE
1462.406	3445.047	1.540	3446.587	2.00	.77	.01	3446.60	.00	.49	1.68	2.000	.000	.00	1 .0
.123	.5635					.0001	.00	1.54	.11	.15	.013	.00	.00	PIPE
1462.528	3445.116	1.470	3446.586	2.00	.81	.01	3446.60	.00	.49	1.77	2.000	.000	.00	1 .0
.112	.5635					.0001	.00	1.47	.12	.15	.013	.00	.00	PIPE
1462.640	3445.179	1.406	3446.585	2.00	.85	.01	3446.60	.00	.49	1.83	2.000	.000	.00	1 .0
.103	.5635					.0001	.00	1.41	.13	.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:24

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION

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
1462.743	3445.237	1.347	3446.584	2.00	.89	.01	3446.60	.00	.49	1.88	2.000	.000	.00	1 .0
.096	.5635					.0001	.00	1.35	.14	.15	.013	.00	.00	PIPE
1462.839	3445.291	1.292	3446.583	2.00	.93	.01	3446.60	.00	.49	1.91	2.000	.000	.00	1 .0
.090	.5635					.0001	.00	1.29	.16	.15	.013	.00	.00	PIPE
1462.929	3445.342	1.240	3446.581	2.00	.98	.01	3446.60	.00	.49	1.94	2.000	.000	.00	1 .0
.084	.5635					.0002	.00	1.24	.17	.15	.013	.00	.00	PIPE
1463.013	3445.389	1.191	3446.580	2.00	1.03	.02	3446.60	.00	.49	1.96	2.000	.000	.00	1 .0
.079	.5635					.0002	.00	1.19	.18	.15	.013	.00	.00	PIPE
1463.092	3445.433	1.145	3446.578	2.00	1.08	.02	3446.60	.00	.49	1.98	2.000	.000	.00	1 .0
.074	.5635					.0002	.00	1.15	.20	.15	.013	.00	.00	PIPE
1463.166	3445.475	1.101	3446.576	2.00	1.13	.02	3446.60	.00	.49	1.99	2.000	.000	.00	1 .0
.070	.5635					.0002	.00	1.10	.21	.15	.013	.00	.00	PIPE
1463.236	3445.515	1.060	3446.575	2.00	1.18	.02	3446.60	.00	.49	2.00	2.000	.000	.00	1 .0
.066	.5635					.0003	.00	1.06	.23	.15	.013	.00	.00	PIPE
1463.302	3445.552	1.021	3446.573	2.00	1.24	.02	3446.60	.00	.49	2.00	2.000	.000	.00	1 .0
.062	.5635					.0003	.00	1.02	.24	.15	.013	.00	.00	PIPE
1463.364	3445.587	.983	3446.570	2.00	1.30	.03	3446.60	.00	.49	2.00	2.000	.000	.00	1 .0
.050	.5635					.0004	.00	.98	.26	.15	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:24

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION

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
1463.415	3445.615	.947	3446.563	2.00	1.36	.03	3446.59	.00	.49	2.00	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1463.415	3445.615	.214	3445.830	2.00	11.05	1.89	3447.72	.00	.49	1.24	2.000	.000	.00	1 .0
.094	.5635					.1253	.01	.21	5.09	.15	.013	.00	.00	PIPE
1463.509	3445.668	.222	3445.889	2.00	10.53	1.72	3447.61	.00	.49	1.26	2.000	.000	.00	1 .0
.328	.5635					.1092	.04	.22	4.77	.15	.013	.00	.00	PIPE
1463.837	3445.853	.229	3446.082	2.00	10.04	1.56	3447.65	.00	.49	1.27	2.000	.000	.00	1 .0
.288	.5635					.0953	.03	.23	4.47	.15	.013	.00	.00	PIPE
1464.125	3446.015	.236	3446.251	2.00	9.57	1.42	3447.67	.00	.49	1.29	2.000	.000	.00	1 .0
.253	.5635					.0832	.02	.24	4.19	.15	.013	.00	.00	PIPE
1464.377	3446.157	.244	3446.402	2.00	9.12	1.29	3447.69	.00	.49	1.31	2.000	.000	.00	1 .0
.223	.5635					.0726	.02	.24	3.93	.15	.013	.00	.00	PIPE
1464.600	3446.283	.252	3446.536	2.00	8.70	1.18	3447.71	.00	.49	1.33	2.000	.000	.00	1 .0
.197	.5635					.0634	.01	.25	3.69	.15	.013	.00	.00	PIPE
1464.797	3446.394	.261	3446.655	2.00	8.30	1.07	3447.72	.00	.49	1.35	2.000	.000	.00	1 .0
.174	.5635					.0553	.01	.26	3.46	.15	.013	.00	.00	PIPE
1464.971	3446.492	.269	3446.762	2.00	7.91	.97	3447.73	.00	.49	1.37	2.000	.000	.00	1 .0
.154	.5635					.0483	.01	.27	3.24	.15	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:24

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION

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
1465.125	3446.579	.278	3446.857	2.00	7.54	.88	3447.74	.00	.49	1.38	2.000	.000	.00	1 .0
.136	.5635					.0422	.01	.28	3.04	.15	.013	.00	.00	PIPE
1465.261	3446.656	.288	3446.943	2.00	7.19	.80	3447.75	.00	.49	1.40	2.000	.000	.00	1 .0
.120	.5635					.0368	.00	.29	2.85	.15	.013	.00	.00	PIPE
1465.382	3446.723	.297	3447.021	2.00	6.86	.73	3447.75	.00	.49	1.42	2.000	.000	.00	1 .0
.106	.5635					.0321	.00	.30	2.67	.15	.013	.00	.00	PIPE
1465.488	3446.783	.307	3447.090	2.00	6.54	.66	3447.75	.00	.49	1.44	2.000	.000	.00	1 .0
.093	.5635					.0281	.00	.31	2.50	.15	.013	.00	.00	PIPE
1465.581	3446.836	.318	3447.154	2.00	6.23	.60	3447.76	.00	.49	1.46	2.000	.000	.00	1 .0
.082	.5635					.0245	.00	.32	2.34	.15	.013	.00	.00	PIPE
1465.663	3446.882	.328	3447.210	2.00	5.94	.55	3447.76	.00	.49	1.48	2.000	.000	.00	1 .0
.072	.5635					.0214	.00	.33	2.20	.15	.013	.00	.00	PIPE
1465.735	3446.922	.339	3447.261	2.00	5.67	.50	3447.76	.00	.49	1.50	2.000	.000	.00	1 .0
.062	.5635					.0187	.00	.34	2.06	.15	.013	.00	.00	PIPE
1465.797	3446.958	.351	3447.308	2.00	5.40	.45	3447.76	.00	.49	1.52	2.000	.000	.00	1 .0
.054	.5635					.0163	.00	.35	1.93	.15	.013	.00	.00	PIPE
1465.851	3446.988	.362	3447.350	2.00	5.15	.41	3447.76	.00	.49	1.54	2.000	.000	.00	1 .0
.046	.5635					.0143	.00	.36	1.81	.15	.013	.00	.00	PIPE

FILE: KR_Lateral-SDDI_6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 5

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:24

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION

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
1465.897	3447.014	.375	3447.388	2.00	4.91	.37	3447.76	.00	.49	1.56	2.000	.000	.00	1 .0
.039	.5635					.0125	.00	.37	1.69	.15	.013	.00	.00	PIPE
1465.936	3447.035	.387	3447.423	2.00	4.68	.34	3447.76	.00	.49	1.58	2.000	.000	.00	1 .0
.032	.5635					.0109	.00	.39	1.59	.15	.013	.00	.00	PIPE
1465.968	3447.054	.400	3447.454	2.00	4.46	.31	3447.76	.00	.49	1.60	2.000	.000	.00	1 .0
.026	.5635					.0095	.00	.40	1.49	.15	.013	.00	.00	PIPE
1465.994	3447.069	.414	3447.483	2.00	4.26	.28	3447.76	.00	.49	1.62	2.000	.000	.00	1 .0
.021	.5635					.0083	.00	.41	1.39	.15	.013	.00	.00	PIPE
1466.015	3447.080	.428	3447.508	2.00	4.06	.26	3447.76	.00	.49	1.64	2.000	.000	.00	1 .0
.016	.5635					.0073	.00	.43	1.31	.15	.013	.00	.00	PIPE
1466.031	3447.089	.443	3447.532	2.00	3.87	.23	3447.76	.00	.49	1.66	2.000	.000	.00	1 .0
.011	.5635					.0063	.00	.44	1.22	.15	.013	.00	.00	PIPE
1466.042	3447.095	.458	3447.553	2.00	3.69	.21	3447.76	.00	.49	1.68	2.000	.000	.00	1 .0
.006	.5635					.0055	.00	.46	1.14	.15	.013	.00	.00	PIPE
1466.048	3447.099	.473	3447.572	2.00	3.52	.19	3447.76	.00	.49	1.70	2.000	.000	.00	1 .0
.002	.5635					.0048	.00	.47	1.07	.15	.013	.00	.00	PIPE
1466.050	3447.100	.491	3447.591	2.00	3.34	.17	3447.76	.00	.49	1.72	2.000	.000	.00	1 .0
1469.050	3447.100	.491	3447.591	2.00	3.34	.17	3447.76	.00	.49	1.72	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-6 100 YEAR ULTIMATE CONDITION
SO   1452.50 3441.05  48                          3448.51
R    1455.50 3441.15  24      .013                              .000    00.0 0
R    1466.06 3447.10  24      .013                              .000    00.0 0
SH   1469.06 3447.10  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            2.000   .0
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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:40

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-7 100 YEAR ULTIMATE CONDITION

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	
1870.380	3445.830	9.380	3455.210	3.00	.95	.01	3455.22	.00	.60	.00	2.000	.000	.00	1 .0
3.000	.0333					.0002	.00	9.38	.00	.36	.013	.00	.00	PIPE
1873.380	3445.930	9.281	3455.210	3.00	.95	.01	3455.22	.00	.60	.00	2.000	.000	.00	1 .0
25.920	.1385					.0002	.00	9.28	.00	.26	.013	.00	.00	PIPE
1899.300	3449.520	5.695	3455.215	3.00	.95	.01	3455.23	.00	.60	.00	2.000	.000	.00	1 .0
3.000	.1385					.0589	1.53	5.69	.00	.26	.013	.00	.00	PIPE
1902.300	3449.520	5.695	3455.215	3.00	.95	.01	3455.23	.00	.60	.00	2.000	.000	.00	1 .0

```
T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-7 100 YEAR ULTIMATE CONDITION
SO   1870.39 3445.83  42                          3456.64
R    1873.39 3445.93  24      .013                                .000    00.0 0
R    1899.31 3449.52  24      .013                                .000    00.0 0
SH   1902.31 3449.52  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             3.000   .0
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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:26:52

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-8 100 YEAR ULTIMATE CONDITION

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	
1870.380	3445.830	9.380	3455.210	2.00	.64	.01	3455.22	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0333					.0001	.00	9.38	.00	.30	.013	.00	.00	PIPE
1873.380	3445.930	9.280	3455.210	2.00	.64	.01	3455.22	.00	.49	.00	2.000	.000	.00	1 .0
5.080	.0788					.0001	.00	9.28	.00	.24	.013	.00	.00	PIPE
1878.460	3446.330	8.881	3455.211	2.00	.64	.01	3455.22	.00	.49	.00	2.000	.000	.00	1 .0
3.000	.0788					.0149	.08	8.88	.00	.24	.013	.00	.00	PIPE
1881.460	3446.330	8.881	3455.211	2.00	.64	.01	3455.22	.00	.49	.00	2.000	.000	.00	1 .0

```
T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-8 100 YEAR ULTIMATE CONDITION
SO   1870.39 3445.83  42                          3456.64
R    1873.39 3445.93  24      .013                                .000    00.0 0
R    1878.47 3446.33  24      .013                                .000    00.0 0
SH   1881.47 3446.33  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            2.000   .0
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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27: 4

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION

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
725.320	3432.980	5.880	3438.860	33.00	10.50	1.71	3440.57	.00	1.90	.00	2.000	.000	.00	1 .0
3.000	.0334					.0213	.06	5.88	.00	1.35	.013	.00	.00	PIPE
728.320	3433.080	5.844	3438.924	33.00	10.50	1.71	3440.64	.00	1.90	.00	2.000	.000	.00	1 .0
6.834	.1359					.0213	.15	5.84	.00	.87	.013	.00	.00	PIPE
735.154	3434.009	5.060	3439.069	33.00	10.50	1.71	3440.78	.00	1.90	.00	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
735.154	3434.009	.952	3434.961	33.00	22.37	7.77	3442.73	.00	1.90	2.00	2.000	.000	.00	1 .0
9.340	.1359					.0978	.91	.95	4.59	.87	.013	.00	.00	PIPE
744.494	3435.277	.969	3436.246	33.00	21.88	7.43	3443.68	.00	1.90	2.00	2.000	.000	.00	1 .0
13.681	.1359					.0892	1.22	.97	4.44	.87	.013	.00	.00	PIPE
758.175	3437.136	1.006	3438.142	33.00	20.86	6.76	3444.90	.00	1.90	2.00	2.000	.000	.00	1 .0
10.039	.1359					.0786	.79	1.01	4.13	.87	.013	.00	.00	PIPE
768.214	3438.501	1.044	3439.545	33.00	19.89	6.14	3445.69	.00	1.90	2.00	2.000	.000	.00	1 .0
7.772	.1359					.0692	.54	1.04	3.85	.87	.013	.00	.00	PIPE
775.985	3439.557	1.085	3440.642	33.00	18.96	5.58	3446.23	.00	1.90	1.99	2.000	.000	.00	1 .0
6.215	.1359					.0611	.38	1.08	3.58	.87	.013	.00	.00	PIPE
782.201	3440.401	1.128	3441.529	33.00	18.08	5.08	3446.61	.00	1.90	1.98	2.000	.000	.00	1 .0
5.084	.1359					.0540	.27	1.13	3.32	.87	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27: 4

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION

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
787.285	3441.092	1.173	3442.265	33.00	17.24	4.61	3446.88	.00	1.90	1.97	2.000	.000	.00	1 .0
4.218	.1359					.0477	.20	1.17	3.08	.87	.013	.00	.00	PIPE
791.502	3441.665	1.220	3442.885	33.00	16.44	4.20	3447.08	.00	1.90	1.95	2.000	.000	.00	1 .0
3.534	.1359					.0423	.15	1.22	2.86	.87	.013	.00	.00	PIPE
795.036	3442.146	1.271	3443.416	33.00	15.67	3.81	3447.23	.00	1.90	1.93	2.000	.000	.00	1 .0
2.977	.1359					.0375	.11	1.27	2.64	.87	.013	.00	.00	PIPE
798.014	3442.550	1.325	3443.875	33.00	14.94	3.47	3447.34	.00	1.90	1.89	2.000	.000	.00	1 .0
2.511	.1359					.0333	.08	1.32	2.44	.87	.013	.00	.00	PIPE
800.525	3442.891	1.382	3444.274	33.00	14.25	3.15	3447.43	.00	1.90	1.85	2.000	.000	.00	1 .0
2.114	.1359					.0297	.06	1.38	2.24	.87	.013	.00	.00	PIPE
802.639	3443.179	1.444	3444.623	33.00	13.58	2.87	3447.49	.00	1.90	1.79	2.000	.000	.00	1 .0
1.766	.1359					.0266	.05	1.44	2.06	.87	.013	.00	.00	PIPE
804.404	3443.419	1.512	3444.930	33.00	12.95	2.61	3447.54	.00	1.90	1.72	2.000	.000	.00	1 .0
1.450	.1359					.0239	.03	1.51	1.87	.87	.013	.00	.00	PIPE
805.855	3443.616	1.586	3445.202	33.00	12.35	2.37	3447.57	.00	1.90	1.62	2.000	.000	.00	1 .0
1.150	.1359					.0216	.02	1.59	1.69	.87	.013	.00	.00	PIPE
807.005	3443.772	1.670	3445.442	33.00	11.77	2.15	3447.59	.00	1.90	1.48	2.000	.000	.00	1 .0
.837	.1359					.0198	.02	1.67	1.51	.87	.013	.00	.00	PIPE

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27: 4

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION

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	
807.842	3443.886	1.769	3445.655	33.00	11.23	1.96	3447.61	.00	1.90	1.28	2.000	.000	.00	1 .0
.398	.1359					.0187	.01	1.77	1.31	.87	.013	.00	.00	PIPE
808.240	3443.940	1.901	3445.841	33.00	10.70	1.78	3447.62	.00	1.90	.87	2.000	.000	.00	1 .0
811.240	3443.940	1.901	3445.841	33.00	10.70	1.78	3447.62	.00	1.90	.87	2.000	.000	.00	1 .0

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T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-9 100 YEAR ULTIMATE CONDITION
SO     991.65 3435.64  54                          3441.52
R      994.65 3435.74  24      .013                              .000    00.0 0
R     1074.57 3449.03  24      .013                              .000    00.0 0
SH    1077.57 3449.03  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q            33.000   .0
```

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27:22

SUMMERLIN WEST VILLAGE 22

KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)

ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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
1161.120	3437.730	4.870	3442.600	4.00	1.27	.03	3442.63	.00	.70	.00	2.000	.000	.00	1 .0
3.000	.0334					.0003	.00	4.87	.00	.42	.013	.00	.00	PIPE
1164.120	3437.830	4.771	3442.601	4.00	1.27	.03	3442.63	.00	.70	.00	2.000	.000	.00	1 .0
39.300	.0708					.0003	.01	4.77	.00	.35	.013	.00	.00	PIPE
1203.420	3440.613	2.000	3442.613	4.00	1.27	.03	3442.64	.00	.70	.00	2.000	.000	.00	1 .0
2.579	.0708					.0003	.00	2.00	.00	.35	.013	.00	.00	PIPE
1205.999	3440.796	1.815	3442.611	4.00	1.34	.03	3442.64	.00	.70	1.16	2.000	.000	.00	1 .0
1.488	.0708					.0003	.00	1.81	.15	.35	.013	.00	.00	PIPE
1207.487	3440.901	1.707	3442.608	4.00	1.40	.03	3442.64	.00	.70	1.41	2.000	.000	.00	1 .0
1.216	.0708					.0003	.00	1.71	.17	.35	.013	.00	.00	PIPE
1208.703	3440.988	1.618	3442.606	4.00	1.47	.03	3442.64	.00	.70	1.57	2.000	.000	.00	1 .0
1.056	.0708					.0003	.00	1.62	.20	.35	.013	.00	.00	PIPE
1209.759	3441.062	1.540	3442.603	4.00	1.54	.04	3442.64	.00	.70	1.68	2.000	.000	.00	1 .0
.941	.0708					.0004	.00	1.54	.22	.35	.013	.00	.00	PIPE
1210.700	3441.129	1.470	3442.599	4.00	1.62	.04	3442.64	.00	.70	1.77	2.000	.000	.00	1 .0
.853	.0708					.0004	.00	1.47	.24	.35	.013	.00	.00	PIPE
1211.553	3441.189	1.406	3442.595	4.00	1.69	.04	3442.64	.00	.70	1.83	2.000	.000	.00	1 .0
.780	.0708					.0005	.00	1.41	.26	.35	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27:22

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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
1212.333	3441.244	1.347	3442.591	4.00	1.78	.05	3442.64	.00	.70	1.88	2.000	.000	.00	1 .0
.717	.0708					.0005	.00	1.35	.29	.35	.013	.00	.00	PIPE
1213.050	3441.295	1.292	3442.587	4.00	1.86	.05	3442.64	.00	.70	1.91	2.000	.000	.00	1 .0
.661	.0708					.0006	.00	1.29	.31	.35	.013	.00	.00	PIPE
1213.711	3441.342	1.240	3442.582	4.00	1.96	.06	3442.64	.00	.70	1.94	2.000	.000	.00	1 .0
.209	.0708					.0006	.00	1.24	.34	.35	.013	.00	.00	PIPE
1213.919	3441.357	1.240	3442.597	4.00	1.96	.06	3442.66	.00	.70	1.94	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1213.919	3441.357	.368	3441.725	4.00	10.09	1.58	3443.31	.00	.70	1.55	2.000	.000	.00	1 .0
.410	.0708					.0574	.02	.37	3.52	.35	.013	.00	.00	PIPE
1214.329	3441.386	.368	3441.754	4.00	10.09	1.58	3443.33	.00	.70	1.55	2.000	.000	.00	1 .0
7.671	.0708					.0537	.41	.37	3.51	.35	.013	.00	.00	PIPE
1222.001	3441.929	.380	3442.309	4.00	9.62	1.44	3443.75	.00	.70	1.57	2.000	.000	.00	1 .0
4.925	.0708					.0469	.23	.38	3.29	.35	.013	.00	.00	PIPE
1226.926	3442.278	.393	3442.671	4.00	9.17	1.31	3443.98	.00	.70	1.59	2.000	.000	.00	1 .0
3.535	.0708					.0410	.14	.39	3.08	.35	.013	.00	.00	PIPE
1230.461	3442.528	.406	3442.935	4.00	8.74	1.19	3444.12	.00	.70	1.61	2.000	.000	.00	1 .0
2.690	.0708					.0358	.10	.41	2.89	.35	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27:22

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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	
1233.151	3442.719	.420	3443.139	4.00	8.34	1.08	3444.22	.00	.70	1.63	2.000	.000	.00	1 .0
2.121	.0708					.0313	.07	.42	2.71	.35	.013	.00	.00	PIPE
1235.272	3442.869	.434	3443.303	4.00	7.95	.98	3444.28	.00	.70	1.65	2.000	.000	.00	1 .0
1.712	.0708					.0274	.05	.43	2.54	.35	.013	.00	.00	PIPE
1236.984	3442.990	.449	3443.439	4.00	7.58	.89	3444.33	.00	.70	1.67	2.000	.000	.00	1 .0
1.403	.0708					.0239	.03	.45	2.38	.35	.013	.00	.00	PIPE
1238.387	3443.090	.465	3443.554	4.00	7.23	.81	3444.36	.00	.70	1.69	2.000	.000	.00	1 .0
1.158	.0708					.0209	.02	.46	2.22	.35	.013	.00	.00	PIPE
1239.546	3443.172	.480	3443.652	4.00	6.89	.74	3444.39	.00	.70	1.71	2.000	.000	.00	1 .0
.961	.0708					.0183	.02	.48	2.08	.35	.013	.00	.00	PIPE
1240.507	3443.240	.497	3443.737	4.00	6.57	.67	3444.41	.00	.70	1.73	2.000	.000	.00	1 .0
.799	.0708					.0160	.01	.50	1.95	.35	.013	.00	.00	PIPE
1241.306	3443.296	.514	3443.810	4.00	6.26	.61	3444.42	.00	.70	1.75	2.000	.000	.00	1 .0
.663	.0708					.0140	.01	.51	1.83	.35	.013	.00	.00	PIPE
1241.969	3443.343	.532	3443.875	4.00	5.97	.55	3444.43	.00	.70	1.77	2.000	.000	.00	1 .0
.545	.0708					.0122	.01	.53	1.71	.35	.013	.00	.00	PIPE
1242.514	3443.382	.550	3443.932	4.00	5.69	.50	3444.44	.00	.70	1.79	2.000	.000	.00	1 .0
.444	.0708					.0107	.00	.55	1.60	.35	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27:22

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION

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
1242.958	3443.413	.569	3443.982	4.00	5.43	.46	3444.44	.00	.70	1.80	2.000	.000	.00	1 .0
.353	.0708					.0094	.00	.57	1.50	.35	.013	.00	.00	PIPE
1243.311	3443.438	.589	3444.027	4.00	5.18	.42	3444.44	.00	.70	1.82	2.000	.000	.00	1 .0
.277	.0708					.0082	.00	.59	1.40	.35	.013	.00	.00	PIPE
1243.588	3443.458	.610	3444.067	4.00	4.94	.38	3444.45	.00	.70	1.84	2.000	.000	.00	1 .0
.204	.0708					.0072	.00	.61	1.31	.35	.013	.00	.00	PIPE
1243.792	3443.472	.631	3444.103	4.00	4.71	.34	3444.45	.00	.70	1.86	2.000	.000	.00	1 .0
.140	.0708					.0063	.00	.63	1.23	.35	.013	.00	.00	PIPE
1243.932	3443.482	.653	3444.135	4.00	4.49	.31	3444.45	.00	.70	1.88	2.000	.000	.00	1 .0
.081	.0708					.0055	.00	.65	1.15	.35	.013	.00	.00	PIPE
1244.014	3443.488	.676	3444.164	4.00	4.28	.28	3444.45	.00	.70	1.89	2.000	.000	.00	1 .0
.026	.0708					.0048	.00	.68	1.07	.35	.013	.00	.00	PIPE
1244.040	3443.490	.701	3444.191	4.00	4.07	.26	3444.45	.00	.70	1.91	2.000	.000	.00	1 .0
1247.040	3443.490	.701	3444.191	4.00	4.07	.26	3444.45	.00	.70	1.91	2.000	.000	.00	1 .0

```
T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS -SDDI-10 100 YEAR ULTIMATE CONDITION
SO   1115.63 3437.28  48                          3443.40
R    1118.63 3437.38  24      .013                                .000    00.0 0
R    1198.55 3451.50  24      .013                                .000    00.0 0
SH   1201.55 3451.50  24
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q             4.000   .0
```

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING Date:10-28-2020 Time: 3:27:31

SUMMERLIN WEST VILLAGE 22
KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
ATKINS - 100 YEAR ULTIMATE CONDITION

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	
1778.870	3444.710	8.690	3453.400	42.00	8.56	1.14	3454.54	.00	2.17	.00	2.500	.000	.00	1 .0
3.000	.0334				.0105	.03	8.69	.00	1.34	.013	.00	.00	PIPE	
1781.870	3444.810	8.621	3453.431	42.00	8.56	1.14	3454.57	.00	2.17	.00	2.500	.000	.00	1 .0
83.780	.0377				.0105	.88	8.62	.00	1.29	.013	.00	.00	PIPE	
1865.650	3447.970	6.340	3454.310	42.00	8.56	1.14	3455.45	.00	2.17	.00	2.500	.000	.00	1 .0
3.000	.0377				.0198	1.66	6.34	.00	1.29	.013	.00	.00	PIPE	
1868.650	3447.970	6.340	3454.310	42.00	8.56	1.14	3455.45	.00	2.17	.00	2.500	.000	.00	1 .0

```
T1 SUMMERLIN WEST VILLAGE 22                                                0
T2 KETTLE RIDGE DRIVE (SUNSET RUN DRIVE TO FLIGHT RANGE AVE)
T3 ATKINS - 100 YEAR ULTIMATE CONDITION
SO   1778.88 3444.71  48                        3455.33
R    1781.88 3444.81  30      .013                              .000    00.0 0
R    1865.66 3447.97  30      .013                              .000    00.0 0
SH   1868.66 3447.97  30
CD  55  3   0    .000   5.000    5.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
Q           42.000   .0
```

D.4. Rip-Rap Calculations

KettleRidge-North Flight Range to Kindle Rise Interim Triangular Swale 1' Riprap

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.040
Channel Slope	0.068 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	58.00 cfs

Results	
Normal Depth	1.56 ft
Flow Area	7.3 ft²
Wetted Perimeter	9.9 ft
Hydraulic Radius	0.74 ft
Top Width	9.37 ft
Critical Depth	1.88 ft
Critical Slope	0.026 ft/ft
Velocity	7.93 ft/s
Velocity Head	0.98 ft
Specific Energy	2.54 ft
Froude Number	1.582
Flow Type	Supercritical

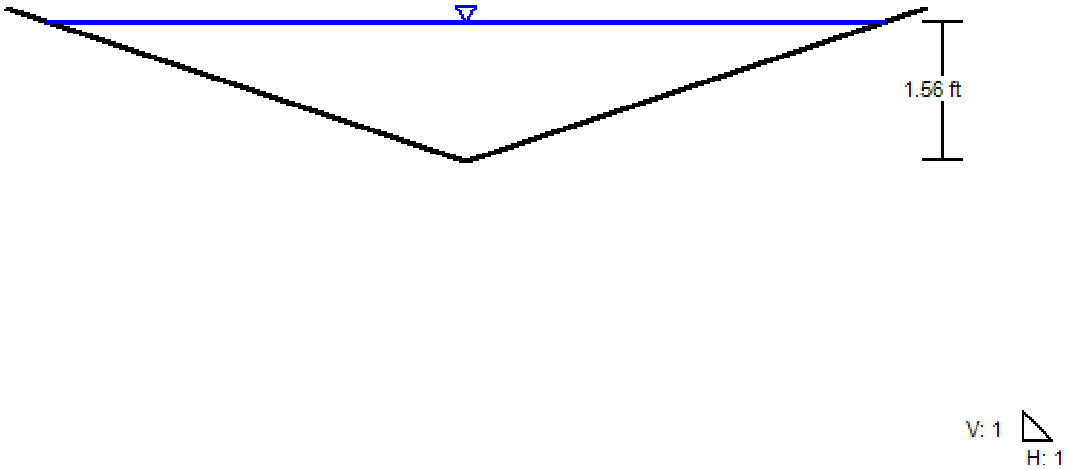
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	1.56 ft
Critical Depth	1.88 ft
Channel Slope	0.068 ft/ft
Critical Slope	0.026 ft/ft

Cross Section for KettleRidge-North Flight Range to Kindle Rise Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.040
Channel Slope	0.068 ft/ft
Normal Depth	1.56 ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	58.00 cfs



HEC-11 RIPRAP SIZING CALCULATIONS

Location: Summerlin West Village 22 Kettle Ridge: Flight Range to Kindle Rise Interim Triangular Roadside Swale
Conditions: Q=58 cfs

Equations:

$K_1 = [1-(\sin^2\theta/\sin^2\Phi)]^{0.5}$ (eq. 7, pg. 30)

d_{avg}= Flow Area/ Top Width

$n=0.39S_f^{0.38} R^{-0.16}$ (eq. 4, pg. 23)

(slopes > 0.002 ft/ft and D50 > 0.2 ft)

Bank & Bed $D_{50} = 0.001V_a^3/(d_{avg}^{0.5}K_1^{1.5})$ (eq. 6, pg. 30)

$C_{sg} = 2.12/(S_g-1)^{1.5}$ (eq. 8, pg. 31)

$C_{sf} = (SF/1.2)^{1.5}$ (eq. 9, pg. 31)

Stability Factor = 1.3 (Table 1 pg 31)

Gradually Varying Flow; Moderate Bed Curvature (30 > curve radius/channel width > 10)
Impact from waves or floating debris moderate

$C = C_{sg}C_{sf}$

$D'_{50} = CD_{50}$

Input Variables:

Channel BW =	0	ft	
Enery Grade Slope "S_f" =	0.068	ft/ft	
Hydraulic Radius "R" =	0.74	ft	
Flow area =	7.3	sqft	Balance w/ Manning's n until
Wetted perimeter =	9.9	ft	results match input FlowMaster
Top width =	9.37	ft	
Average channel velocity =	7.93	fps	
Depth of flow =	1.56	ft	
Side slope horizontal (H:1) =	3		
Riprap angle of repose "Φ" =	41	degrees	(Chart 4, pg. 129 HEC-11)
Rock riprap specific gravity =	2.65		
Stability Factor =	1.3		
D_{50} =	1.00	ft	

Calculations:

θ =	18.4	degrees
K_1 =	0.876	
d_{avg} =	0.78	ft
Manning's n =	0.147	
Bank D_{50} =	0.46	ft
Bed D_{50} =	0.56	
C_{sf} =	1.128	
C_{sg} =	1.000	
C =	1.128	
Bank D'_{50} =	0.52	ft
Bed D'_{50} =	0.64	ft
Stable?	**Yes**	
t_o =	3.1	lb/ft^2 (average shear stress on channel)
t_c =	4.2	lb/ft^2 (critical shear stress-resistance to movement)
Stable?	**Yes**	

CCRFCD Equations (d_{50} Eq.s use Eq. 732 for Manning's n)

R_h =	0.74	ft (Eq. 732 for $R_h > 2d_{50}$)
n =	0.040	Formula Under Predicts n Value
Y/d_{50} =	1.6	(Eq. 733 for $1.5 < Y/d_{50} < 185$)
n =	0.087	Yes
d_{50} =	1.03	ft (Eq. 734)
d_{50} =	1.56	ft (Eq. 735, generally larger sizes)
d_{50} =	2.24	ft (Eq. 736 for S_e=S)

Stability Factor:

1.0 - 1.2 Uniform flow; straight or mildly curving reach (curve radius/channel width > 30); impact from wave action and floating debris is minimal; little or no uncertainty in design parameters.

1.3 - 1.6 Gradually varying flow; moderate bend curvature (30 > curve radius/channel width > 10); impact from waves or floating debris moderate.

1.6 - 2.0 Approaching rapidly varying flow; sharp bend curvature (10 > curve radius/channel width); significant impact potential from floating debris and/or ice; significant wind and/or boat generated waves (1-2 ft); high flow turbulence; turbulently mixing flow at bridge abutments; significant uncertainty in design parameters.

= Values referenced in flow master

Spreadsheet not for pier scour or wave action

KettleRidge-North Flight Edge to Flight Range Interim Triangular Swale Bare Earth

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	23.00 cfs

Results	
Normal Depth	1.30 ft
Flow Area	5.1 ft²
Wetted Perimeter	8.2 ft
Hydraulic Radius	0.62 ft
Top Width	7.82 ft
Critical Depth	1.30 ft
Critical Slope	0.007 ft/ft
Velocity	4.51 ft/s
Velocity Head	0.32 ft
Specific Energy	1.62 ft
Froude Number	0.985
Flow Type	Subcritical

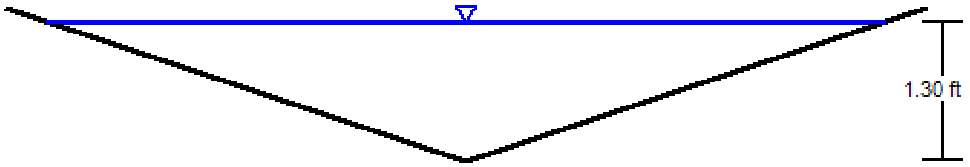
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

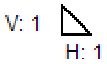
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.30 ft
Critical Depth	1.30 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for KettleRidge-North Flight Edge to Flight Range Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Normal Depth	1.30 ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	23.00 cfs





KettleRidge-South Interim Triangular Swale 0.5' Riprap

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.027 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	9.00 cfs

Results	
Normal Depth	0.88 ft
Flow Area	2.3 ft²
Wetted Perimeter	5.6 ft
Hydraulic Radius	0.42 ft
Top Width	5.29 ft
Critical Depth	0.89 ft
Critical Slope	0.025 ft/ft
Velocity	3.86 ft/s
Velocity Head	0.23 ft
Specific Energy	1.11 ft
Froude Number	1.026
Flow Type	Supercritical

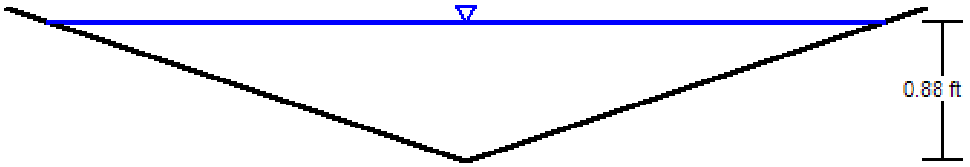
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

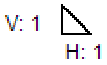
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.88 ft
Critical Depth	0.89 ft
Channel Slope	0.027 ft/ft
Critical Slope	0.025 ft/ft

Cross Section for KettleRidge-South Interim Triangular Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.027 ft/ft
Normal Depth	0.88 ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	9.00 cfs





HEC-11 RIPRAP SIZING CALCULATIONS

Location: Summerlin West Village 22 Kettle Ridge: COS-3 to Sunset Run Drive Triangular Roadside Swale
Conditions: Q= 9 cfs

Equations:

$K_1 = [1-(\sin^2\theta/\sin^2\Phi)]^{0.5}$ (eq. 7, pg. 30)

d_{avg}= Flow Area/ Top Width

$n=0.39S_f^{0.38} R^{-0.16}$ (eq. 4, pg. 23)

(slopes > 0.002 ft/ft and D50 > 0.2 ft)

Bank & Bed $D_{50} = 0.001V_a^3/(d_{avg}^{0.5}K_1^{1.5})$ (eq. 6, pg. 30)

$C_{sg} = 2.12/(S_g-1)^{1.5}$ (eq. 8, pg. 31)

$C_{sf} = (SF/1.2)^{1.5}$ (eq. 9, pg. 31)

Stability Factor = 1.3 (Table 1 pg 31)

Gradually Varying Flow; Moderate Bed Curvature (30 > curve radius/channel width > 10)
Impact from waves or floating debris moderate

$C = C_{sg}C_{sf}$

$D'_{50} = CD_{50}$

Input Variables:

Channel BW =	0	ft	
Enery Grade Slope "S_f" =	0.0265	ft/ft	
Hydraulic Radius "R" =	0.42	ft	
Flow area =	2.3	sqft	Balance w/ Manning's n until
Wetted perimeter =	5.6	ft	results match input FlowMaster
Top width =	5.3	ft	
Average channel velocity =	3.86	fps	
Depth of flow =	0.9	ft	
Side slope horizontal (H:1) =	3		
Riprap angle of repose "Φ" =	41	degrees	(Chart 4, pg. 129 HEC-11)
Rock riprap specific gravity =	2.65		
Stability Factor =	1.3		
D_{50} =	0.50	ft	

Calculations:

θ = 18.4 degrees
K_1 = 0.876
d_{avg} = 0.43 ft
Manning's n = 0.113
Bank D_{50} = 0.07 ft
Bed D_{50} = 0.09
C_{sf} = 1.128
C_{sg} = 1.000
C = 1.128
Bank D'_{50} = 0.08 ft
Bed D'_{50} = 0.10 ft
Stable? **Yes**

t_o = 0.7 lb/ft^2 (average shear stress on channel)
t_c = 2.1 lb/ft^2 (critical shear stress-resistance to movement)
Stable? **Yes**

CCRFCD Equations (d_{50} Eq.s use Eq. 732 for Manning's n)

R_h =	0.40	ft (Eq. 732 for $R_h > 2d_{50}$)
n =	0.035	Formula Under Predicts n Value
Y/d_{50} =	1.8	(Eq. 733 for $1.5 < Y/d_{50} < 185$)
n =	0.072	Yes
d_{50} =	0.18	ft (Eq. 734)
d_{50} =	0.27	ft (Eq. 735, generally larger sizes)
d_{50} =	0.50	ft (Eq. 736 for S_e=S)

Stability Factor:

1.0 - 1.2 Uniform flow; straight or mildly curving reach (curve radius/channel width > 30); impact from wave action and floating debris is minimal; little or no uncertainty in design parameters.

1.3 - 1.6 Gradually varying flow; moderate bend curvature (30 > curve radius/channel width > 10); impact from waves or floating debris moderate.

1.6 - 2.0 Approaching rapidly varying flow; sharp bend curvature (10 > curve radius/channel width); significant impact potential from floating debris and/or ice; significant wind and/or boat generated waves (1-2 ft); high flow turbulence; turbulently mixing flow at bridge abutments; significant uncertainty in design parameters.

= Values referenced in flow master

Spreadsheet not for pier scour or wave action

Appendix E. CD-ROM

SUMMERLIN VILLAGE 22
IMPROVEMENT PLANS FOR:
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)
FUTURE SID PROJECT
A PORTION OF VILLAGE 22 ONE-WAY COUPLET

SUMMERLIN®

SHEET INDEX

1	TITLE SHEET	
2	LEGEND AND ABBREVIATIONS	
3	GENERAL NOTES	
4	HORIZONAL CONTROL PLAN	
5	MASTER DRAINAGE PLAN	
6	MASTER WATER PLAN	
7	MASTER SEWER PLAN	
8	ROADWAY GRADING PLAN	BEGIN TO STA 34+00
9	ROADWAY PLAN AND PROFILE	BEGIN TO STA 34+00
10	ROADWAY GRADING PLAN	STA 34+00 TO STA 38+00
11	ROADWAY PLAN AND PROFILE	STA 34+00 TO STA 38+00
12	ROADWAY GRADNG PLAN	STA 38+00 TO STA 42+00
13	ROADWAY PLAN AND PROFILE	STA 38+00 TO STA 42+00
14	ROADWAY GRADING PLAN	STA 42+00 TO STA 46+00
15	ROADWAY PLAN AND PROFILE	STA 42+00 TO STA 46+00
16	ROADWAY GRADING PLAN	STA 46+00 TO STA 49+00
17	ROADWAY PLAN AND PROFILE	STA 46+00 TO STA 49+00
18	ROADWAY GRADING PLAN	STA 49+00 TO END
19	ROADWAY PLAN AND PROFILE	STA 49+00 TO END
20	STORM DRAIN LATERAL PROFILES 1	
21	STORM DRAIN LATERAL PROFILES 2	
22	WATER LATERAL PROFILES 1	
23	WATER LATERAL PROFILES 2	
24	STREETLIGHT PLAN	
25	TRAFFIC CONTROL PLAN	
26	DETAILS	
27	STORM DETAILS	
28	STORM DETAILS	
29	WATER DETAIL	

UTILITY NOTE

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

CALL BEFORE YOU DIG: 1-800-642-2444

THIS PROPERTY MAY HAVE STATIC WATER PRESSURE IN EXCESS OF 80 PSI. THE UNIFORM PLUMBING CODE REQUIRES THAT INDIVIDUAL, ON-SITE (PRIVATE) PRESSURE REDUCING VALVES BE INSTALLED WHENEVER THE PRESSURE EXCEEDS 80 PSI. PRV'S ARE THE DEVELOPER'S RESPONSIBILITY AND WILL NOTE BE INSPECTED OR INCLUDED IN THE ACCEPTANCE OF THE LAS VEGAS VALLEY WATER DISTRICT FACILITIES.

NOTICE OF INTENT NOTE

NOTE: ALL LAND SURFACE AREA DISTURBANCES OVER 1 ACRE REQUIRE A STORMWATER DISCHARGE PERMIT ISSUED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP). A PHASED CONSTRUCTION UNIT IN A CONTIGUOUS SUBDIVISION IS CONSIDERED UNDER CONSTRUCTION UNTIL ALL STRIPPED SURFACE AREAS HAVE BEEN COVERED BY PAVING, BUILDING CONSTRUCTION OR PLANTING. A STORMWATER DISCHARGE PERMIT APPLICATION AND ASSOCIATED INFORMATION MAY BE DOWNLOADED FROM THE WEB SITE: HTTP://WWW.STATE.NV.US/BWPC/STORM01.HTM PROJECTS THAT DISTURB MORE THAN ONE ACRE OF LAND MUST SUBMIT TO NDEP A "NOTICE OF INTENT" FOR INCLUSION UNDER STORMWATER PERMIT NO. NVR100000 ALONG WITH APPROPRIATE FILLING FEE.

NPDES PERMIT NOTE

THE ENGINEER SHOULD CONTACT THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP) TO OBTAIN A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT PRIOR TO CONSTRUCTION. ALL CONSTRUCTION PROJECTS ONE ACRE OR LARGER MUST APPLY FOR THE PERMIT THROUGH NDEP. ALL QUESTIONS REGARDING THE NPDES PERMIT REQUIREMENTS SHOULD BE DIRECTED TO THE NDEP AT (775) 687-9429.

DISCLAIMER NOTE

EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON, THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

FEMA FLOOD ZONE INFORMATION

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE X (UNSHADED) AS DEPICTED ON FLOOD INSURANCE RATE MAP (FIRM) PANEL 32003C2150E, DATED 9/27/2002. A ZONE X (UNSHADED) IS DESCRIBED AS AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN.

PROPOSED RIGHT-OF-WAY ACREAGE
1.52 AC

PROPOSED DISTURBED AREA ACREAGE
35.89 AC

GEOTECHNICAL ENGINEER
PREPARED BY: NOVA GEOTECHNICAL & INSPECTION SERVICES
4480 W. HACIENDA AVENUE, SUITE 104, LAS VEGAS, NV 89118
PHONE: 702-873-3478
PROJECT NO.: G-18-176
DATED: DECEMBER 3, 2018 AND SUBSEQUENT LETTER DATED ON DECEMBER 30, 2019

OWNER /DEVELOPER

OWNER

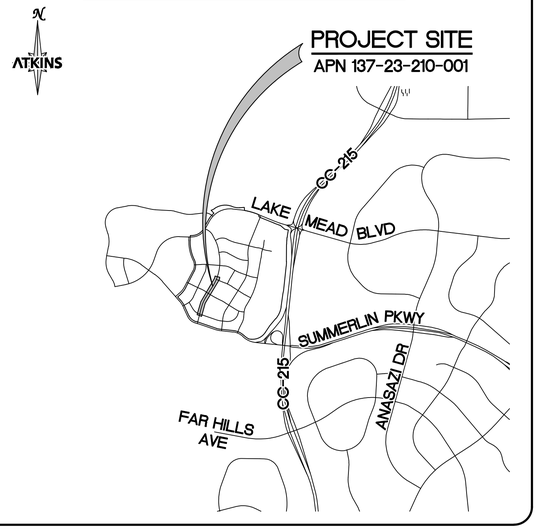
CONTACT: KEVIN ORROCK
HOWARD HUGHES COMPANY LLC, A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NV 89135

ENGINEER / CONSULTANT

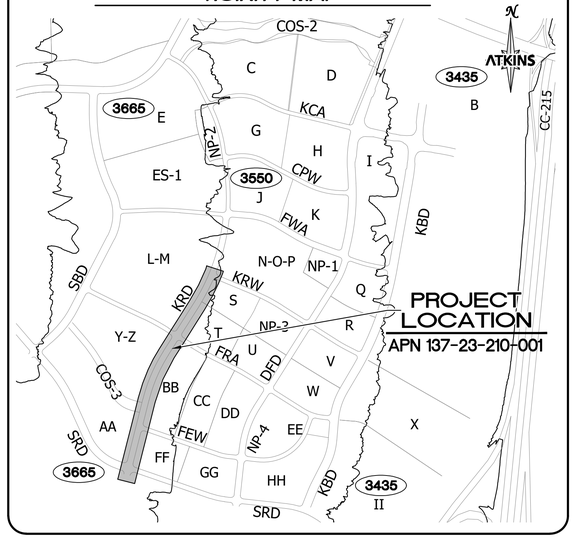
CIVIL

CONTACT: DAVID WILSON P.E.
ATKINS
2270 CORPORATE CIRCLE SUITE 200
HENDERSON, NEVADA 89074
(702) 263-7275

LOCATION MAP



VICINITY MAP



APPROVALS

HOWARD HUGHES COMPANY LLC, A DELAWARE LIMITED LIABILITY COMPANY

KEVIN T. ORROCK, VICE PRESIDENT — DATE

STEVEN FORD, P.E. #012175 — DATE
CITY ENGINEER

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND OR/ DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD. THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARDS DRAWING AND SPECIFICATIONS CLARK COUNTY AREA, NEVADA.

CITY OF LAS VEGAS PLANNING DEPARTMENT — DATE

NOTE:
THIS PLAN CONFORMS TO THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT.

LAS VEGAS FIRE AND RESCUE — DATE

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK — DATE

THE AFFIXED CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES, AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 0000 FIRST APPROVED DATE: _____

SHEETS: _____

NV ENERGY — DATE

NV ENERGY HAS ACKNOWLEDGED WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA UTILITY COMMISSION'S RULES AND REGULATIONS.

SOUTHWEST GAS CORPORATION — DATE

COX COMMUNICATIONS OF LAS VEGAS, INC — DATE

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE
PROJECTION: TRANSVERSE MERCATOR STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID OF ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)
NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECTED AREA.
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

LEGAL DESCRIPTION

BEING A PORTION OF LOT 1 AS SHOWN ON THE MAP THEREOF IN BOOK 161 OF PLATS, PAGE 68, OFFICIAL RECORDS, CITY OF LAS VEGAS CLARK COUNTY, NEVADA

FAST Call before you UnderGround 1-702-432-5300 FEDERAL AID INTERSTATE SYSTEM OF TRANSPORTATION

Call before you Dig AVOID BURYING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DIG OVERHEAD 1-702-227-2929

NICOLAS A. BARCOS PROFESSIONAL ENGINEER-STATE OF NEVADA EXP. 12-31-20 CIVIL No. 25573
10/21/2020

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

TITLE SHEET

JOB NO.	100066768
DATE:	NOVEMBER, 2020
DRAWING NO.	1/29
CLV	00-00000

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-01-TTL-C1.dwg LAYOUT: C1 Nov 02, 2020 - 5:40PM

@	AT
#	NUMBER
AB	ABANDONED
AC	ASPHALTIC CONCRETE
ACP	ASBESTOS CEMENT PIPE
AGG	AGGREGATE
AIP	ABANDON IN PLACE
ALT	ALTERNATE
AP	ANGLE POINT
APPROX	APPROXIMATE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS INTERNATIONAL
AV/AR	AIR VACUUM AIR RELIEF VALVE
BC	BACK OF CURB
BCR	BACK OF CURB RETURN
BLK	BLOCK
BLVD	BOULEVARD
BM	BENCHMARK
BO	BLOW OFF
BP	BOTTOM OF PIPE
BSW	BACK OF SIDEWALK
BVC	BEGIN VERTICAL CURVE
BVCE	BEGINNING OF VERTICAL CURVE ELEVATION
BVCS	BEGINNING OF VERTICAL CURVE STATION
BW	BOTTOM WIDTH
C&G	CURB AND GUTTER
C–C	CENTER TO CENTER
CATV	CABLE TELEVISION
CCAUSD	CLARK COUNTY AREA UNIFORM STANDARD DRAWING
CCRFCD	CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
CCWRD	CLARK COUNTY WATER RECLAMATION DISTRICT
CF	CUBIC FOOT
CIP	CAST IRON PIPE OR CAST IN PLACE
CL	CENTERLINE
CLR	CLEAR
CLV	CITY OF LAS VEGAS
CM	CONSTRUCTION MANAGER
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNDT	CONDUIT
CNLV	CITY OF NORTH LAS VEGAS
CO	CLEANOUT
COH	CITY OF HENDERSON
COL	COLUMN
COS	COMMUNITY OPEN SPACE
CPP	CORRUGATED PLASTIC PIPE
CSP	CORRUGATED STEEL PIPE
CU	CUBIC
CULV	CULVERT
CY	CUBIC YARD
D	DEPTH
DCSWCS	DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS
DET, DTL	DETAIL
DEPT	DEPARTMENT
DG	DESIGN GRADE
DI	DROP INLET
DIA	DIAMETER
DIAG	DIAGONAL
DIP	DUCTILE IRON PIPE
DOC	DOCUMENT
DW	DRIVEWAY
DWG	DRAWING
E	EAST
EA	EACH
EB	EASTBOUND
EC	END OF CURVE
ECR	END CURB RETURN
EF	EACH FACE
EG	EXISTING GROUND
ELEC	ELECTRICAL
ELEV	ELEVATION
EMBK	EMBANKMENT
EOP	EDGE OF PAVEMENT
EP	EDGE OF PAVEMENT ALIGNMENT END
EQ	EQUAL
ESMT	EASEMENT
EVC	END VERTICAL CURVE
EVCS	END VERTICAL CURVE STATION
EW	EACH WAY
EX, EXST	EXISTING
EXP, JT	EXPANSION JOINT
FA	FIRE ALARM
FC	FACE OF CURB

FF	FINISHED FLOOR ELEVATION
FH	FIRE HYDRANT
FL	FLOW LINE
FO	FIBER OPTIC
FT	FOOT OR FEET
G	GAS LINE
GALV	GALVANIZED
GB	GRADE BREAK
GL	GRATE LENGTH
GM	GAS METER
GUT	GUTTER
GV	GATE VALVE
H	HEIGHT
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HDWL	HEADWALL
HE	HORIZONTAL ELLIPTICAL
HGL	HYDRAULIC GRADE LINE
HOA	HOMEOWNER'S ASSOCIATION
HOR	HORIZONTAL
HP	HIGH POINT
ID	INSIDE DIAMETER
IN	INCH(ES)
INT	INTERSECTION/INTERIM
INV	INVERT
IQAC	INTERAGENCY QUALITY ASSURANCE COMMITTEE
IRR	IRRIGATION
ISL	ISLAND
JB	JUNCTION BOX
JCT	JUNCTION
JT	JOINT
K	VERTICAL CURVE K VALUE
L	LENGTH
LB	POUND(S)
LF	LINEAR FEET
LIN	LINEAR
LIN #	CCWRD MANHOLE NUMBER
LOC	LENGTH OF CURVE
LOL	LAYOUT LINE
LP	LOW POINT
LS	LANDSCAPE
LT	LEFT
LVC	LENGTH OF VERTICAL CURVE
LVVWD	LAS VEGAS VALLEY WATER DISTRICT
MAS	MASONRY
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MON	MONOLITHIC, MONUMENT
MTL	MATERIAL
ME	MATCH EXISTING
MUE	MUNICIPAL UTILITY EASEMENT
N	NORTH
NAP	NOT A PART
NDOT	NEVADA DEPARTMENT OF TRANSPORTATION
NF	NEAR FACE
NG	NUMBER OF GRATES, NATURAL GRADE
NIC	NOT IN CONTRACT
No.	NUMBER
NTS	NOT TO SCALE
NVE	NV ENERGY
OC	ON CENTER
OD	OUTSIDE DIAMETER
OG	OPEN GRADE
OH	OVERHEAD
OHP	OVERHEAD POWER
OS	OFFSET
P	POWER
PB	PULL BOX
PBS	PLANTMIX BITUMINOUS SURFACE
PC	POINT OF CURVATURE
PCC	PORTLAND CEMENT CONCRETE OR POINT OF COMPOUND CURVATURE
PE	POLYETHYLENE
PG	PROPOSED GRADE
PGL	PROFILE GRADE LINE
PH	POT HOLE
PI	POINT OF INTERSECTION
PIP	PROTECT IN PLACE
PL	PROPERTY LINE
PLCS	PLACES
PMF	PAVEMENT MARKING FILM
POC	POINT OF CONNECTION
PP	POWER POLE
PRC	POINT OF REVERSE CURVATURE
PROP	PROPOSED
PSI	POUNDS PER SQUARE INCH
PT	POINT, POINT OF TANGENCY

PUE	PUBLIC UTILITY EASEMENT
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
QTY	QUANTITY
(R)	RADIAL
R/W,ROW	RIGHT OF WAY
R	RADIUS
RC	REINFORCED CONCRETE
RCB	REINFORCED CONCRETE BOX
RCC	ROLLER COMPACTED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
REINF	REINFORCED OR REINFORCEMENT
RELOC	RELOCATE
REV	REVISION
RG	ROUGH GRADE
RP	RADIUS POINT
RPM	RAISED PAVEMENT MARKER
RR	RAILROAD
RT	RIGHT
SCHED	SCHEDULE
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SF	SQUARE FOOT/SQUARE FEET
SHLD	SHOULDER
SHT	SHEET
SHP	STEEL HIGH PRESSURE PIPE
SMFO	SINGLE MODE FIBER OPTIC
SNWA	SOUTHERN NEVADA WATER AUTHORITY
SQ	SQUARE
SS	SANITARY SEWER OR SIDE SLOPE
SSD	SUMMERLIN STANDARD DRAWING
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL
STLT	STREETLIGHT
SDHW	STORM DRAIN HEADWALL
STRUCT	STRUCTURAL OR STRUCTURE
SUM #	CCWRD MANHOLE NUMBER
SURV	SURVEY
SVZ	SIGHT VISIBILITY ZONE
SW	SIDEWALK
SY	SQUARE YARD
T	TELEPHONE LINE
TAN	TANGENT
TB	TOP OF BOX
TBA	TO BE ADJUSTED
TBC	TOP OF BACK OF CURB
TBR	TO BE REMOVED
TC	TOP OF CURB
TCD	TRAFFIC CONTROL DEVICE
TDS	TECHNICAL DRAINAGE STUDY
TEL	TELEPHONE
TEMP	TEMPORARY
TF	TOP OF FOOTING
THK	THICK
THR	THRUST
THW	TOP OF HEADWALL
TOF	TOP OF FACE
TW/TOW	TOP OF WALL
TP	TOP OF PIPE
TRANS	TRANSITION
TS	TRAFFIC SIGNAL
TSI	TRAFFIC SIGNAL INTERCONNECT
TW	TOP OF WALL
TYP	TYPICAL
UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS
UG	UNDERGROUND
UGP	UNDERGROUND POWER
UIE	UPPER INVERT ELEVATION
ULT	ULTIMATE
UNO	UNLESS NOTED OTHERWISE
UPRR	UNION PACIFIC RAILROAD
USD	UNIFORM STANDARD DRAWING
UTACS	ULTRA THIN ASPHALT CONCRETE SURFACE
USTCDE	UTILITY, STREETLIGHT, TRAFFIC CONTROL DEVICE EASEMENT
V	VOLT
VAR	VARIABLE
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VG	VALLEY GUTTER
W	WEST, WATER

W/	WITH
WB	WEST BOUND
WL	WATER LINE
WM	WATER METER
W/O	WITHOUT
WPJ	WEAKENED PLANE JOINT
WV	WATER VALVE
WW	WING WALL
YD	YARD(S)

	EXISTING	PROPOSED
DAYLIGHT LINE		
FLOWLINE		
CENTERLINE		
PARCEL LINE		
RIGHT OF WAY		
PAVEMENT STRIPING		
OVERHEAD POWER	—OHP—	—OHP—
UNDERGROUND POWER	—UGP—	—UGP—
SANITARY SEWER	–S–	15" SS
WATER		24"W (3550)
STORM DRAIN		
GAS	–G–	–G–
CABLE T.V.	—CATV—	—CATV—
TELEPHONE	–T–	–T–
STREETLIGHT CONDUIT	—STLT—	STLT
STOP BAR		
CONCRETE ENCASEMENT		
FENCE		
BLOCK WALL		
RETAINING WALL		
SAWCUT PAVEMENT		
CONTOUR	(3000)	3005
CURB AND GUTTER		
EDGE OF PAVEMENT		
EASEMENT		
MATCHLINE		
SIGN		
DOUBLE POST SIGN		
STORM DRAIN MANHOLE	SD	
STORM DRAIN STRUCTURE		
DROP INLET		
BEEHIVE INLET		
SEWER MANHOLE	S	S
FIRE HYDRANT		
CAP AND BLOWOFF		
GATE VALVE		
REDUCER		
STREETLIGHT	OR	
PULLBOX		
SIGNAL POLE		
ELEVATION	(0000.0) FG	0000.0 FG
WATER PRESSURE ZONE BOUNDARY		
WATER PRESSURE ZONE		3550
RIP–RAP		
		FUTURE
HARDSCAPE		

NOTE TO CONTRACTOR

- QUANTITIES SHOWN ARE ESTIMATES ONLY AND ARE INTENDED TO ILLUSTRATE SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE EXACT QUANTITIES INVOLVED.

ROADWAY ALIGNMENT DESIGNATIONS

"KRD" = KETTLE RIDGE DRIVE
"SRD" = SUNSET RUN DRIVE
"FWA" = FLEET WING AVENUE
"FEW" = FLIGHT EDGE WAY
"FRA" = FLIGHT RANGE AVENUE
"KRW" = KINDLE RISE WAY

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368
(REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 NEVADA AND ARIZONA SYSTEMS OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. CALL SOON. Call 811 OR 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25573 PROFESSIONAL ENGINEER-STATE OF NEVADA
10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

LEGEND AND ABBREVIATIONS

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 2/29
CLV 00-00000

X:\Projects\SummitWest\Village 22\100066768 – Y22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-02-LGND-G2.dwg LAYOUT: G2 Nov 02, 2020 – 5:26PM

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF–SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT–OF–WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300´ IN EXTRUDED–TYPE CURB.
8. AC PAVEMENT TO BE ONE–HALF INCH (½´) ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY THE (NOVA, G–18–176, 12/03/18) APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. AFTER HAUNCHING AND PRIOR TO BACKFILL OPERATIONS WHICH WOULD COVER SANITARY SEWER AND STORM DRAIN FACILITIES, CONTRACTOR IS REQUIRED TO SCHEDULE CLV OPEN–TRENCH UTILITY SURVEY INSPECTION FOR DETERMINATION OF FINAL LOCATION COORDINATES. FACILITIES TO BE LOCATED BY CLV SHALL INCLUDE AT A MINIMUM THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT–OF–WAY, SEWER AND STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS.
22. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION.
23. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED 06/04/2018

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF–SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.
3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.
6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

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

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

7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.
8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT–OF–WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED 04/15/10

PLAN CONCURRENCE NOTE

THE FOLLOWING SEPARATE VILLAGE 22 ROADWAY IMPROVEMENT PLANS ARE TO BE CONSTRUCTED CONCURRENTLY AND ARE SHOWN AS FUTURE (BY OTHERS):

1. VILLAGE 22 J PHASE I
2. SUMMERLIN WEST VILLAGE 21 SUMMERLIN PARKWAY EXTENSION BY VTN
3. CONTRACT NO. C1554 SUMMERLIN VILLAGE 25 3665 ZONE NORTH PIPELINE PHASE II BY GCW

CITY OF LAS VEGAS FIRE DEPARTMENT NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6631 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALLEY WATER DISTRICT'S APPROVED PRODUCTS LIST ARE ALLOWED TO BE INSTALLED.
3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON–SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. IFC § 105.6.15
4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. IFC § 3310, § 3312
5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. IFC § 507.5.7.3
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TESTS WITH PRIOR FIRE PREVENTION APPROVAL. IFC § 106.3
7. ALL ON–SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. IFC § 507.2.1, NFPA 24
8. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. IFC § 507
9. PRIVATE HYDRANTS SHALL BE PAINTED RED. IFC § 507.5.7.1
10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. IFC § 507
11. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: IFC § C102
    - RESIDENTIAL – 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.
    - COMMERCIAL – 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.
12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS. IFC § C102.8
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL–DE–SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL–DE–SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. IFC § C102.10
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE–TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. IFC § 102.4
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. IFC § C102.7
17. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD–END STREET SHALL NOT EXCEED 200 FT. IFC § C102.6
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD–INS ARE INSTALLED ON A SINGLE SYSTEM. FOR SYSTEMS REQUIRED TO HAVE TWO (2) SOURCES OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD–INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. FOR SYSTEMS PERMITTED TO HAVE ONE SOURCE OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 3 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD–IN CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. IFC § C104
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL–WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. IFC § 503.2.3
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12% ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. IFC § 503.2.7; 503.2.8
21. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FT OUTSIDE AND 28 FT INSIDE TURNING RADIUS. IFC § 503.2.4
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13FT 6 INS. IFC § 503.2.1
23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 33 FT WITH PARKING ON BOTH SIDES MEASURED TO FACE OF CURB. NOT LESS THAN 28 FT WIDE WITH PARKING RESTRICTED TO ONE SIDE MEASURED TO FACE OF CURB. NOT LESS THAN 24 FT WIDE WITH NO PARKING ON EITHER SIDE MEASURED TO FACE OF CURB. FIRE LANES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FT. IFC § 503.2.1.1
24. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. IFC § 503.1.1
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD–ENDS OR A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. CLV REGULATION AND MOU
26. ALL DEAD–END FIRE APPARATUS ROADS AND/OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. CLV REGULATION
27. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF NO CURB IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. IFC § 503.3
28. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. IFC § 503.6
29. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS, OR HAVING FOUR OR MORE TRAVEL LANES AND A TRAFFIC COUNT OF MORE THAN 30,000 VEHICLES PER DAY, ALL HYDRANTS BEINGS UTILIZED TO DELIVER FIRE FLOW TO THE ROAD LOCATION SHALL BE LOCATED ON THE SAME SIDE OF THE STREET AS THE PROPOSED DEVELOPMENT. CLV REGULATION

REVISED FEBRUARY 4, 2019

CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.
3. BEFORE ANY WORK IS STARTED IN THE RIGHT–OF–WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
4. WHEN A DESIGNATED "SUGGESTED ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTING SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.
5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL UTILIZE TYPE XI RETROREFLECTIVE SHEETING IN ACCORDANCE WITH CCAUSS 627 AND 716 AND SHALL HAVE AN ANTI–GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF–SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.
10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.
11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA (RTC). IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.
13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828–3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.
14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.
15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

REVISED JUNE 4, 2018

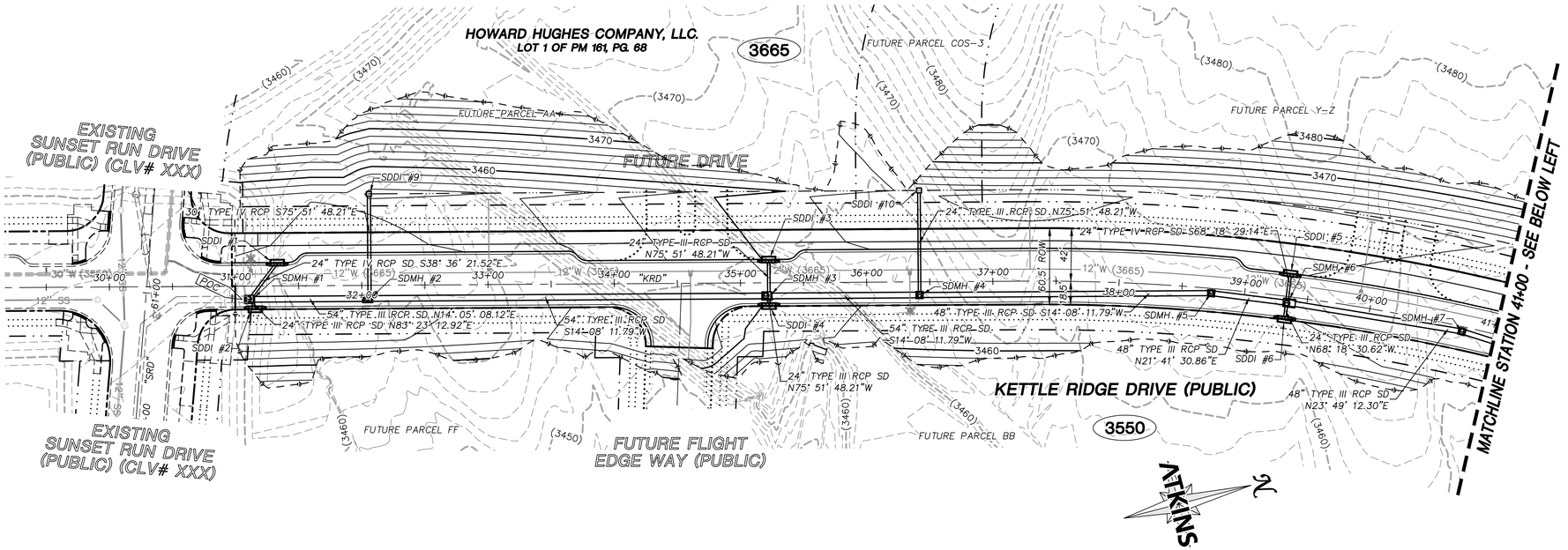
CITY OF LAS VEGAS SEWER NOTES

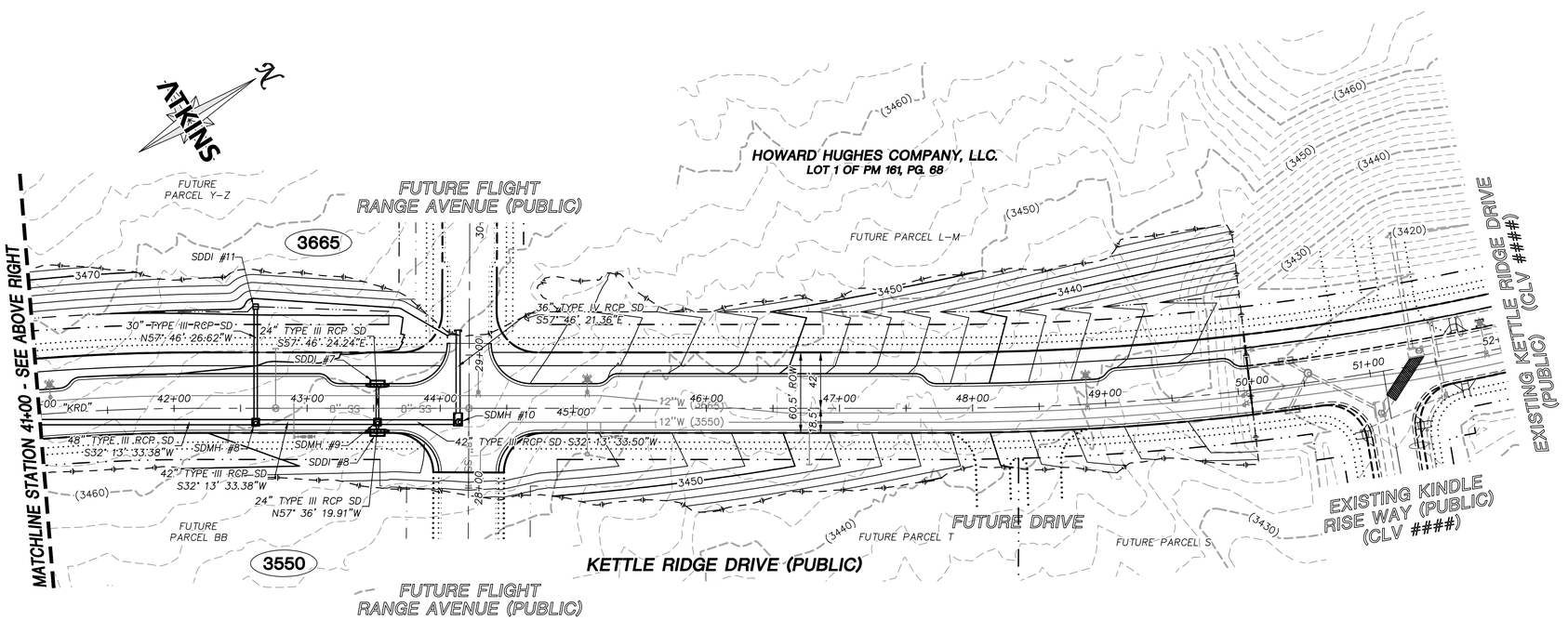
1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF–SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.
2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.
3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.
4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D–3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y"S SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.
7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.
8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.
9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C–900 PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

REVISED 04/15/10

CITY OF LAS VEGAS STREET LIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF–SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION (USS), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF–SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.
2. DESIGN PROFESSIONAL AND CONTRACTOR SHALL VERIFY CITY'S LATEST LED FIXTURE SPECIFICATIONS AND APPROVED FIXTURES PER CLV WEBSITE, UNDER BUILDING AND SAFETY FORMS, PRIOR TO ORDERING MATERIALS.
3. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS, ETC., LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.
4. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.
5. ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN NO. #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.
6. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 320A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING





SUMMARY OF QUANTITIES

DESCRIPTION	QUANTITY	UNIT
DRAINAGE		
RIP-RAP (D50=12")	515	CY
RIP-RAP (D50=6")	390	CY
10' TYPE "CM2" DROP INLET	6	EACH
7.5' TYPE "CM2" DROP INLET	2	EACH
2' X 2' NDOT TYPE "CM2" DROP INLET	3	EACH
60" TYPE II MANHOLE	3	EACH
60" TYPE III MANHOLE	7	EACH
24" CLASS III RCP SD	145	LF
24" CLASS IV RCP SD	95	LF
30" CLASS III RCP SD	90	LF
30" CLASS IV RCP SD	85	LF
36" CLASS IV RCP SD	70	LF
42" CLASS III RCP SD	155	LF
48" CLASS III RCP SD	620	LF
54" CLASS III RCP SD	530	LF

MASTER PLAN NOTE

THIS SHEET IS FOR INFORMATIONAL PURPOSES ONLY. IT IS AN OVERALL REPRESENTATION OF THE UTILITY FOR REVIEW AND COORDINATION WITH OTHER PROJECT DETAILS WITHIN THIS PLAN SET.

STORM DRAIN NOTES

1. SEE ROADWAY PLAN AND PROFILE SHEETS FOR CONSTRUCTION DETAILS.
2. ALL STORM DRAIN MATERIAL TO BE CLASS III REINFORCED CONCRETE PIPE, UNLESS OTHERWISE NOTED IN PROFILES.
3. CONTRACTOR TO PROVIDE 6" MINIMUM OF CLEARANCE BETWEEN OUTSIDE OF PIPE TO INSIDE WALL OF STORM DRAIN STRUCTURES.

GRAPHIC SCALE
50 0 25 50 100
HORIZONTAL: 1"= 50'

SOILS REPORT

BY NOVA
PROJECT NO. G-18-176
DATED 12/03/18 AND
SUBSEQUENT UPDATE LETTER
DATED 12/30/19
EARTHWORK QUANTITIES (RAW):
CUT= 47000 CU YDS
FILL= 8500 CU YDS

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DS#XXX-0000

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

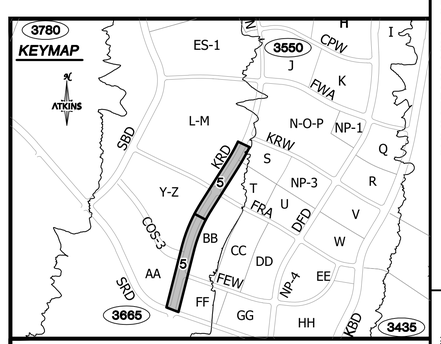
BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368
(REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 REGIONAL AND NATIONAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING OR DAMAGING UTILITY LINES. IT'S COSTLY. Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929



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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673
10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

MASTER DRAINAGE PLAN

DESIGNED BY:	N. BARCOS
DRAWN BY:	L. MAMACLAY
CHECKED BY:	P. BATES
HORIZ.:	NONE
VERT.:	NONE
JOB NO.	100066768
DATE:	NOVEMBER, 2020
DRAWING NO.	5/29
CLV	00-00000

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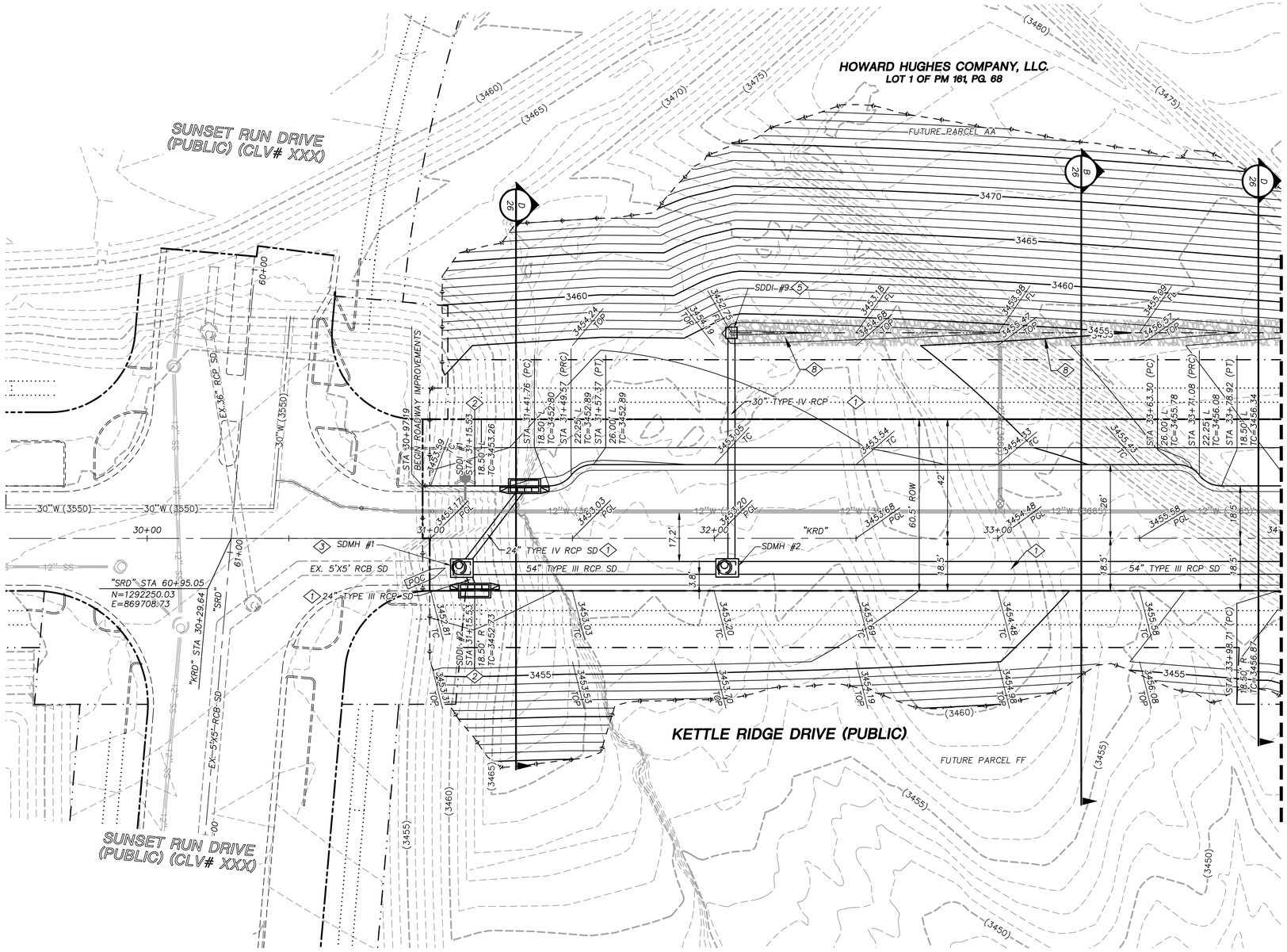
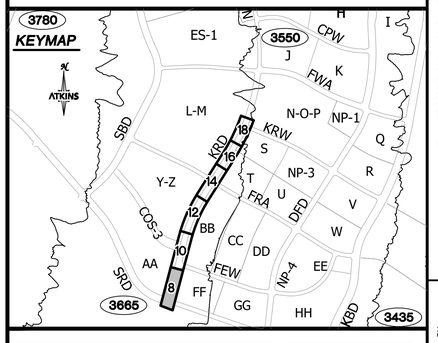


STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET 3 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
3. INSTALL TYPE II SD MANHOLE PER CCAUSD #405.2
4. INSTALL TYPE III SD MANHOLE PER CCAUSD #406
5. INSTALL NDOT TYPE 2 DROP INLET PER NDOT R-4.2.1 (SEE SHEET 27)
6. STUB & PLUG STORM DRAIN FOR FUTURE CONNECTION PER MANUFACTURER'S PLUG, OR APPROVED EQUAL (SEE SHEET 27)
7. INSTALL RIP-RAP (D50=12", THICKNESS=24")
8. INSTALL RIP-RAP (D50=6", THICKNESS=12")

ROADWAY CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE PER SOILS REPORT. SEE SHEET 26 FOR TYPICAL PAVEMENT SECTION.
2. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD #216
3. FUTURE SIDEWALK BY OTHERS
4. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1.
5. CONSTRUCT CONCRETE BIKE PATH PER CCAUSD #234
6. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1 (A=B=6.5')
7. INSTALL SCHEDULE 40 PVC IRRIGATION SLEEVES (2-4",1-6") PER DETAIL B ON SHEET 29



GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"=20'
5 0 2.5 5 10
VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT. DS#XXX-0000

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.

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T21S,R59E,S03

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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673 10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

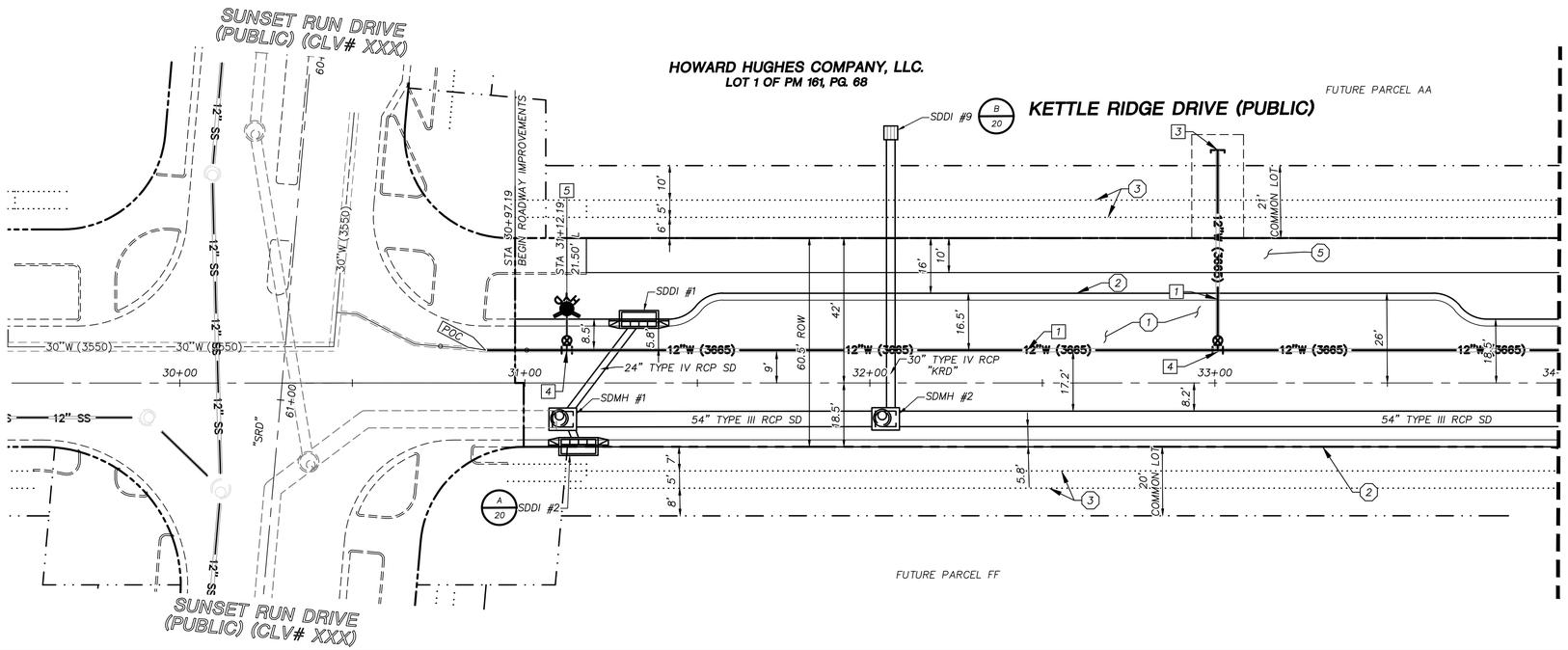
SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

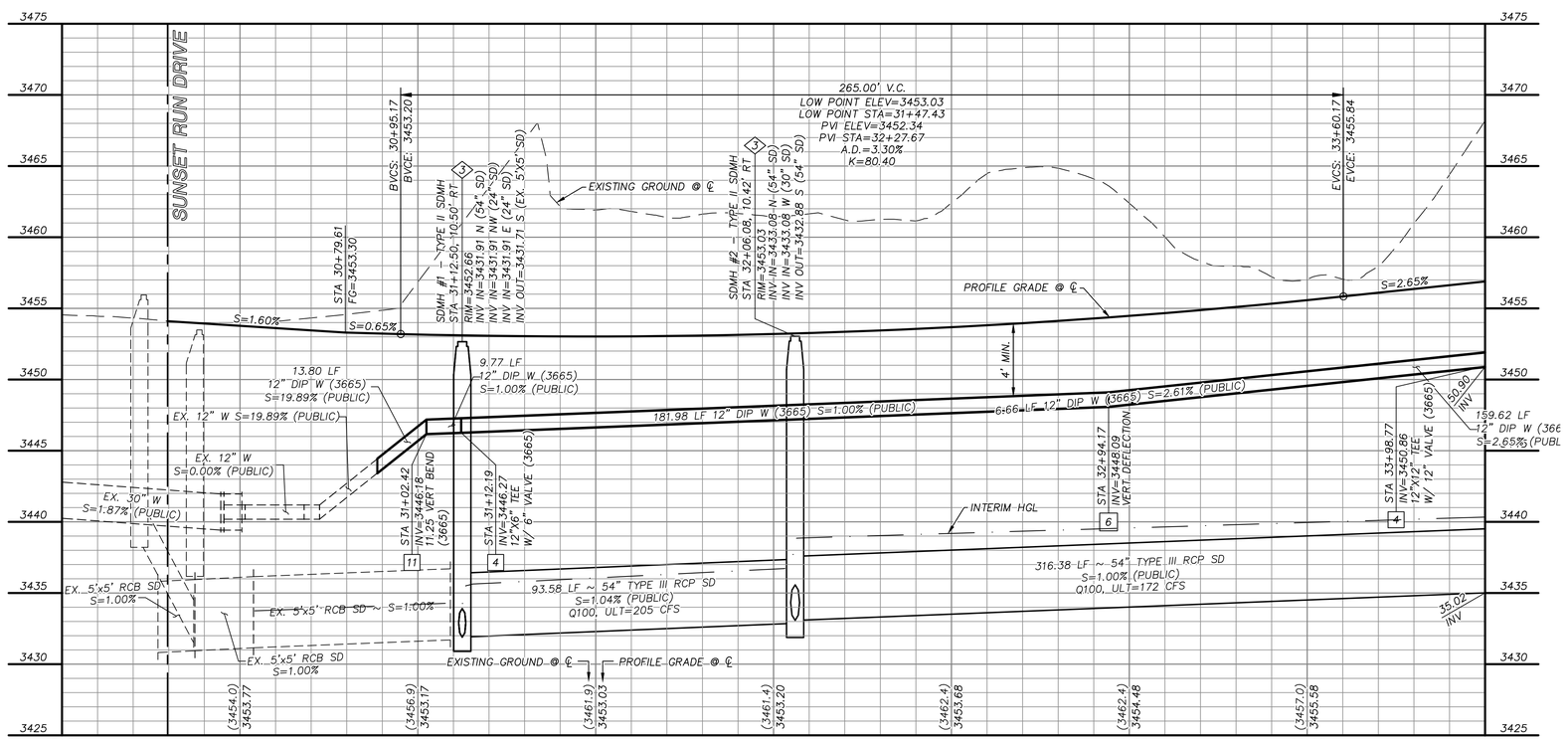
ROADWAY GRADING PLAN
BEGIN TO STA 34+00

JOB NO.	100066768
DATE	NOVEMBER, 2020
DRAWING NO.	8 /29
CLV	00-00000

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-10-GRAD-C10.dwg LAYOUT: G1 Nov 03, 2020 - 10:22PM





STORM DRAIN CONSTRUCTION NOTES

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2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
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7. INSTALL RIP-RAP (D50=12", THICKNESS=24")
8. INSTALL RIP-RAP (D50=6", THICKNESS=12")

SEWER CONSTRUCTION NOTES

1. INSTALL SEWER MANHOLE PER DCSWCS SD-1A, SD-1B, AND SD-4
2. INSTALL SEWER MAIN PER DCSWCS SD-17
3. STUB AND CAP SEWER PIPE. PLACE MARKER BALL AND 4"X4" POST, DOUGLAS FIR, OVER END OF PIPE AND INSTALL THRUST BLOCK (1 CUBIC FT. MINIMUM).

WATERLINE CONSTRUCTION NOTES

1. INSTALL WATER MAIN PER UDACS PLATES #17 AND PLATE #19
2. INSTALL GATE VALVE PER UDACS PLATES #30 AND #39
3. INSTALL CAP AND 2" MANUAL BLOWOFF ASSEMBLY PER UDACS PLATE #36
4. INSTALL TEE W/ VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31 AND #39
5. INSTALL FIRE HYDRANT WITH APPURTENANCES (CONCRETE PAD, LATERAL, VALVE, AND TEE) PER UDACS PLATES #30, #31, #39, AND #40.
6. INSTALL DEFLECTION AT PIPE JOINTS (MAXIMUM OF 1°)
7. INSTALL 5° HORIZONTAL BEND PER UDACS PLATE #31
8. INSTALL 45° HORIZONTAL BEND PER UDACS PLATE #31
9. INSTALL TAPPING SLEEVE WITH TAPPING VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31, #34, AND #39
10. REMOVE CAP AND 2" BLOWOFF AND CONNECT TO EXISTING WATERLINE STUB
11. INSTALL 11.25° VERTICAL BEND PER UDACS PLATE #31
12. INSTALL 5° VERTICAL BEND PER UDACS PLATE #31
13. INSTALL 1-1/2" IRRIGATION METER WITH 1-1/2" RPPA PER UDACS PLATES #4 AND #8 WITH CURB STOP
14. INSTALL COMBINATION AIR VALVE ASSEMBLY WITH ALL APPURTENANCES PER UDACS PLATE #38

ROADWAY CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE PER SOILS REPORT. SEE SHEET 26 FOR TYPICAL PAVEMENT SECTION.
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	REVISIONS			

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ROADWAY PLAN AND PROFILE
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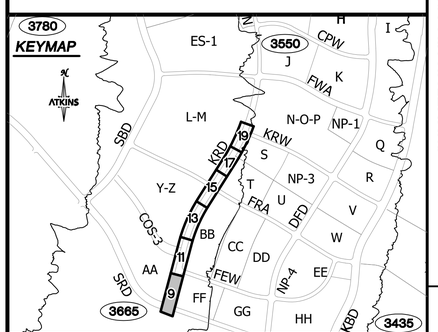

GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"=20'
5 0 2.5 5 10
VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

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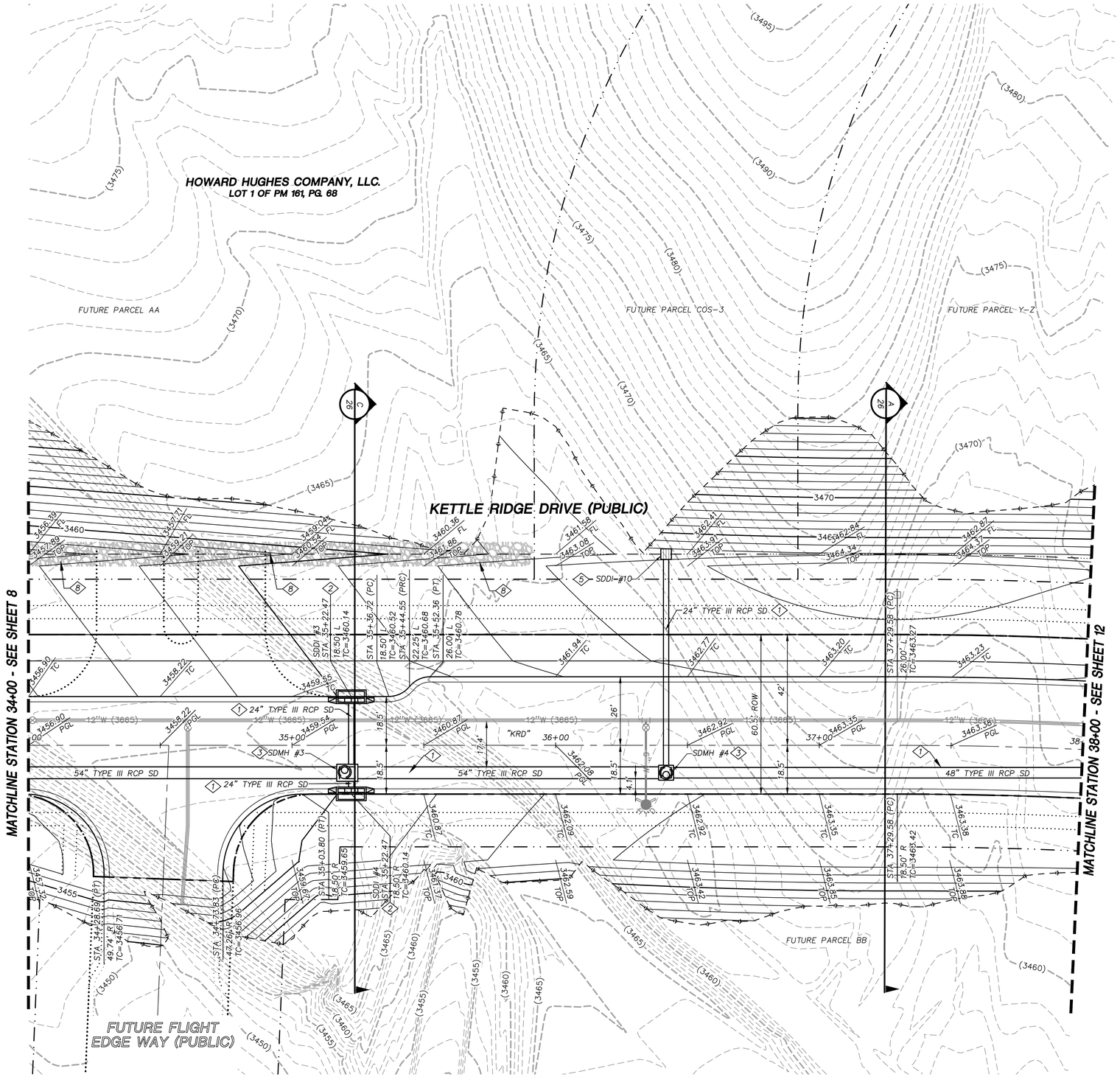
PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673
10/21/2020

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 9/29
CLV 00-00000

X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-11-PLAN-C11.dwg LAYOUT: P1 Nov 03, 2020 - 10:29PM



STORM DRAIN CONSTRUCTION NOTES

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7. INSTALL RIP-RAP (D50=12", THICKNESS=24")
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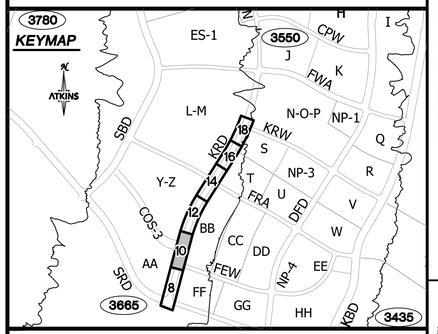

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

ROADWAY GRADING PLAN
STA 34+00 TO STA 38+00

GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"=20'
5 0 2.5 5 10
VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DS#XXX-0000

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368
(REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 FREQUENTLY AND ANTICIPATED SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES, ITS QUIETLY Call 811 OR 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES, ITS QUIETLY CALL BEFORE YOU DIG OVERHEAD 1-702-227-2929

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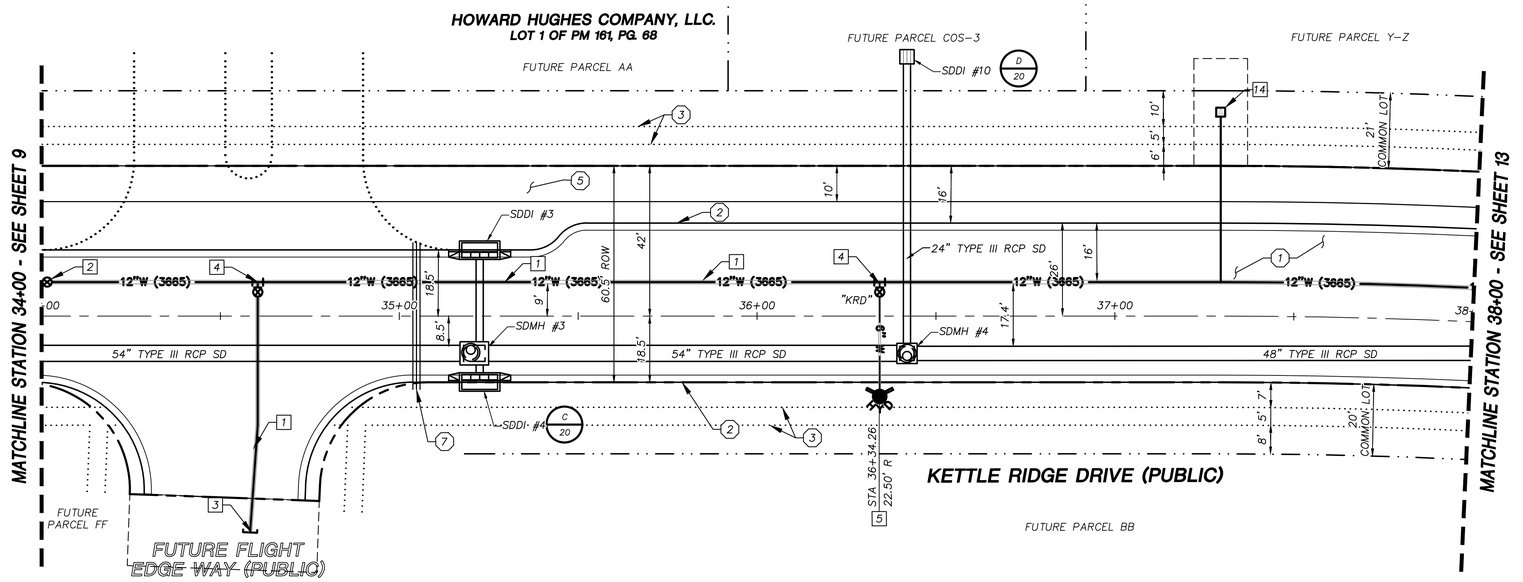
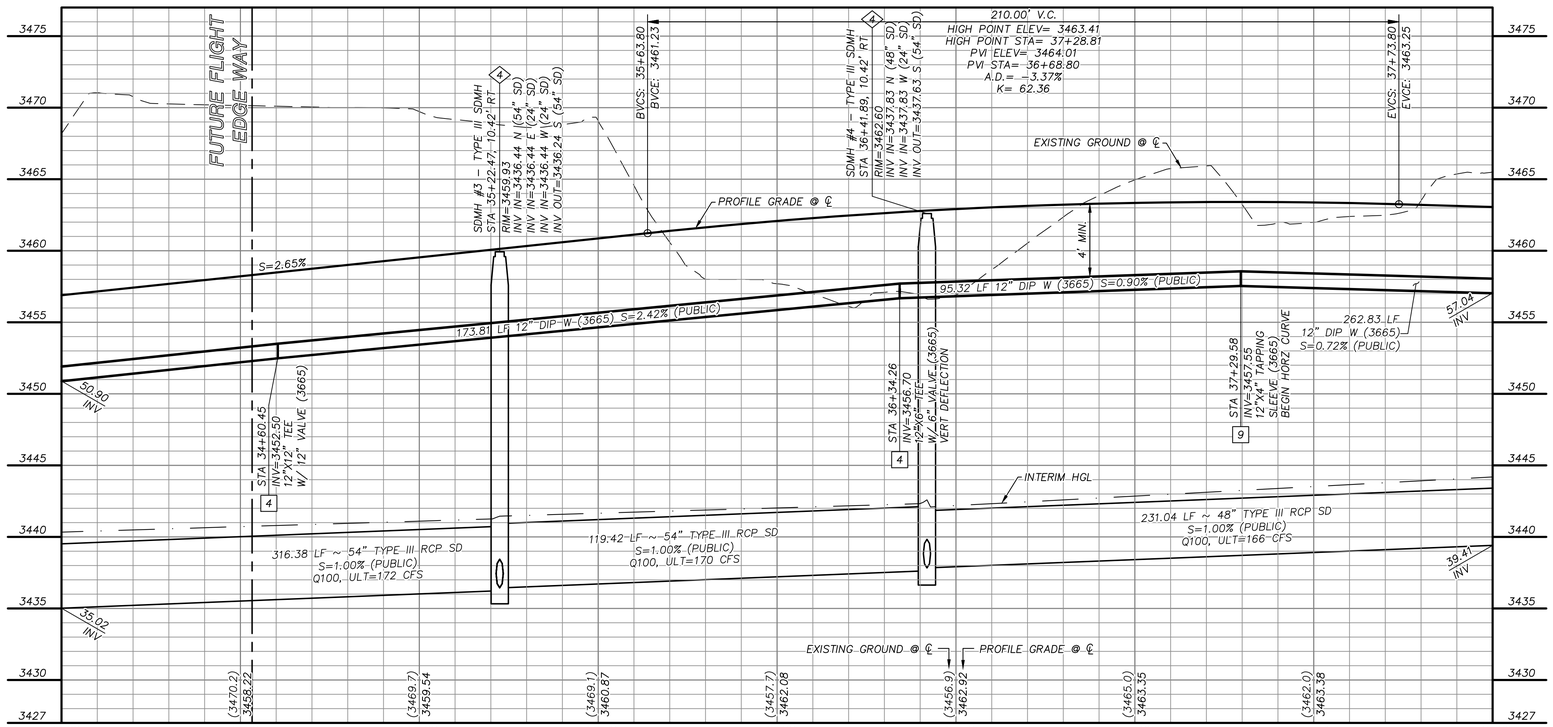
PROFESSIONAL ENGINEER-STATE OF NEVADA
NICOLAS A. BARCOS
EXP. 12-31-20
CIVIL
No. 25673
10/21/2020

JOB NO.	100066768	DESIGNED BY:	N. BARCOS
DATE:	NOVEMBER, 2020	DRAWN BY:	L. MAMACLAY
DRAWING NO.	10/29	CHECKED BY:	P. BATES
		HORIZ.:	NONE
		VERT.:	NONE
CLV	00-00000		

X:\Projects\SummitWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-10-GRAD-C10.dwg LAYOUT: G2 Nov 02, 2020 - 5:29PM





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1. INSTALL WATER MAIN PER UDACS PLATES #17 AND PLATE #19
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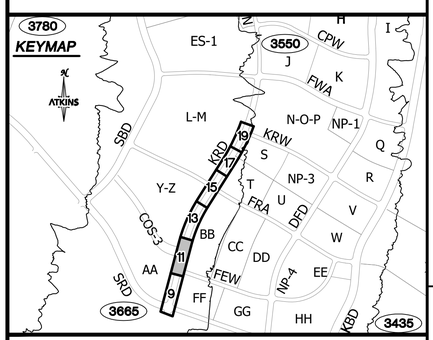

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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673 10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

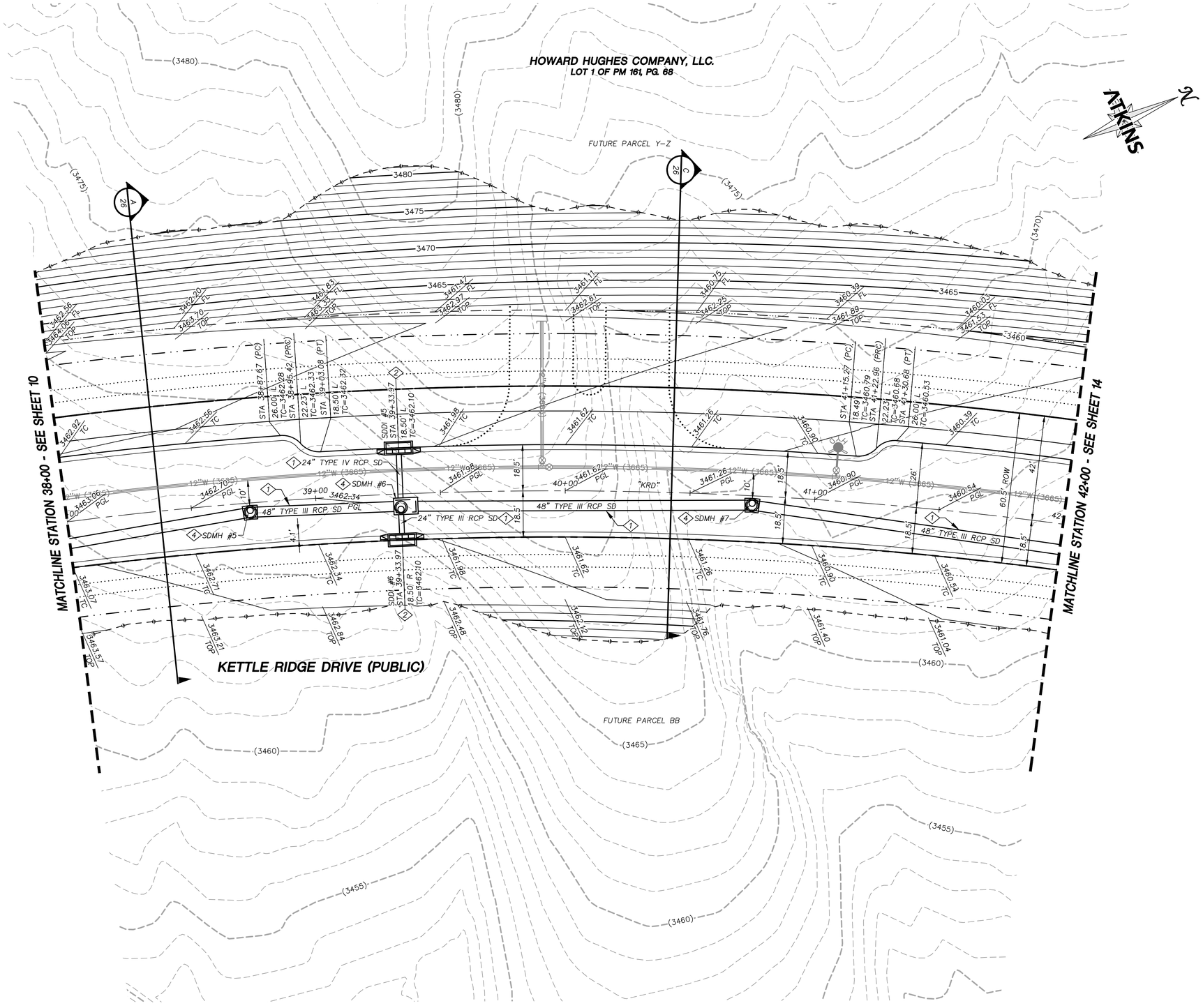
SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

ROADWAY PLAN AND PROFILE
STA 34+00 TO STA 38+00

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 11/29
CLV 00-00000

K:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-11-PLAN-C11.dwg LAYOUT: P2 Nov 02, 2020 - 5:29PM



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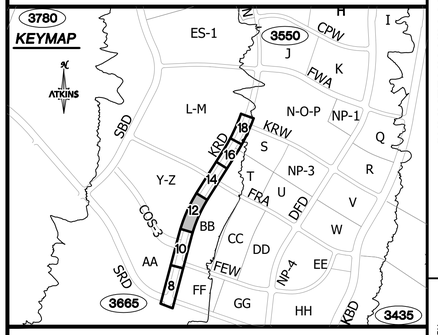

GRAPHIC SCALE

20 0 10 20 40

HORIZONTAL: 1"=20'

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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

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NICOLAS BARCOS PE#25673 DATE

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T21S,R59E,S03

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PROFESSIONAL ENGINEER - STATE OF NEVADA - NICOLAS A. BARCOS - EXP. 12-31-20 - CIVIL - No. 25673

10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
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ROADWAY GRADING PLAN
STA 38+00 TO STA 42+00

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 12/29
CLV 00-00000

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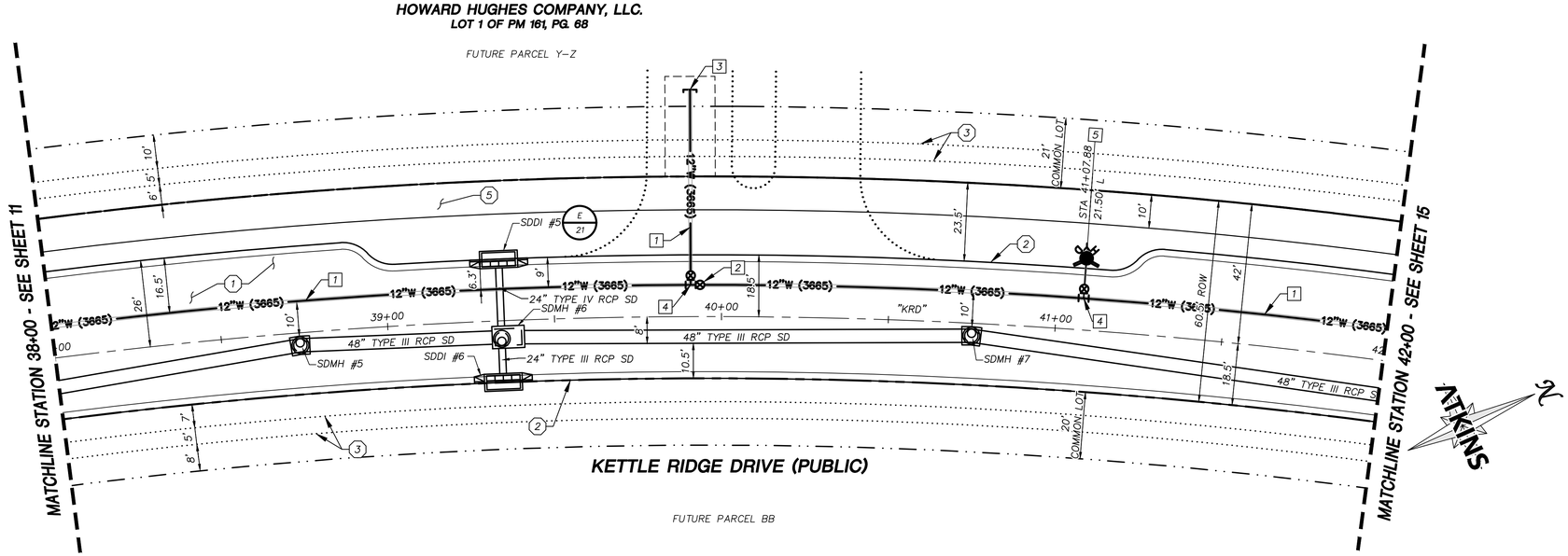

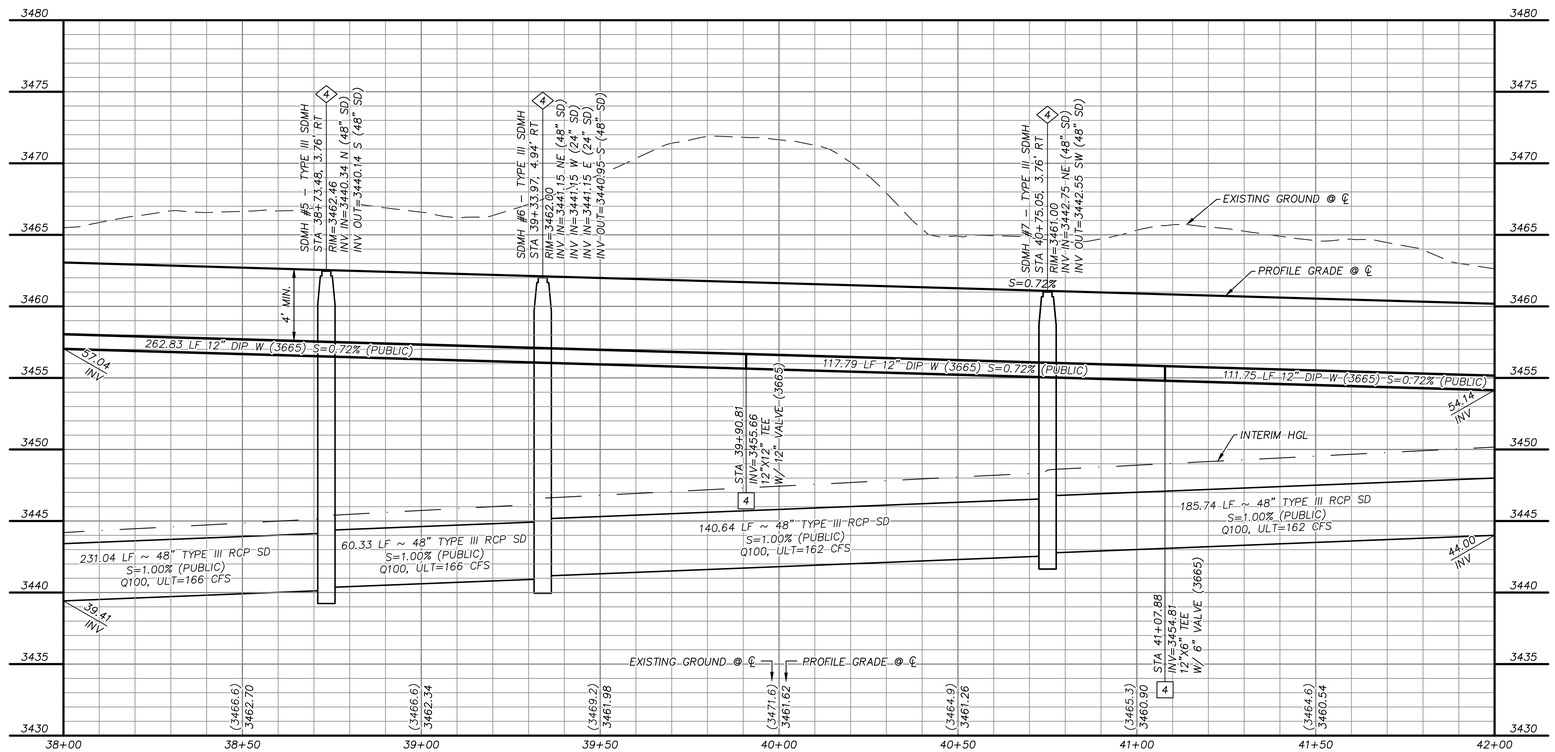

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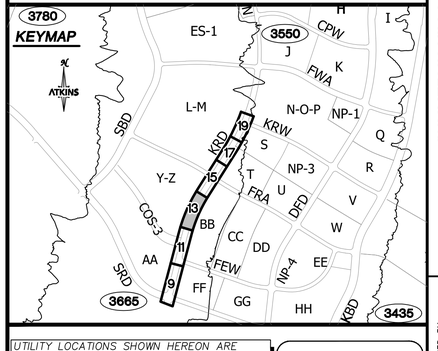

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PROFESSIONAL ENGINEER-STATE OF NEVADA
NICOLAS A. BARCOS
EXP. 12-31-20
CIVIL
No. 25673
10/21/2020

GRAPHIC SCALE
HORIZONTAL: 1"=20'
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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

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SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

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STA 38+00 TO STA 42+00

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 13/29
CLV 00-00000

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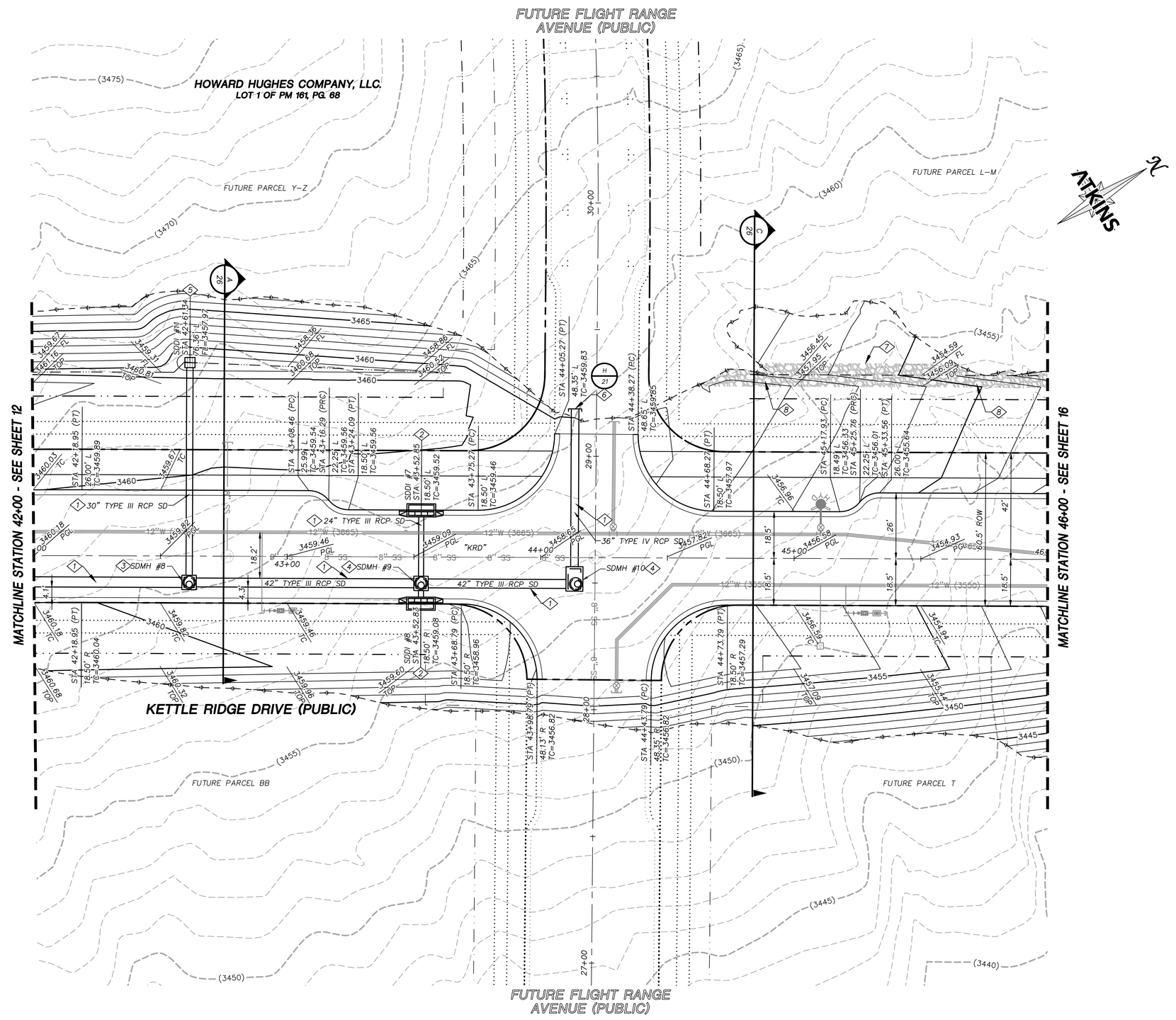
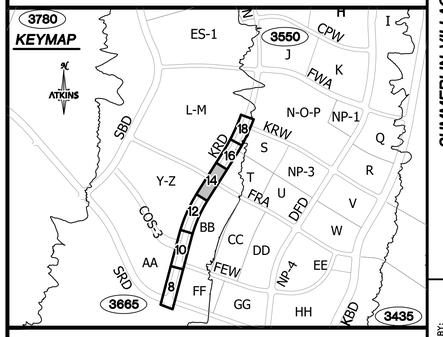


STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET 3 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
3. INSTALL TYPE II SD MANHOLE PER CCAUSD #405.2
4. INSTALL TYPE III SD MANHOLE PER CCAUSD #406
5. INSTALL NDOT TYPE 2 DROP INLET PER NDOT R-4.2.1 (SEE SHEET 27)
6. STUB & PLUG STORM DRAIN FOR FUTURE CONNECTION PER MANUFACTURER'S PLUG, OR APPROVED EQUAL (SEE SHEET 27)
7. INSTALL RIP-RAP (D50=12", THICKNESS=24")
8. INSTALL RIP-RAP (D50=6", THICKNESS=12")

ROADWAY CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE PER SOILS REPORT. SEE SHEET 26 FOR TYPICAL PAVEMENT SECTION.
2. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD #216
3. FUTURE SIDEWALK BY OTHERS
4. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1.
5. CONSTRUCT CONCRETE BIKE PATH PER CCAUSD #234
6. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1 (A=B=6.5')
7. INSTALL SCHEDULE 40 PVC IRRIGATION SLEEVES (2-4",1-6") PER DETAIL B ON SHEET 29



GRAPHIC SCALE

HORIZONTAL: 1"=20'

VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT. DS#XXX-0000

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368
(REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 (FEDERAL AND NATIONAL SYSTEM OF TRANSPORTATION)

Call before you Dig AVOID CUTTING OR DAMAGING UTILITY LINES. IT'S COSTLY. Call 811 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673 10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

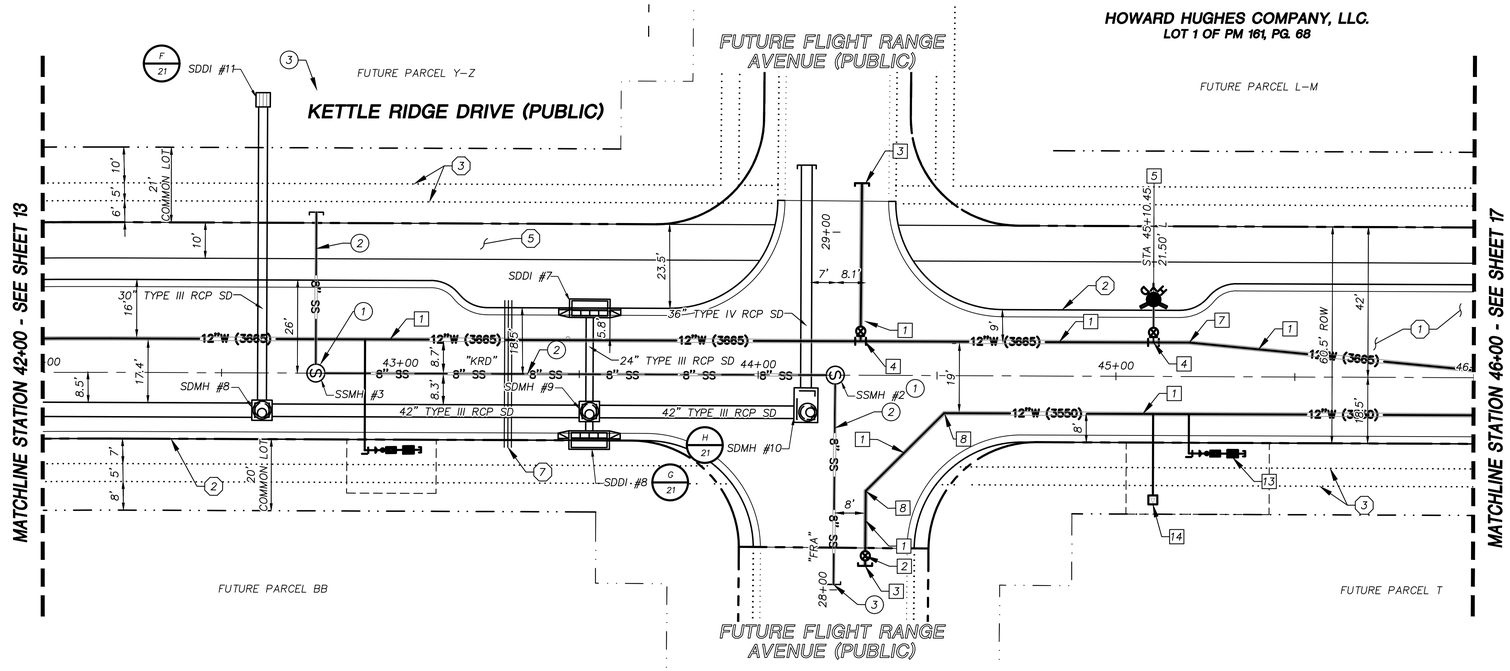
SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

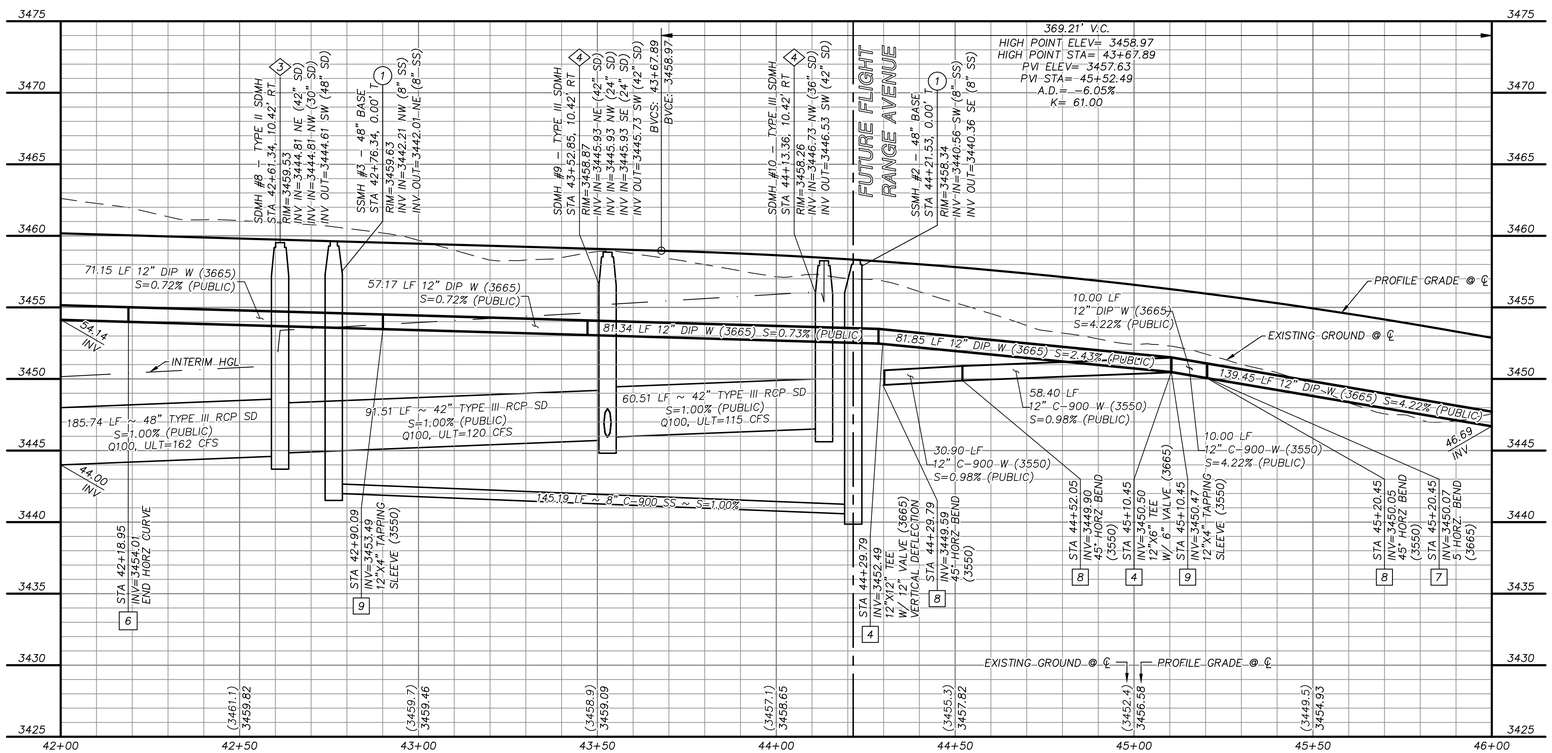
ROADWAY GRADING PLAN
STA 42+00 TO STA 46+00

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE NOVEMBER, 2020
DRAWING NO. 14 / 29
CLV 00-00000

X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-10-GRAD-C10.dwg LAYOUT: G4 Nov 02, 2020 - 5:29PM





GRAPHIC SCALE

HORIZONTAL: 1"=20'

VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

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DS#XXX-0000

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T21S,R59E,S03

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7. INSTALL RIP-RAP (D50=12", THICKNESS=24")
8. INSTALL RIP-RAP (D50=6", THICKNESS=12")

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1. INSTALL SEWER MANHOLE PER DCSWCS SD-1A, SD-1B, AND SD-4
2. INSTALL SEWER MAIN PER DCSWCS SD-17
3. STUB AND CAP SEWER PIPE. PLACE MARKER BALL AND 4"X4" POST, DOUGLAS FIR, OVER END OF PIPE AND INSTALL THRUST BLOCK (1 CUBIC FT. MINIMUM).

WATERLINE CONSTRUCTION NOTES

1. INSTALL WATER MAIN PER UDACS PLATES #17 AND PLATE #19
2. INSTALL GATE VALVE PER UDACS PLATES #30 AND #39
3. INSTALL CAP AND 2" MANUAL BLOWOFF ASSEMBLY PER UDACS PLATE #36
4. INSTALL TEE W/ VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31 AND #39
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12. INSTALL 5° VERTICAL BEND PER UDACS PLATE #31
13. INSTALL 1-1/2" IRRIGATION METER WITH 1-1/2" RPPA PER UDACS PLATES #4 AND #8 WITH CURB STOP
14. INSTALL COMBINATION AIR VALVE ASSEMBLY WITH ALL APPURTENANCES PER UDACS PLATE #38

ROADWAY CONSTRUCTION NOTES

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3. FUTURE SIDEWALK BY OTHERS
4. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1.
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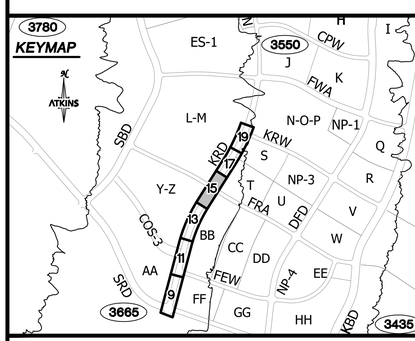

REVISIONS			
REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

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KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

ROADWAY PLAN AND PROFILE STA 42+00 TO STA 46+00

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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673 10/21/2020

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 15/29
CLV 00-00000

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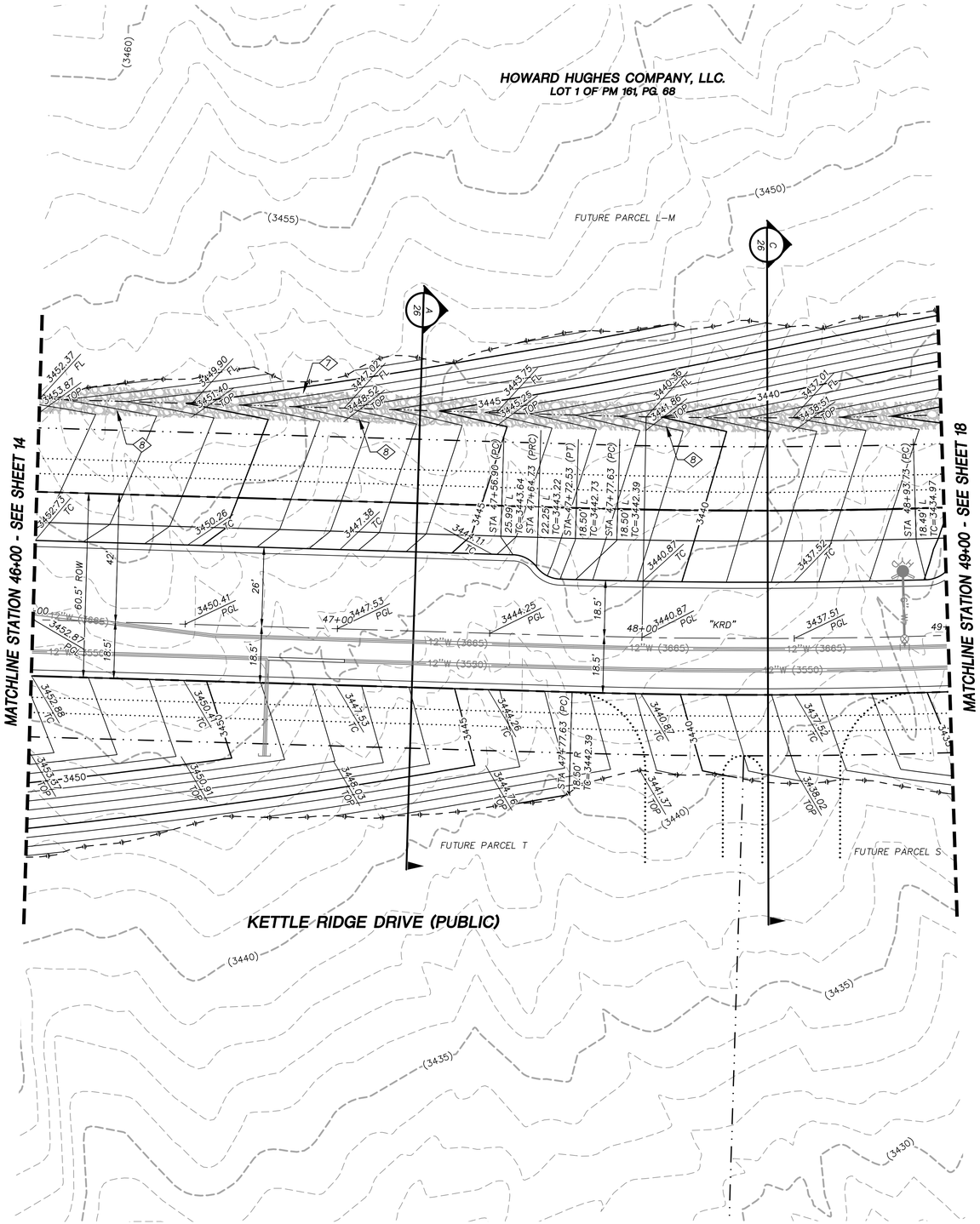

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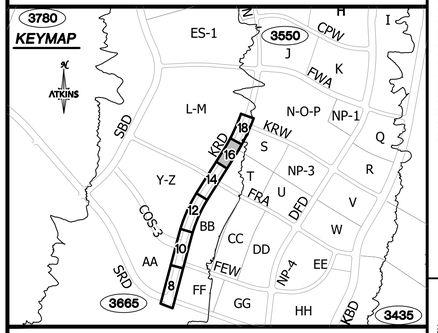

GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"=20'
5 0 2.5 5 10
VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

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DS#XXX–0000

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BENCHMARK

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(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

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Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. ITS QUIETLY. Call 811 OR 1-800-642-2444

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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673
10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

ROADWAY GRADING PLAN
STA 46+00 TO STA 49+00

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 16 /29

CLV 00–00000

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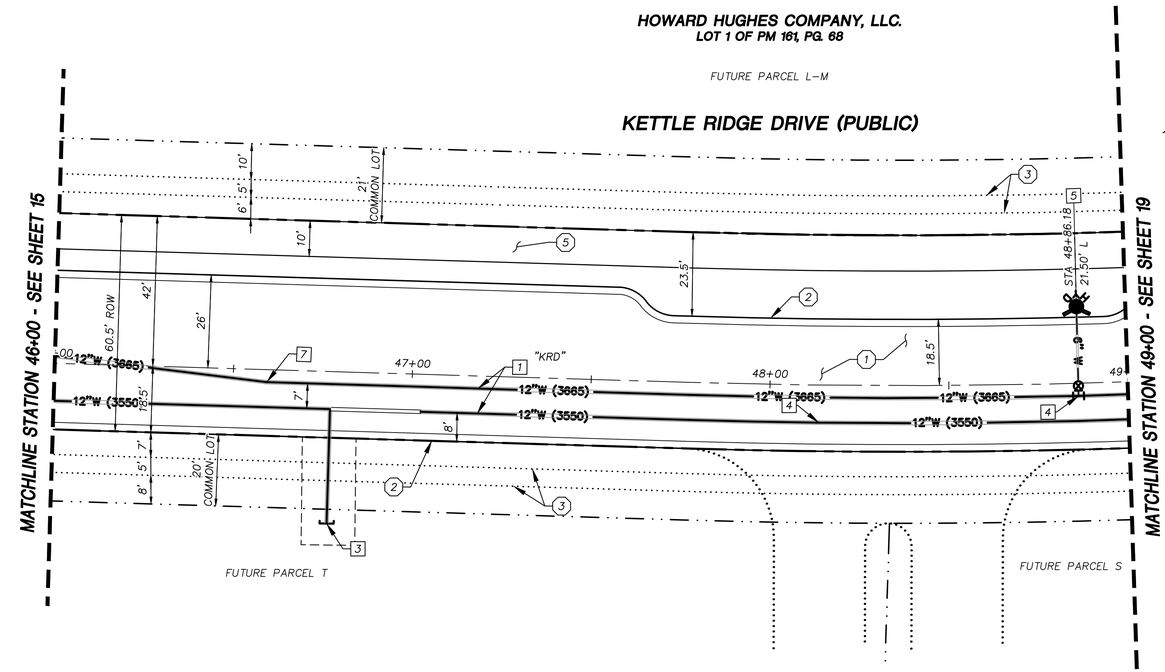

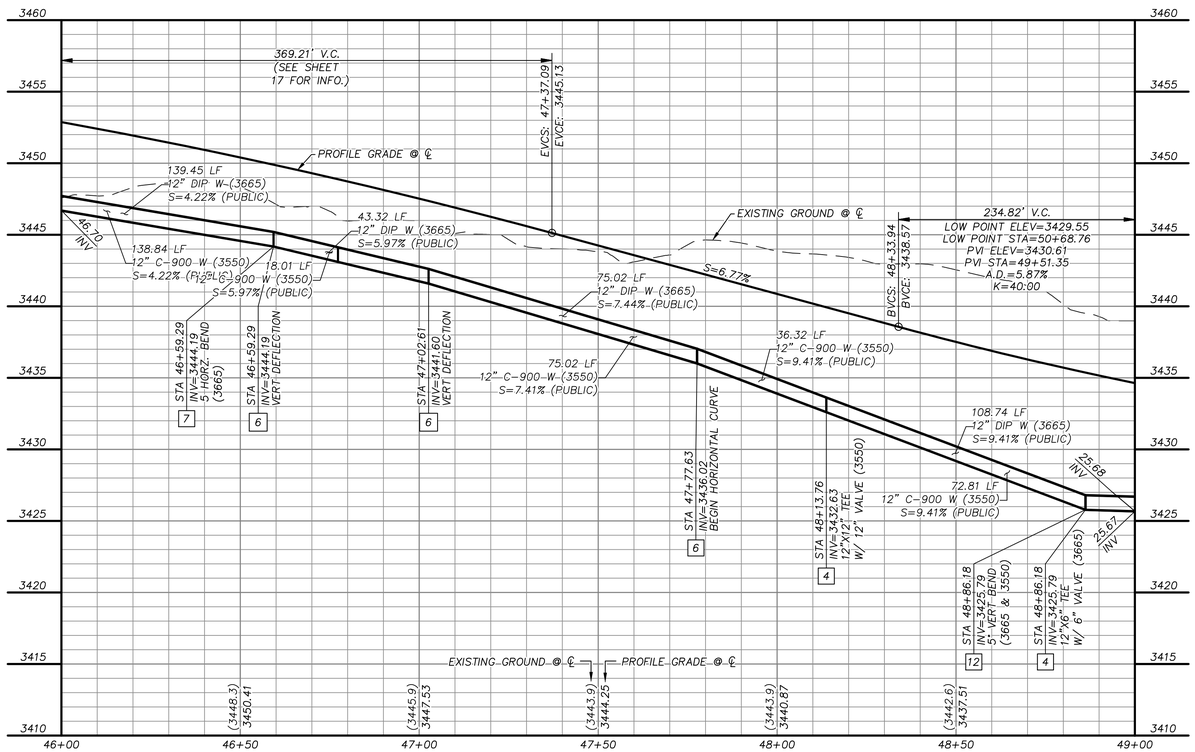

GRAPHIC SCALE

20 0 10 20 40

HORIZONTAL: 1"=20'

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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

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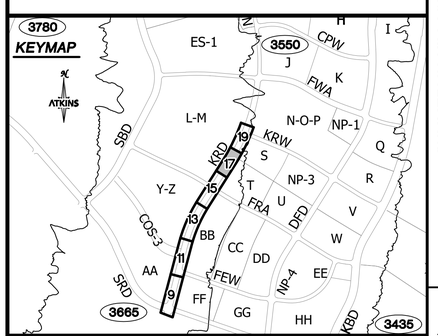

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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673

10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
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Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

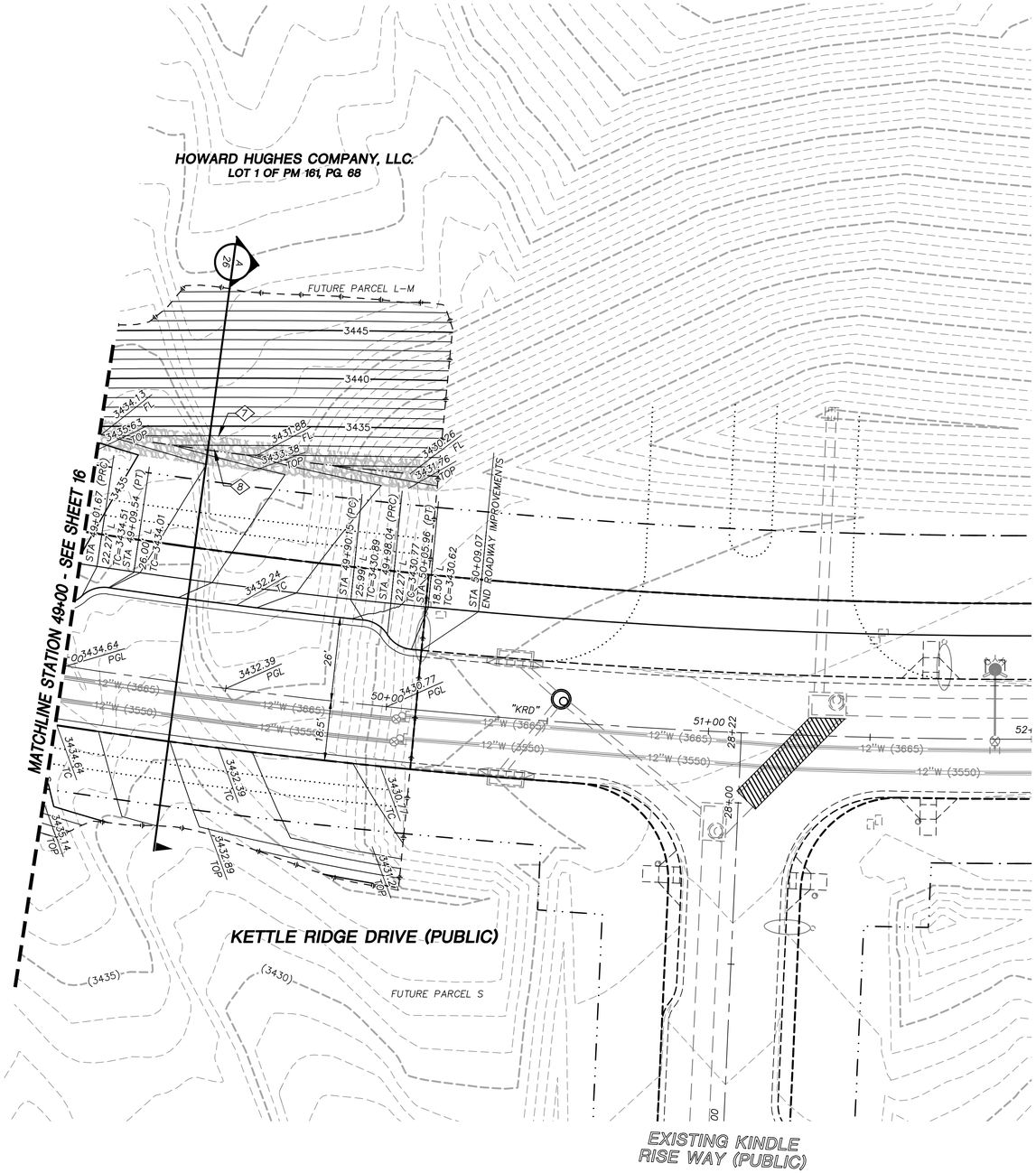
SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

ROADWAY PLAN AND PROFILE
STA 46+00 TO STA 49+00

DESIGNED BY:	N. BARCOS
DRAWN BY:	L. MAMACLAY
CHECKED BY:	P. BATES
HORIZ.:	NONE
VERT.:	NONE
JOB NO.	100066768
DATE:	NOVEMBER, 2020
DRAWING NO.	17 / 29
CLV	00–00000

X:\Projects\SummWest\Village 22\100066768 – V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768–11–PLAN–C11.dwg LAYOUT: P5 Nov 02, 2020 – 5:30PM

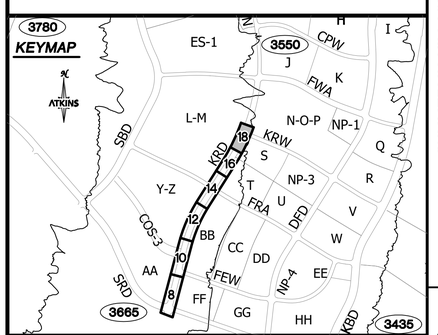


STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET 3 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
3. INSTALL TYPE II SD MANHOLE PER CCAUSD #405.2
4. INSTALL TYPE III SD MANHOLE PER CCAUSD #406
5. INSTALL NDOT TYPE 2 DROP INLET PER NDOT R-4.2.1 (SEE SHEET 27)
6. STUB & PLUG STORM DRAIN FOR FUTURE CONNECTION PER MANUFACTURER'S PLUG, OR APPROVED EQUAL (SEE SHEET 27)
7. INSTALL RIP-RAP (D50=12", THICKNESS=24")
8. INSTALL RIP-RAP (D50=6", THICKNESS=12")

ROADWAY CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE PER SOILS REPORT. SEE SHEET 26 FOR TYPICAL PAVEMENT SECTION.
2. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD #216
3. FUTURE SIDEWALK BY OTHERS
4. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1.
5. CONSTRUCT CONCRETE BIKE PATH PER CCAUSD #234
6. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1 (A=B=6.5')
7. INSTALL SCHEDULE 40 PVC IRRIGATION SLEEVES (2-4",1-6") PER DETAIL B ON SHEET 29



GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"=20'
5 0 2.5 5 10
VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

GRADING PLAN CERTIFICATION

NICOLAS BARCOS PE#25673 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DS#XXX-0000

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368
(REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 REGIONAL AND NATIONAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING & DAMAGING UTILITY LINES, IT'S COSTLY. Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES, IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673 10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

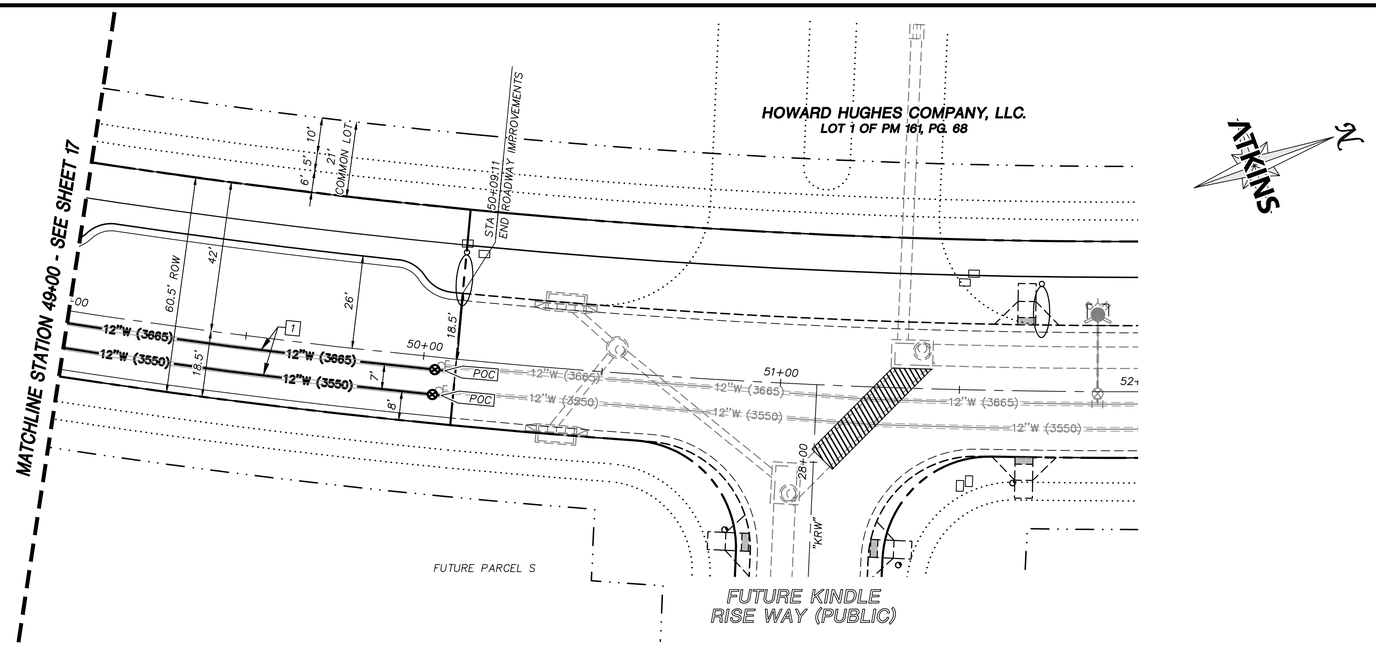
SUMMERLIN

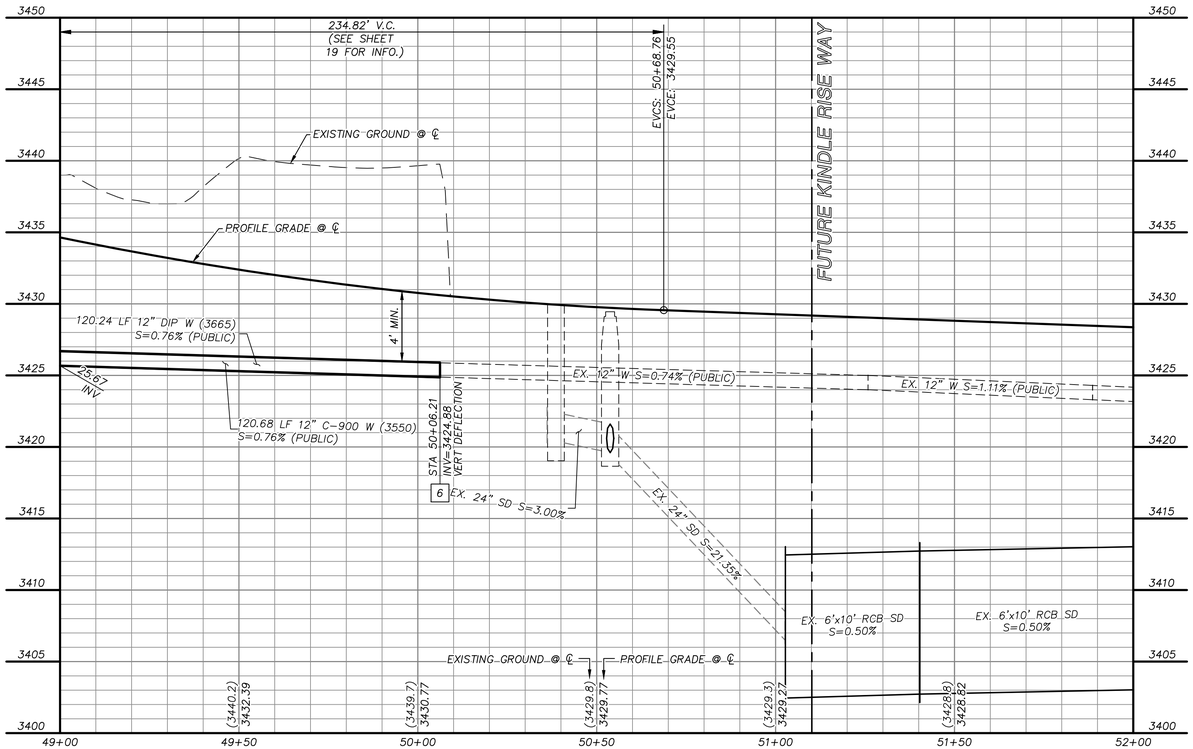
SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

ROADWAY GRADING PLAN
STA 49+00 TO END

DESIGNED BY:	N. BARCOS
DRAWN BY:	L. MAMACLAY
CHECKED BY:	P. BATES
HORIZ.:	NONE
VERT.:	NONE
JOB NO.	100066768
DATE:	NOVEMBER, 2020
DRAWING NO.	18 / 29
CLV	00-00000

X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-10-GRAD-C10.dwg LAYOUT: 08 Nov 02, 2020 - 5:30PM





GRAPHIC SCALE

20 0 10 20 40

HORIZONTAL: 1"=20'

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VERTICAL: 1"=5'

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

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DS#XXX-0000

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STORM DRAIN CONSTRUCTION NOTES

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2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
3. INSTALL TYPE II SD MANHOLE PER CCAUSD #405.2
4. INSTALL TYPE III SD MANHOLE PER CCAUSD #406
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8. INSTALL RIP-RAP (D50=6", THICKNESS=12")

SEWER CONSTRUCTION NOTES

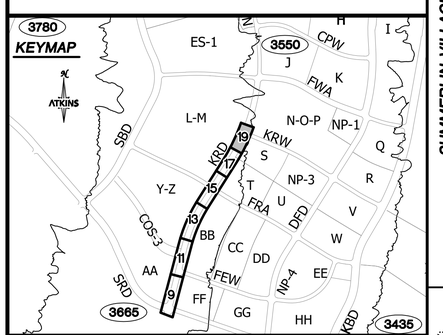
1. INSTALL SEWER MANHOLE PER DCSWCS SD-1A, SD-1B, AND SD-4
2. INSTALL SEWER MAIN PER DCSWCS SD-17
3. STUB AND CAP SEWER PIPE. PLACE MARKER BALL AND 4"X4" POST, DOUGLAS FIR, OVER END OF PIPE AND INSTALL THRUST BLOCK (1 CUBIC FT. MINIMUM).

WATERLINE CONSTRUCTION NOTES

1. INSTALL WATER MAIN PER UDACS PLATES #17 AND PLATE #19
2. INSTALL GATE VALVE PER UDACS PLATES #30 AND #39
3. INSTALL CAP AND 2" MANUAL BLOWOFF ASSEMBLY PER UDACS PLATE #36
4. INSTALL TEE W/ VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31 AND #39
5. INSTALL FIRE HYDRANT WITH APPURTENANCES (CONCRETE PAD, LATERAL, VALVE, AND TEE) PER UDACS PLATES #30, #31, #39, AND #40.
6. INSTALL DEFLECTION AT PIPE JOINTS (MAXIMUM OF 1°)
7. INSTALL 5° HORIZONTAL BEND PER UDACS PLATE #31
8. INSTALL 45° HORIZONTAL BEND PER UDACS PLATE #31
9. INSTALL TAPPING SLEEVE WITH TAPPING VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31, #34, AND #39
10. REMOVE CAP AND 2" BLOWOFF AND CONNECT TO EXISTING WATERLINE STUB
11. INSTALL 11.25° VERTICAL BEND PER UDACS PLATE #31
12. INSTALL 5° VERTICAL BEND PER UDACS PLATE #31
13. INSTALL 1-1/2" IRRIGATION METER WITH 1-1/2" RPPA PER UDACS PLATES #4 AND #8 WITH CURB STOP
14. INSTALL COMBINATION AIR VALVE ASSEMBLY WITH ALL APPURTENANCES PER UDACS PLATE #38

ROADWAY CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE PER SOILS REPORT. SEE SHEET 26 FOR TYPICAL PAVEMENT SECTION.
2. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD #216
3. FUTURE SIDEWALK BY OTHERS
4. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1.
5. CONSTRUCT CONCRETE BIKE PATH PER CCAUSD #234
6. CONSTRUCT CURB RAMP, TYPE A, PER NDOT STANDARD PLAN R-5.2.1 (A=B=6.5')
7. INSTALL SCHEDULE 40 PVC IRRIGATION SLEEVES (2-4",1-6") PER DETAIL B ON SHEET 29



REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

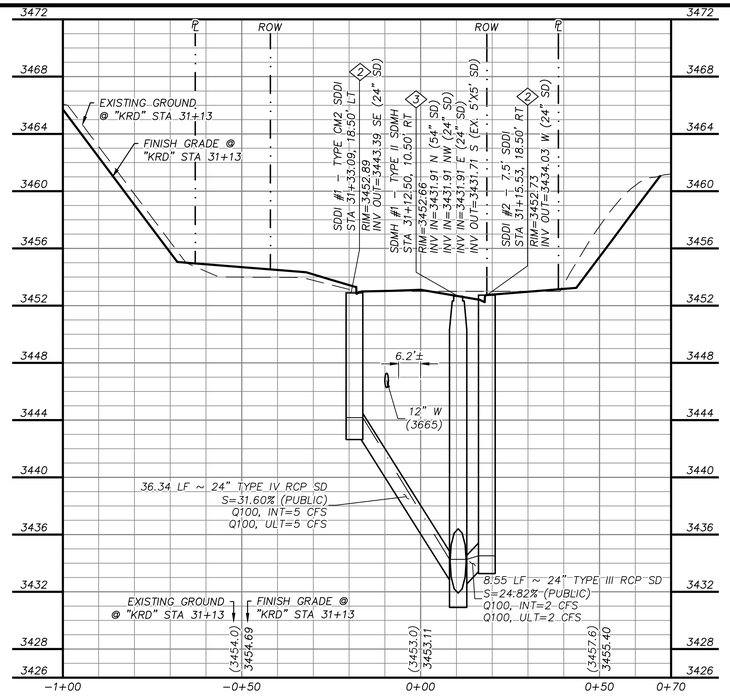
ROADWAY PLAN AND PROFILE
STA 49+00 TO END

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673 PROFESSIONAL ENGINEER-STATE OF NEVADA
10/21/2020

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 19/29
CLV 00-00000

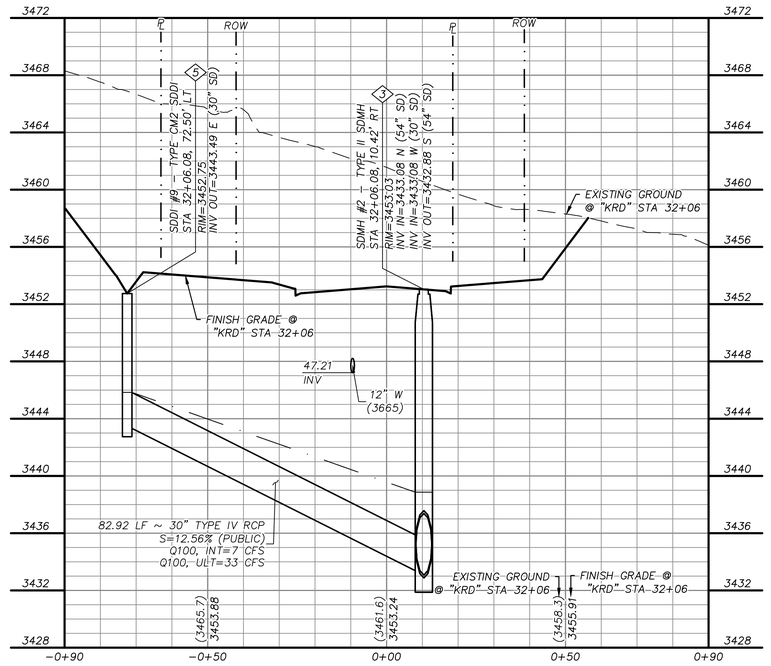
X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)\...\Sheets\66768-11-PLAN-C11.dwg LAYOUT: P6 Nov 02, 2020 - 5:30PM



STORM DRAIN LATERAL 1

"KRD" STA. 31+13 SEE SHEET 9

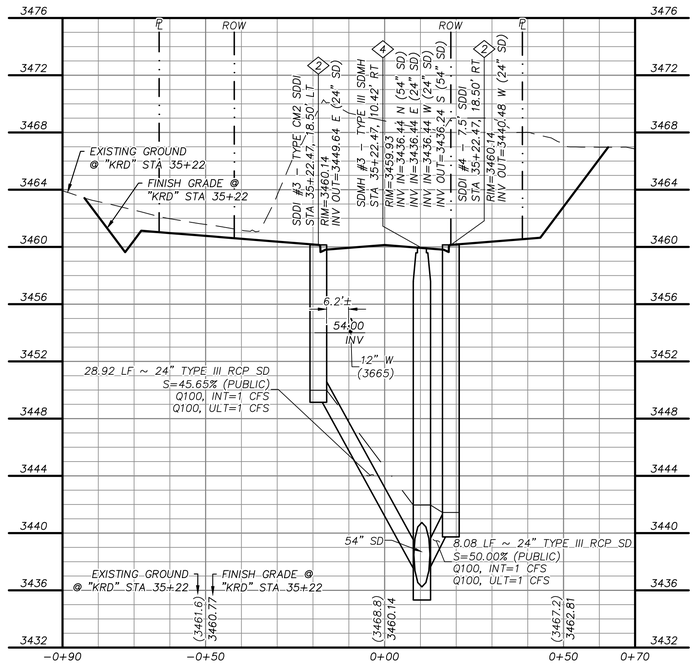
A / 20



STORM DRAIN LATERAL 2

"KRD" STA. 32+06 SEE SHEET 9

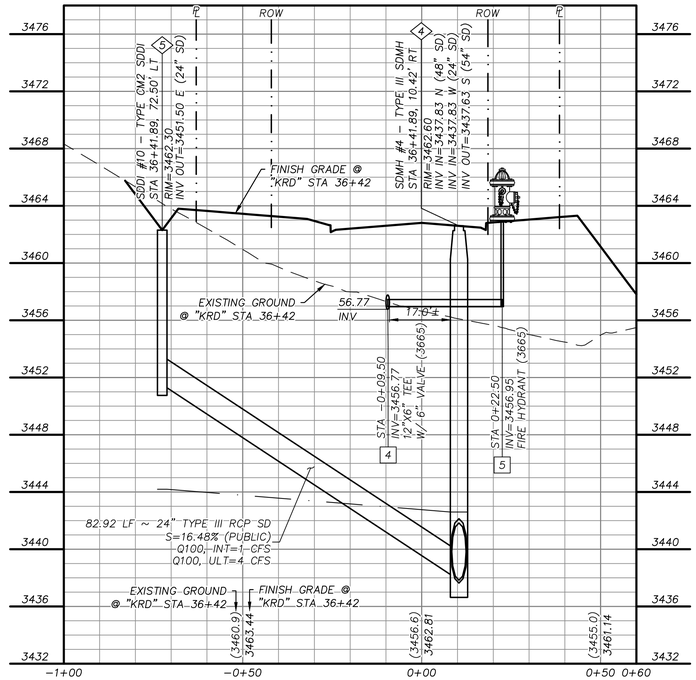
B / 20



STORM DRAIN LATERAL 3

"KRD" STA. 35+22 SEE SHEET 11

C / 20



STORM DRAIN LATERAL 4

"KRD" STA. 36+42 SEE SHEET 11

D / 20

STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET 3 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
3. INSTALL TYPE II SD MANHOLE PER CCAUSD #405.2
4. INSTALL TYPE III SD MANHOLE PER CCAUSD #406
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7. INSTALL RIP-RAP (D50=12", THICKNESS=24")
8. INSTALL RIP-RAP (D50=6", THICKNESS=12")

SEWER CONSTRUCTION NOTES

1. INSTALL SEWER MANHOLE PER DCSWCS SD-1A, SD-1B, AND SD-4
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3. STUB AND CAP SEWER PIPE. PLACE MARKER BALL AND 4"X4" POST, DOUGLAS FIR, OVER END OF PIPE AND INSTALL THRUST BLOCK (1 CUBIC FT. MINIMUM).

WATERLINE CONSTRUCTION NOTES

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2. INSTALL GATE VALVE PER UDACS PLATES #30 AND #39
3. INSTALL CAP AND 2" MANUAL BLOWOFF ASSEMBLY PER UDACS PLATE #36
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6. INSTALL DEFLECTION AT PIPE JOINTS (MAXIMUM OF 1°)
7. INSTALL 5° HORIZONTAL BEND PER UDACS PLATE #31
8. INSTALL 45° HORIZONTAL BEND PER UDACS PLATE #31
9. INSTALL TAPPING SLEEVE WITH TAPPING VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31, #34, AND #39
10. REMOVE CAP AND 2" BLOWOFF AND CONNECT TO EXISTING WATERLINE STUB
11. INSTALL 11.25° VERTICAL BEND PER UDACS PLATE #31
12. INSTALL 5° VERTICAL BEND PER UDACS PLATE #31
13. INSTALL 1-1/2" IRRIGATION METER WITH 1-1/2" RPPA PER UDACS PLATES #4 AND #8 WITH CURB STOP
14. INSTALL COMBINATION AIR VALVE ASSEMBLY WITH ALL APPURTENANCES PER UDACS PLATE #38

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

STORM DRAIN LATERAL PROFILES 1

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368
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NAVD88 ELEVATION: 989.574 METERS
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FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 NEVADA'S ONE AND ONLY SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING & DAMAGING OUR UTILITY LINES. IT'S COSTLY. Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

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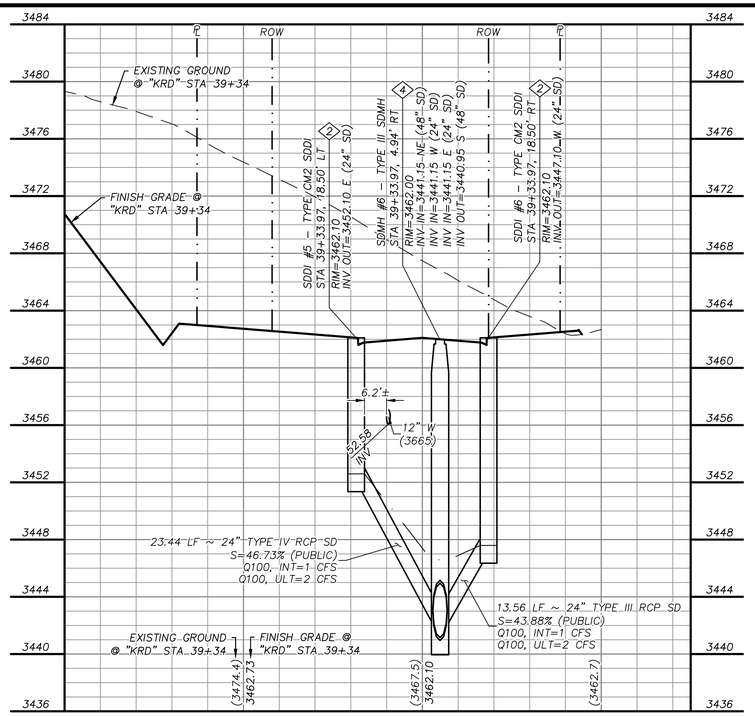
PROFESSIONAL ENGINEER-STATE OF NEVADA — NICOLAS A. BARCOS — EXP. 12-31-20 — CIVIL — No. 25675 — 10/21/2020

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 20 / 29
CLV 00-00000

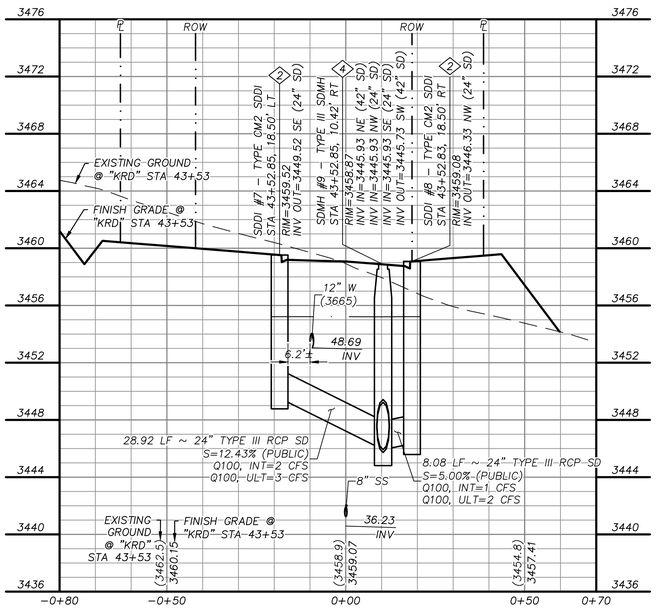
X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-12-LATL-01.dwg LAYOUT: Storm Drain Profiles-1 Nov 04, 2020 - 12:47AM



STORM DRAIN LATERAL 5

"KRD" STA. 39+34 SEE SHEET 13

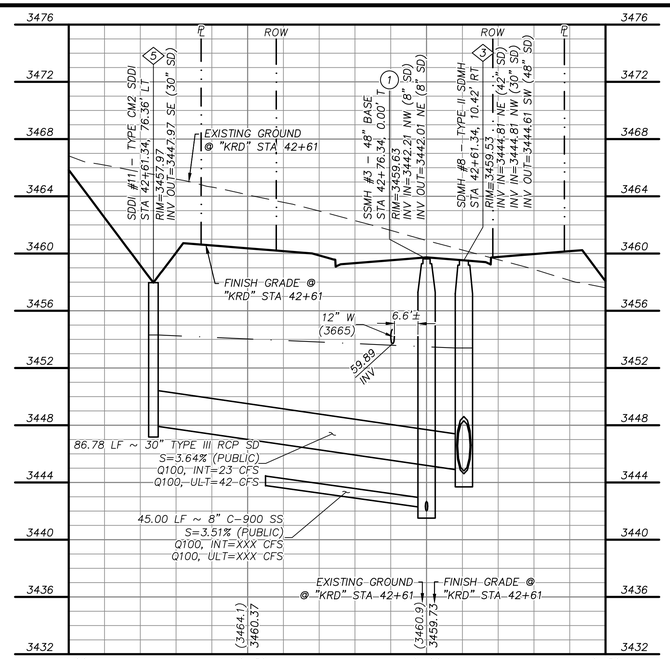
E 21



STORM DRAIN LATERAL 7

"KRD" STA. 43+53 SEE SHEET 15

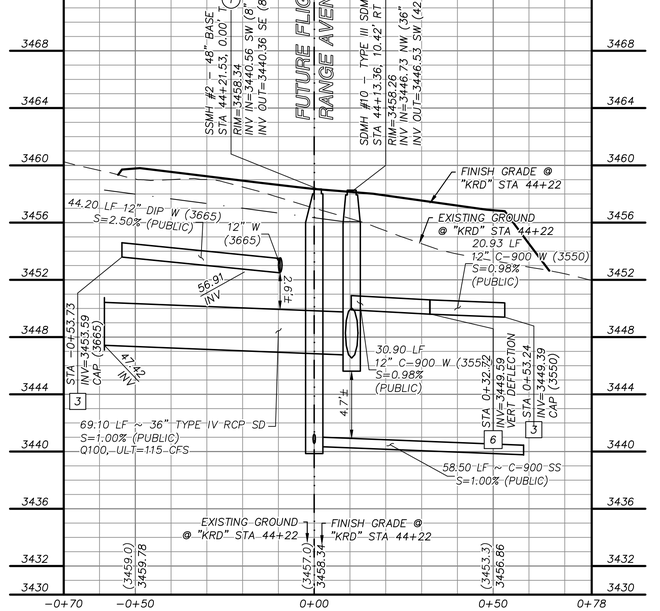
G 21



STORM DRAIN LATERAL 6

"KRD" STA. 42+61 SEE SHEET 15

F 21



STORM DRAIN LATERAL 8

"KRD" STA. 44+22 SEE SHEET 15

H 21

STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET 3 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
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14. INSTALL COMBINATION AIR VALVE ASSEMBLY WITH ALL APPURTENANCES PER UDACS PLATE #38

REV.	DESCRIPTION	BY	DATE	APPROVAL
	REVISIONS			

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
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Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

STORM DRAIN LATERAL PROFILES 2

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 0000 FIRST APPROVED DATE: _____

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK: D368
(REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 EMERGENCY AND NOTIFICATION SYSTEM OF TRANSMISSION

Call before you Dig AVOID CUTTING OR DAMAGING UTILITY LINES. IT'S COSTLY. Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

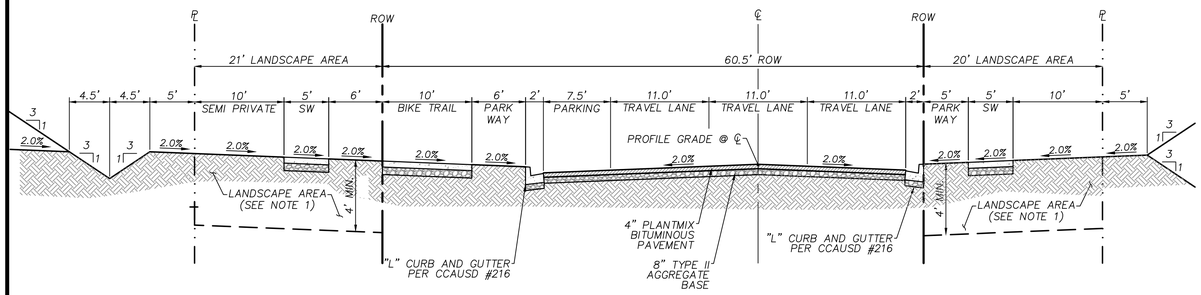
UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

PROFESSIONAL ENGINEER – STATE OF NEVADA – NICOLAS A. BARCOS – EXP. 12-31-20 – CIVIL – No. 25675 – 10/21/2020

JOB NO.	100066768
DATE:	NOVEMBER, 2020
DRAWING NO.	21/29
CLV	00-00000

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-12-LATL-01.dwg LAYOUT: Storm Drain Profiles-2 Nov 02, 2020 - 5:31PM



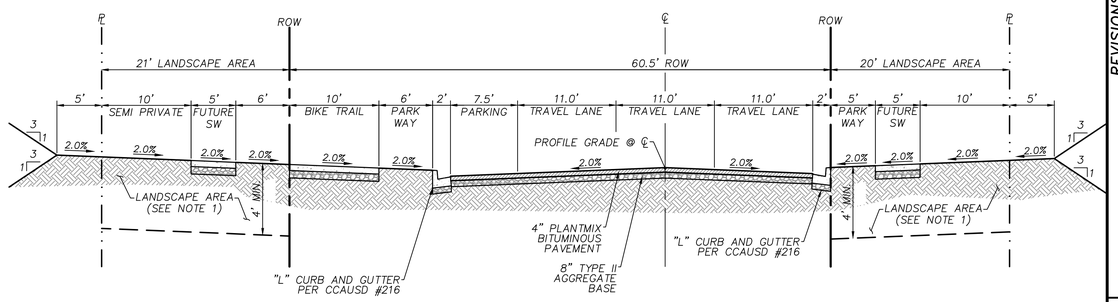
NOTES:

1. EXCAVATE BOTH SIDES TO DEPTH INDICATED PRIOR TO STREET IMPROVEMENTS. SIFT/SCREEN OUT ROCK AND DEBRIS GREATER THAN 6" FROM EXCAVATED MATERIAL, THEN BACKFILL TO 85% COMPACTION. FILL AS NECESSARY TO 2" BELOW THE FINISHED GRADE.

KETTLE RIDGE DRIVE - TYPICAL WITH SWALE

N.T.S.

A 26



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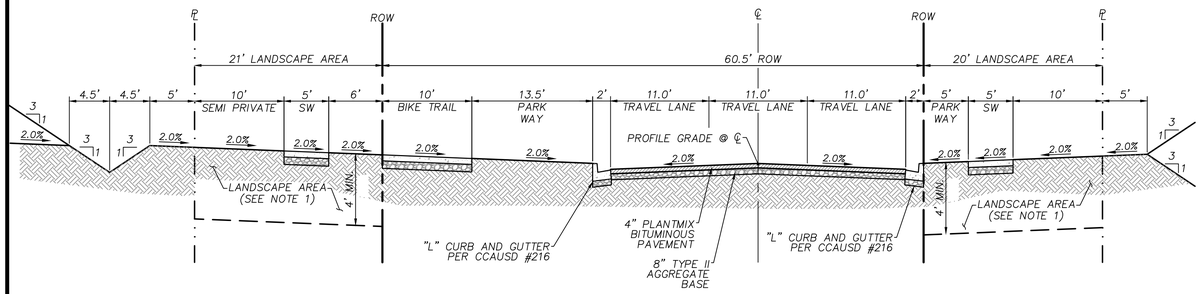
KETTLE RIDGE DRIVE - TYPICAL

N.T.S.

B 26



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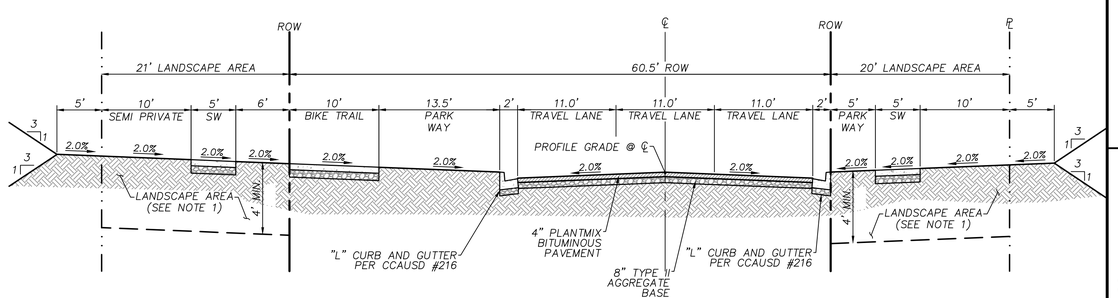
KETTLE RIDGE DRIVE - CURB EXTENSION WITH SWALE

N.T.S.

C 26



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KETTLE RIDGE DRIVE - CURB EXTENSION

N.T.S.

D 26

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.

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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A. BARCOS EXP. 12-31-20 CIVIL No. 25673

10/21/2020

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

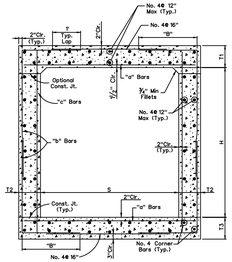
SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

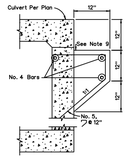
DETAILS

JOB NO. 100066768	DESIGNED BY: N. BARCOS	DRAWN BY: L. MAMACLAY	CHECKED BY: P. BATES
DATE: NOVEMBER, 2020	DRAWING NO. 26 /29	HORIZ.: NONE	VERT.: NONE
CLV 00-00000			

X:\Projects\SummWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-15-DETAILS-01.dwg LAYOUT: D1 Nov 02, 2020 - 5:33PM



TYPICAL SECTION



PAVING NOTCH DETAIL

BENT BARS

NOTES:

1. DESIGN SPECIFICATIONS: "AASHTO LRFD Bridge Design Specifications 2012"
2. CONSTRUCTION SPECIFICATIONS: "State of Nevada Department of Transportation Standard Specifications for Road and Bridge Construction 2014"
3. LIVE LOADS:
   HS-93 Design Truck (32.0 KIP Axle)
   HL-93 Design Tandem (Two 25.0 KIP Axles Spaced 4 Feet Apart)
   (Live Load Impact Factor for Top Slab is 33% up to 2 Feet of Cover)

   LATERAL LIVE LOAD PRESSURE:
   Equivalent to 2 Feet of Earth Surcharge Applied Horizontally = 240 PSF

   DEAD LOADS:
   Soil Unit Weight = 120 PCF
   Min. Lateral Earth Pressure = 30 PCF
   Max. Lateral Earth Pressure = 60 PCF
4. CONCRETE: Class DA Modified (Mojor)
   F'C=4,500 PSI @ 28 Days.
   (Class D in Clark County)
5. REINFORCING STEEL: All reinforcing steel to be ASTM A615 grade 60 or A706. Dimension relating to bar spacing are center to center.
6. DESIGNATION: Box culverts are shown on plans as span times height times length (10'x 8'x 190' RCB).
7. Where traffic loads will be placed directly on the top slab, the minimum cover shall be 2 feet of fill, increase top slab thickness by 1/2 inch and cover for top reinforcement from 2 inches to 2½ inches. Provide epoxy coated reinforcement in top slab (except in Clark County). Decrease spacing of top slab bottom longitudinal bars (**No. 6** @ 12") to 6" inch spacing. Use LA Modified Mojor concrete (Class E in Clark County) in lieu of Class DA. Adjust quantities accordingly.
8. Provide 2 foot wide Type 1 or Type 2 drain backfill wrapped in Class 1 or Class 2 non-woven geotextile along full height of each culvert exterior wall face.
9. Provide paving notch when top slab is exposed and when pavement is concrete. Adjust quantities accordingly.
10. For additional notes, see sheet B-20.1.1

SHEET 1 OF 2

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS
SINGLE

B-20.1.2	(502,505)	Signed Original On File
ADOPTED 11/70	REVISED 10/85	CHIEF BRIDGE ENGR.

RCB DETAILS PER NDOT

N.T.S.

A
27

SPAN, "S"		FT.	5			6				7					8						10						
HEIGHT, "H"		FT.	3	4	5	3	4	5	6	3	4	5	6	7	4	5	6	7	8	5	6	7	8	9	10		
MAXIMUM EARTH COVER		FT.	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20		
CONC.	ROOF T1	IN.	9½ 9½	9½ 9½	9½ 9½	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10 10	10½ 10½	10½ 10½	10½ 10½	10½ 10½	10½ 10½	11 11	11 11	11 11
	WALLS T2	IN.	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	10 10	10 10
	INVERT T3	IN.	8 8	8 8	8 8	8 9	9 9	9 9	9 9	9 9	9 9	9 9	9 9	9 9	10 10	10 10	10 10	10 10	10 10	10 10	10½ 10½	10½ 10½	10½ 10½	10½ 10½	10½ 10½	12 13	12 13	12 13
REINFORCEMENT	"a" BAR SIZE		4 5	4 5	4 5	5 5	5 5	5 5	5 5	5 6	5 6	5 6	5 6	5 6	6 6	6 6	6 6	6 6	6 6	6 6	6 7	6 7	6 7	6 7	6 7	7 8	7 8	7 8
	"a" SPACING	IN.	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6
	"a" LENGTH	ft-in	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	7-0 7-0	7-0 7-0	7-0 7-0	7-0 7-0	7-0 7-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-0 8-0	8-4 8-4	8-4 8-4	8-4 8-4
	"b" BAR SIZE		4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 5	4 5	4 5	4 5	4 5	4 5	5 5	5 5	5 5
	"b" SPACING	IN.	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8
	"b" LENGTH	ft-in	5-7 5-7	6-4 6-4	6-7 6-7	5-9 5-9	6-3 6-3	6-9 6-9	7-3 7-3	5-5 5-5	6-4 6-4	6-10 6-10	7-4 7-4	7-10 7-10	6-4 6-4	7-3 7-3	7-10 7-10	8-4 8-4	8-10 8-10	8-9 8-9	9-3 9-3	9-9 9-9	10-3 10-3	10-10 10-10	11-4 11-4	11-10 11-10	9-7 9-7	10-3 10-3	10-10 10-10
	B	ft-in	2-8 2-8	2-8 2-8	2-8 2-8	2-10 2-10	2-10 2-10	2-10 2-10	2-10 2-10	2-11 2-11	2-11 2-11	2-11 2-11	2-11 2-11	2-11 2-11	3-0 3-0	3-0 3-0	3-0 3-0	3-0 3-0	3-0 3-0	3-0 3-0	3-1 3-1	3-1 3-1	3-1 3-1	3-1 3-1	3-1 3-1	3-1 3-1	3-6 4-3	3-6 4-3	3-6 4-3
	"c" BAR SIZE		4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 5	4 5	4 5	4 5	4 5	4 5	5 5	5 5	5 5
	"c" SPACING	IN.	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12
	"c" LENGTH	ft-in	4-0 4-0	5-0 5-0	5-0 5-0	4-2 4-2	5-2 5-2	6-2 6-2	7-2 7-2	4-3 4-3	5-3 5-3	6-3 6-3	7-3 7-3	8-3 8-3	5-4 5-4	6-4 6-4	7-4 7-4	8-4 8-4	9-4 9-4	10-4 10-4	6-4 6-4	7-4 7-4	8-4 8-4	9-4 9-4	10-4 10-4	11-4 11-4	8-7 8-7	9-8 9-8	10-8 10-8
	#4@ 12" LENGTH	ft-in	2-7 2-7	2-7 2-7	2-7 2-7	2-7 2-7	3-5 3-5	3-5 3-5	3-5 3-5	3-4 3-4	4-2 4-2	4-2 4-2	4-2 4-2	4-2 4-2	4-2 4-2	4-2 4-2	4-2 4-2	4-2 4-2	4-2 4-2	4-2 4-2	5-0 4-2	5-0 4-2	5-0 4-2	5-0 4-2	5-0 4-2	5-0 4-2	5-4 5-4	5-4 5-4	5-4 5-4
	#4@ 12" NUMBER=#		40 40	44 44	48 48	44 48	52 52	56 56	60 60	64 64	56 56	60 60	64 64	68 68	72 72	72 68	68 72	72 72	76 76	80 80	64 64	68 68	72 72	76 76	80 80	84 84	88 88	88 88
QUANT.	CONCRETE	CF/LF	13.2 13.2	14.4 14.4	15.5 15.5	15.6 16.9	16.8 18.3	18.3 19.6	19.8 17.9	17.9 19.2	19.2 20.6	20.6 21.9	21.9 23.3	23.3 21.7	21.7 23.0	23.0 24.4	24.4 25.7	25.7 27.0	27.0 30.7	30.7 31.7	32.4 33.3	33.3 34.0	35.0 35.7	36.7 37.4	38.3 39.0	40.0		
	REINFORCEMENT	LB/LF	81 90	88 97	95 104	99 99	106 106	113 113	119 119	119 108	123 115	129 121	136 128	143 135	184 124	183 130	192 137	236 144	253 220	263 198	264 206	275 214	285 222	296 230	307 238	376		

SPAN, "S"		FT.	12						14							
HEIGHT, "H"		FT.	6	7	8	9	10	11	12	7	8	9	10	11	12	13	14
MAXIMUM EARTH COVER		FT.	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20	10 20
CONC.	ROOF T1	IN.	11 13	11 13	11 13	11 13	11 13	11 13	11 13	13 15	13 15	13 15	13 15	13 15	13 15	13 15	13 15
	WALLS T2	IN.	10 12	10 12	10 12	10 12	10 12	10 12	10 12	12 13	12 13	12 13	12 13	12 13	12 13	12 13	12 14
	INVERT T3	IN.	12 15	12 15	12 15	12 15	12 15	12 15	12 15	14 17	14 17	14 17	14 17	14 17	14 17	14 17	14 17
REINFORCEMENT	"a" BAR SIZE		7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8
	"a" SPACING	IN.	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6
	"a" LENGTH	ft-in	13-4 13-4	13-4 13-4	13-4 13-4	13-4 13-4	13-4 13-4	13-4 13-4	13-4 13-4	15-8 15-8	15-8 15-8	15-8 15-8	15-8 15-8	15-8 15-8	15-8 15-8	15-8 15-8	15-8 15-8
	"b" BAR SIZE		8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7	8 7
	"b" SPACING	IN.	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6
	"b" LENGTH	ft-in	9-5 10-5	9-11 10-10	10-5 11-0	10-11 11-5	11-5 11-11	11-10 12-4	12-4 12-10	10-11 11-5	11-5 11-11	11-10 12-4	12-4 12-10	12-10 13-4	13-4 13-10	13-10 14-3	14-3 14-9
	B	ft-in	4-5 5-0	4-5 5-0	4-5 5-0	4-5 5-0	4-5 5-0	4-5 5-0	4-5 5-0	4-8 5-4	4-8 5-4	4-8 5-4	4-8 5-4	4-8 5-4	4-8 5-4	4-8 5-4	4-8 5-4
	"c" BAR SIZE		4 5	4 5	4 5	4 5	4 5	4 5	5 6	4 5	4 6	4 6	4 6	4 6	4 6	5 6	6 7
	"c" SPACING	IN.	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12	12 12
	"c" LENGTH	ft-in	7-8 7-8	8-4 8-9	9-4 9-9	10-4 10-11	11-4 11-10	12-4 12-10	13-4 13-10	9-3 9-8	9-10 10-3	10-10 11-3	11-10 12-3	12-10 13-3	13-10 14-3	14-10 15-3	15-10 16-3
	#4@ 12" LENGTH	ft-in	6-8 7-0	6-8 7-4	6-8 7-8	6-8 8-1	6-8 8-5	6-8 8-9	6-8 9-1	7-3 8-1	7-3 8-5	7-3 8-9	7-3 9-1	7-3 9-5	7-3 9-9	7-3 10-1	7-3 10-5
	#4@ 12" NUMBER=#		80 80	84 84	88 92	92 96	96 100	100 104	104 92	92 96	96 100	100 104	104 108	108 112	112 116	116 120	120
QUANT.	CONCRETE	CF/LF	16.2	17.7	19.2	20.8	20.8	21.9	21.9	23.3	23.3	24.7	24.7	26.0	26.0	27.4	28.7
	REINFORCEMENT	LB/LF	295	394	505	407	315	420	325	433	335	446	345	459	365	485	538
			446	348	468	358	482	368	496	378	510	388	524	409	538	504	668

* QUANTITY INCLUDES #4 CORNER BARS

SHEET 2 OF 2

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS
SINGLE

B-20.1.2.1	(502,505)	Signed Original On File
ADOPTED 11/70	REVISED 10/85	CHIEF BRIDGE ENGR.

BILL OF MATERIALS (RCP HDPE CMP)

PIPE SIZE (INCH)	SINGLE (ONE GRATE) ● CONCRETE (CY)	● REINF. (LB.) ADD RATE (CY/FT)	ADD QUAN. (H MIN.)	ADD RATE (LB/FT)	STR STEEL (LB)	DOUBLE (TWO GRATES) ● CONCRETE (CY)	● REINF. (LB.) ADD RATE (CY/FT)	ADD QUAN. (H MIN.)	ADD RATE (LB/FT)	STR STEEL (LB)	TRIPLE (THREE GRATES) ● CONCRETE (CY)	● REINF. (LB.) ADD RATE (CY/FT)	ADD QUAN. (H MIN.)	ADD RATE (LB/FT)	STR STEEL (LB)
≤15	0.71	0.19	36	10	211	1.06	0.26	50	13	397	1.41	0.33	70	17	583
18	0.89	0.20	40	10	306	1.31	0.28	56	13	574	1.72	0.35	77	18	842
24	1.08	0.22	58	12	349	1.56	0.30	80	15	652	2.04	0.37	105	20	956
30	1.28	0.24	63	12	390	1.83	0.31	86	16	729	2.38	0.38	113	20	1068
36	1.50	0.26	67	13	524	2.11	0.33	92	16	980	2.72	0.41	120	21	1435
42	1.71	0.28	90	15	575	2.39	0.35	120	18	1073	3.07	0.43	154	22	1571
48	1.94	0.30	95	15	707	2.68	0.37	127	18	1329	3.42	0.44	163	23	1951

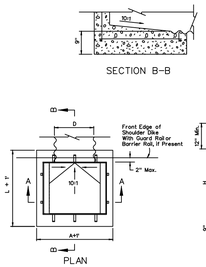
*The Concrete And Reinforcing Quantities Are Based On The H Min. Shown. Increase The Concrete And Reinforcing Base Quantity By The Corresponding Add Rate Per Foot Of Increased Hi If The H Specified Is Larger Than H Min.

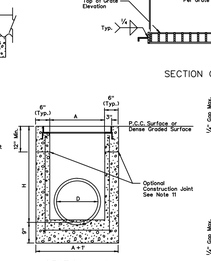
TABLE OF DIMENSIONS (RCP HDPE CMP)

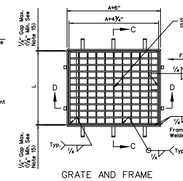
PIPE SIZE (INCH)	A	H Min. (FT)	MAIN BARS (INCH)	FRAME ANGLES (INCH)	FRAME BARS (INCH)	L (FT) SINGLE GRATE	DOUBLE GRATE	TRIPLE GRATE
≤ 15	2'	2.50	3/4 x 3/4	4 X 3 X 3/8	4 X 3/8	2'	4'	6'
18	2'-6"	3.00	4/5 x 3/4	5 X 3 X 3/8	5 X 3/8	2'	4'	6'
24	3'	3.50	4/5 x 3/4	5 X 3 X 3/8	5 X 3/8	2'	4'	6'
30	3'-6"	4.00	4/5 x 3/4	5 X 3 X 3/8	5 X 3/8	2'	4'	6'
36	4'	4.50	5/5 x 3/4	6 X 3½ x 3/8	6 X 3/8	2'	4'	6'
42	4'-6"	5.00	5/5 x 3/4	6 X 3½ x 3/8	6 X 3/8	2'	4'	6'
48	5'	5.50	5/5 x 3/4	6 X 3½ x 3/8	6 X 3/8	2'	4'	6'

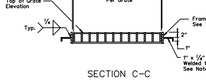
NOTES:

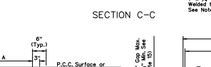
1. All concrete shall be class A or AA.
2. Reinforcing steel shall be No.4 bars with maximum spacing at 18 inch centers, wired tightly at all intersections and embedded 2 inches clear of all concrete surfaces.
3. Exposed edges of concrete shall be chamfered 1 inch.
4. Dimensions may be varied to fit local conditions if ordered by the engineer.
5. Commercial prefabricated gratings approved by the bridge division may be used in lieu of the field-welded grating shown.
6. Extreme low cover situations to be reviewed by hydraulics engineer.
7. Slope catch basin shall be 10:1 from all directions toward the inlet. Flow line is used to distribute flow to the inlet(s) to outlet pipe and provide a 10:1 slope to flow line(s).
8. See sheet R-2.9.1 for details if connecting HDPE pipe.
9. A single Type 2 drop inlet shall be constructed unless a double or triple is specified.
10. Single grate configuration shown for clarity. Outside dimensions of each grate shall measure 2' feet by A+4½".
11. Run rebar continuous thru construction joint. Joint must be a minimum of 3 inches from horizontal bars.
12. Weld one tab on ℄ of grate and remaining two tabs 6 inches from edge of frame. Six tabs per inlet, three tabs on each side
13. Weld tabs 6 inches from edge of frame. Four tabs per grate, two on each side.
14. For multiple grate installations, the station/offset is to the center of the concrete drop inlet structure.
15. Grate is to fit in the frame and be easily removed. If the gap between the grate and frame is greater than 1/4" on each side of the grate, the grate and frame shall be removed and reconstructed to the tolerances specified or, with approval of the engineer, a steel plate 1/4" thick may be welded to the frame to the top of the frame to reduce the gap to a maximum of 1/4".
16. Additional pipe penetrations may be placed in any wall. Pipe penetrations are to be to the center of the structure wall unless specified otherwise.











STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

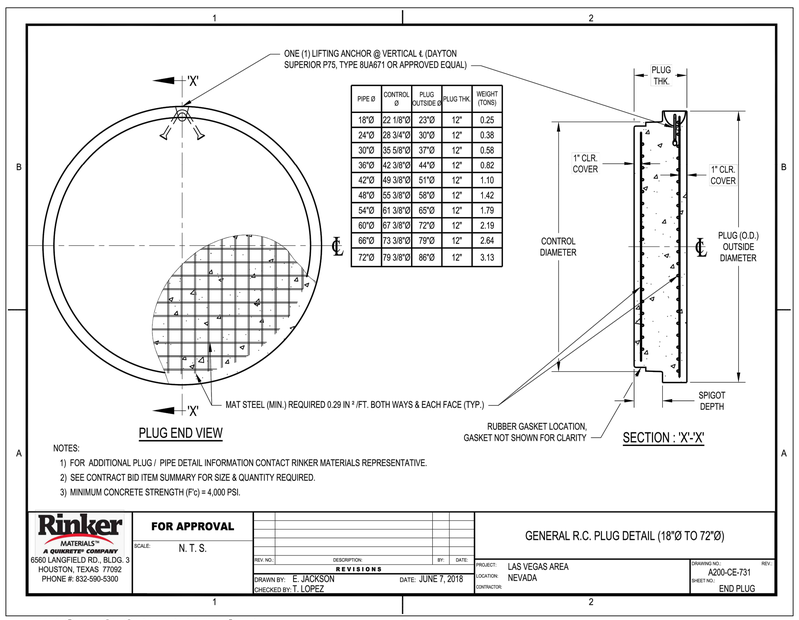
DROP INLET
TYPE 2

R-4.2.1	(5059)	Signed Original On File
ADOPTED 11/70	REVISED 10/85	CHIEF HYDRAULICS ENGR.

DROP INLET TYPE 2 PER NDOT

N.T.S.

B
27



PIPE Ø	CONTROL Ø	PLUG OUTSIDE Ø	PLUG THK	WEIGHT (TONS)
18"Ø	22 1/8"Ø	23"Ø	12"	0.25
24"Ø	28 3/4"Ø	30"Ø	12"	0.38
30"Ø	35 5/8"Ø	37"Ø	12"	0.58
36"Ø	42 3/8"Ø	44"Ø	12"	0.82
42"Ø	49 3/8"Ø	51"Ø	12"	1.10
48"Ø	55 3/8"Ø	58"Ø	12"	1.42
54"Ø	61 3/8"Ø	65"Ø	12"	1.79
60"Ø	67 3/8"Ø	72"Ø	12"	2.19
66"Ø	73 3/8"Ø	79"Ø	12"	2.64
72"Ø	79 3/8"Ø	86"Ø	12"	3.13

NOTES:

1) FOR ADDITIONAL PLUG / PIPE DETAIL INFORMATION CONTACT RINKER MATERIALS REPRESENTATIVE.
2) SEE CONTRACT BID ITEM SUMMARY FOR SIZE & QUANTITY REQUIRED.
3) MINIMUM CONCRETE STRENGTH (F'c) = 4,000 PSI.

Rinker MATERIALS
A QUIKRETE COMPANY
6560 LANGFIELD RD., BLDG. 3
HOUSTON, TEXAS 77092
PHONE #: 832-590-5300

FOR APPROVAL
SCALE: N. T. S.

REV. NO.	DESCRIPTION:	BY:	DATE:

REVISIONS
DRAWN BY: E. JACKSON
CHECKED BY: T. LOPEZ
DATE: JUNE 7, 2018

GENERAL R.C. PLUG DETAIL (18"Ø TO 72"Ø)

PROJECT: LAS VEGAS AREA
LOCATION: NEVADA
CONTRACTOR:

DRAWING NO: A200-CE-731
SHEET NO: END PLUG
REV:

TYPICAL STORM DRAIN CAP

N.T.S.

C
27

REV.	DESCRIPTION	BY	DATE	APPROVAL

REVISIONS

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

STORM DETAILS

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 27/29

CLV 00-00000

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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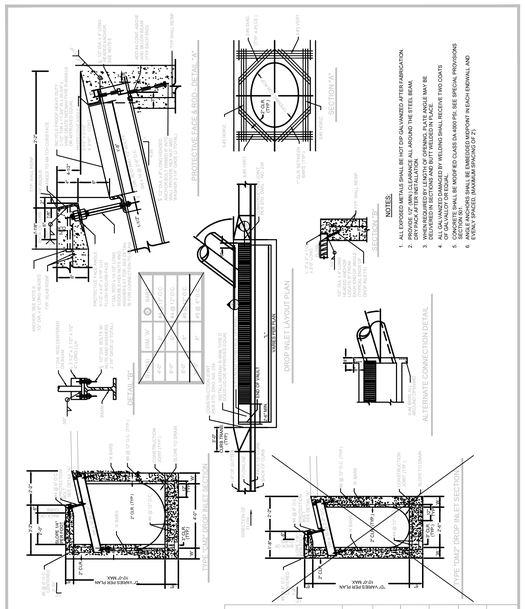
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA
NICOLAS A BARCOS
EXP. 12-31-20
CIVIL
No. 25573
10/21/2020

X:\Projects\SummitWest\Village 22\100066768 - V22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768-16-DETAILS-STRM.dwg LAYOUT: D2 Nov 02, 2020 - 5:33PM



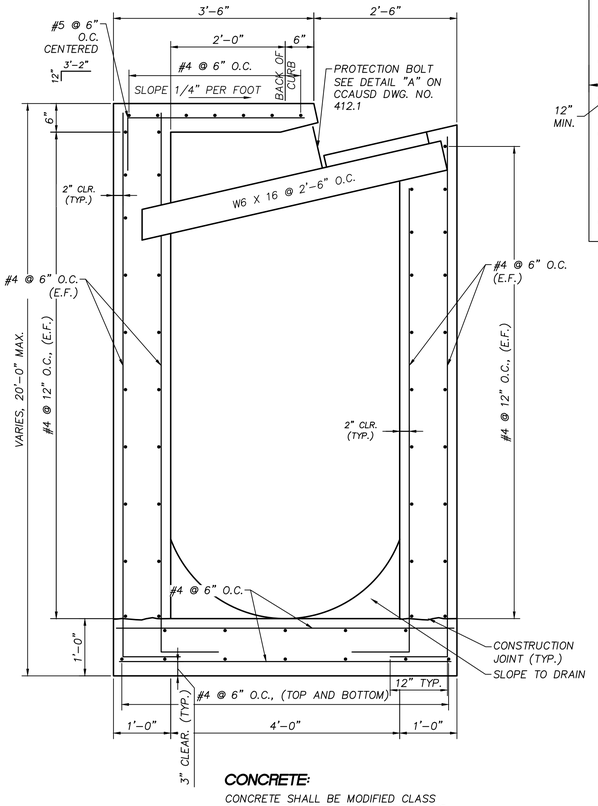
AGENCY APPROVED	B	C	H	L	M	N

SPECIFICATION REFERENCE	
501	CONCRETE
501	CONCRETE STRUCTURES
501	REINFORCING STEEL
501	STEEL

UNIFORM STANDARD DRAWINGS
CLARK COUNTY AREA

TYPE "C-D" MODIFIED
DROP INLET

DATE 9-14-06 | DWG. NO. 412.1



CONCRETE:

CONCRETE SHALL BE MODIFIED CLASS DA 4500 PSI, SEE SPECIAL PROVISIONS SECTION 501.

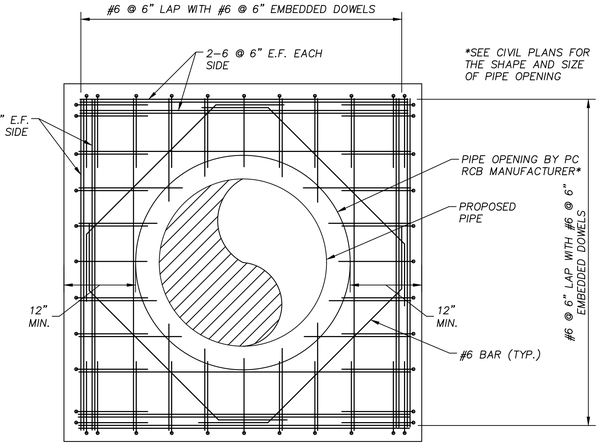
NOTE:

THIS DETAIL IS MEANT TO MODIFY THE TYPE "CM2" DROP INLET SECTION PER CCAUSD DWG. NO. 412.1 FOR STRUCTURES WITH DEPTHS GREATER THAN 10'. ALL OTHER INFORMATION OF THE STANDARD DRAWING STILL APPLY UNLESS OVERWRITTEN BY THIS DETAIL.

SUPPLEMENT TO "CM2" DROP INLET (D>10')

C 28

N.T.S.



NOTES:

1. FOR EXACT LOCATION SEE PIPE LAYING SCHEDULE.
2. RCB REINFORCEMENT NOT SHOWN FOR CLARITY.
3. USE ¾" CHAMFER FOR ALL EXPOSED CORNERS.
4. ALL REINFORCING BAR LAP SPLICES SHALL CONFORM TO ACI 318–11
5. THE OPENING SIZE MAY BE INCREASED (±2") FOR EASE OF INSTALLATION. FILL VOIDS WITH NON–SHRINK CONCRETE GROUT.
6. UNLESS OTHERWISE SHOWN ON THE DRAWINGS CONCRETE COVER FOR REINFORCING BARS SHALL BE AS FOLLOWS:

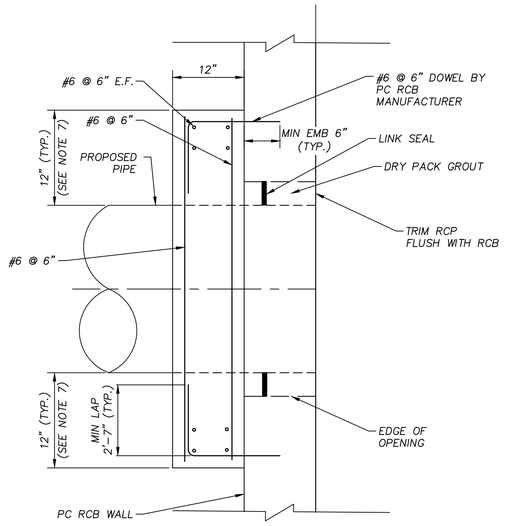
FOR SURFACES IN CONTACT WITH WATER OF WEATHER AND FORMED SURFACES IN CONTACT WITH EARTH	2"
FOR CONCRETE PLACED AGAINST EARTH	3"

7. COLLAR SHOULD NOT GO BEYOND THE TOP OR BOTTOM SLAB OF RCB

LATERAL CONNECTION DETAIL (FOR SMALL PIPES 24" TO 48")

A 28

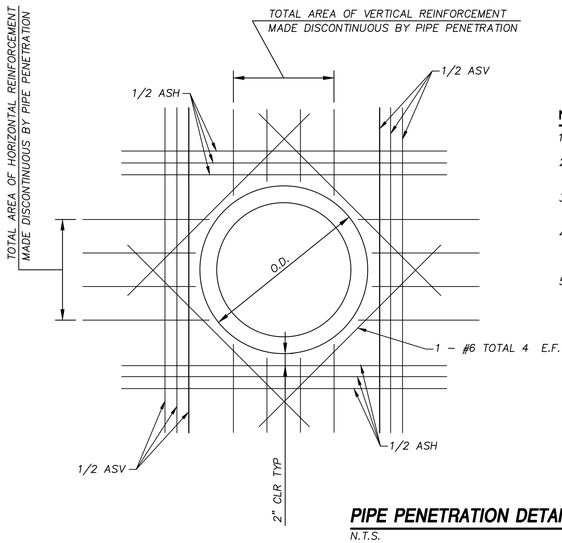
N.T.S.



CONCRETE:

UNLESS OTHERWISE NOTED OR SPECIFIED, ALL STRUCTURAL CONCRETE SHALL BE MODIFIED MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI IN 28 DAYS. CEMENT USED IN STRUCTURLA CONCRETE SHALL BE TYPE V CEMENT UNLESS OTHERWISE NOTED.

REINFORCEMENT STEEL SHALL BE DEFORMED BARS CONFORMING IN QUALITY TO THE REQUIREMENTS OF ASTM A–615 "SPECIFICATIONS FOR DEFORMED BILLET–STEEL BARS FOR CONCRETE REINFORCEMENT" GRADE 60.



NOTES:

1. ALL BARS LENGTHS TO BE I.D. + 3'–10"
2. ASH= TOTAL AREA OF HORIZONTAL REINFORCEMENT MADE DISCONTINUOUS BY PIPE PENETRATION
3. ASV= TOTAL AREA OF VERTICAL REINFORCEMENT MADE DISCONTINUOUS BY PIPE PENETRATION
4. ASH AND ASV BARS SHALL BE EVENLY DISTRIBUTED ON EACH SIDE OF PIPE PENETRATION AND PLACED IN ADDITION TO TYPICAL WALL REINFORCEMENT SHOWN
5. ASH AND ASV BARS SHALL BE UNIFORMLY SPACED OVER A DISTANCE NOT TO EXCEED ¼ O.D. ON EACH SIDE OF THE PIPE PENETRATION

PIPE PENETRATION DETAILS

B 28

N.T.S.

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
KETTLE RIDGE DRIVE (STREET J)
SUNSET RUN DRIVE TO KINDLE RISE WAY (STREET F)

STORM DETAILS

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 100066768
DATE: NOVEMBER, 2020
DRAWING NO. 27/29
CLV 00-00000

FAST Call before you UnderGround 1-702-432-5300 INTERCITY AND ARTERIAL SYSTEM OF TRANSPORTATION

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PROFESSIONAL ENGINEER-STATE OF NEVADA NICOLAS A BARCOS EXP. 12-31-20 CIVIL No. 25573 10/21/2020

K:\Projects\SummitWest\Village 22\100066768 – Y22 Kettle Ridge (Sunset to Fleet Wing)_Sheets\66768–16–DETAILS–STRM.dwg LAYOUT: D3 Nov 02, 2020 – 5:33PM

2270 Corporate Circle
Suite 200
Henderson NV 89074-7755
Tel: 702.263.7275
www.atkinsglobal.com/northamerica

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HEC-11 RIPRAP SIZING CALCULATIONS

Location: Summerlin West Village 22 Kettle Ridge: Flight Range to Kindle Rise Interim Triangular Roadside Swale
Conditions: Q=58 cfs

Equations:

$K_1 = [1-(\sin^2\theta/\sin^2\Phi)]^{0.5}$ (eq. 7, pg. 30)

d_{avg}= Flow Area/ Top Width

$n=0.39S_f^{0.38} R^{-0.16}$ (eq. 4, pg. 23)

(slopes > 0.002 ft/ft and D50 > 0.2 ft)

Bank & Bed $D_{50} = 0.001V_a^3/(d_{avg}^{0.5}K_1^{1.5})$ (eq. 6, pg. 30)

$C_{sg} = 2.12/(S_g-1)^{1.5}$ (eq. 8, pg. 31)

$C_{sf} = (SF/1.2)^{1.5}$ (eq. 9, pg. 31)

Stability Factor = 1.3 (Table 1 pg 31)

Gradually Varying Flow; Moderate Bed Curvature (30 > curve radius/channel width > 10)
Impact from waves or floating debris moderate

$C = C_{sg}C_{sf}$

$D'_{50} = CD_{50}$

Input Variables:

Channel BW =	0	ft	
Enery Grade Slope "S_f" =	0.068	ft/ft	
Hydraulic Radius "R" =	0.74	ft	
Flow area =	7.3	sqft	Balance w/ Manning's n until
Wetted perimeter =	9.9	ft	results match input FlowMaster
Top width =	9.37	ft	
Average channel velocity =	7.93	fps	
Depth of flow =	1.56	ft	
Side slope horizontal (H:1) =	3		
Riprap angle of repose "Φ" =	41	degrees	(Chart 4, pg. 129 HEC-11)
Rock riprap specific gravity =	2.65		
Stability Factor =	1.3		
D_{50} =	1.00	ft	

Calculations:

θ = 18.4 degrees
K_1 = 0.876
d_{avg} = 0.78 ft
Manning's n = 0.147
Bank D_{50} = 0.46 ft
Bed D_{50} = 0.56
C_{sf} = 1.128
C_{sg} = 1.000
C = 1.128
Bank D'_{50} = 0.52 ft
Bed D'_{50} = 0.64 ft
Stable? **Yes**
t_o = 3.1 lb/ft^2 (average shear stress on channel)
t_c = 4.2 lb/ft^2 (critical shear stress-resistance to movement)
Stable? **Yes**

CCRFCD Equations (d_{50} Eq.s use Eq. 732 for Manning's n)

R_h =	0.74	ft (Eq. 732 for $R_h > 2d_{50}$)
n =	0.040	Formula Under Predicts n Value
Y/d_{50} =	1.6	(Eq. 733 for $1.5 < Y/d_{50} < 185$)
n =	0.087	Yes
d_{50} =	1.03	ft (Eq. 734)
d_{50} =	1.56	ft (Eq. 735, generally larger sizes)
d_{50} =	2.24	ft (Eq. 736 for S_e=S)

Stability Factor:

1.0 - 1.2 Uniform flow; straight or mildly curving reach (curve radius/channel width > 30); impact from wave action and floating debris is minimal; little or no uncertainty in design parameters.

1.3 - 1.6 Gradually varying flow; moderate bend curvature (30 > curve radius/channel width > 10); impact from waves or floating debris moderate.

1.6 - 2.0 Approaching rapidly varying flow; sharp bend curvature (10 > curve radius/channel width); significant impact potential from floating debris and/or ice; significant wind and/or boat generated waves (1-2 ft); high flow turbulence; turbulently mixing flow at bridge abutments; significant uncertainty in design parameters.

= Values referenced in flow master

Spreadsheet not for pier scour or wave action