

DS #: 5391

APN: 137-15-810-008, 137-23-210-001

PROJECT: Summerlin Village 22- Parcel G/H Mass Grading

SUBMITTAL: 2nd

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: February 4, 2021
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	COPIES TO:
Summerlin Village 22 - Parcel GH Mass Grading		GCW, Inc.
Cross Streets:	SWC Desert Foothills Dr & Kestrel Creek Ave	Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5391B.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-15-810-008, 137-23-210-001	
Zoning Action:	N/A	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES NO X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal (Paid on 12/28/2020)	11/30/2020 & 12/28/2020	12/28/2020	Not Approved	\$400.00	4112821: \$400
2 nd Submittal	1/21/2021	2/4/2021	See Comments Below	\$400.00	4137512: \$400
			TOTAL FEES (LDDRS):	\$800.00	----

REMARKS:

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

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

- The subject project of mass grading is premised on the existence of all the perimeter streets: *Kettle Ridge Drive* on the west, *Desert Foothill Drive* on the east, *Kestrel Creek Avenue* on the north and *Clowder Pass Way* on the south and the associated storm drain systems for flood cut-off protection. The subject improvement plans will not be approved prior to the posting of construction bonds of all perimeter streets.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
HDR/AYS

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



Technical Drainage Study for Summerlin Village 22 Parcel GH Mass Grading

764-A174-001

November 2020

Prepared for:
Pulte Homes
7255 S Tenaya Way #200
Las Vegas, NV, 89113
(702) 914-4800

Prepared by GCW, Inc.

1555 South Rainbow Blvd
Las Vegas, NV 89146

P: 702.804.2000
F: 702.804.2298

info@gcwengineering.com
www.gcwengineering.com

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin Village 22 Parcel GH Mass Grading Date: November 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Desert Foothills Drive

East/West: Kestrel Creek Avenue

b) Section: 23 Township: 20 Range: 59

c) APN : 137-15-810-008,137-23-210-001

Name of Owner: Developer: Pulte Homes Owner: Howard Hughes Company LLC

Telephone No.: 702 914-4800 Fax No.: _____ E-Mail Address: _____

Address: 7255 S. Tenaya Way #200 Las Vegas, NV 89113

Contact Person-Name: Cody Beck, P.E. Telephone No.: (702) 804-2000

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

Firm: GCW, Inc.

Address: 1555 S. Rainbow Blvd Las Vegas, 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	☐	Mass Grading

1. Total Owned Land Area: At Site: +/- 14.2 AC. Being Developed/Disturbed: +/- 14.2 AC.

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

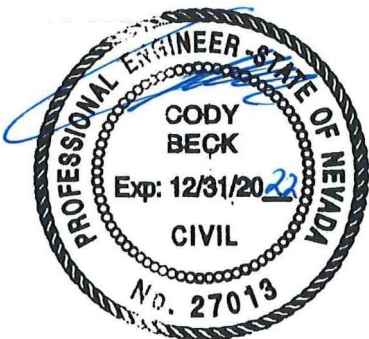
4. Proposed type of development (Residential, Commercial, Etc.): Mass Grading

5. Approximate upstream land area which drains to the subject site: 0 AC.

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Master Plan Update Summerlin West Planning Area, Master Conceptual Drainage Study Summerlin West Village 22, Summerlin Village West 22 Studies Desert Foothills Drive, Kettle Ridge Drive, Kestrel Creek Avenue, and Clowder Pass Way

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Storm drain in Desert Foothills

8. Briefly describe your proposed schedule for the subject project: The Client intends to start construction as soon as practical. Any expediting of the review is appreciated.



11/25/20

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Summerlin Village 22 Parcel GH Mass Grading

Map ID: 137-15-810-008,137-23-210-001

Firm Name: GCW, Inc.

Engineer: Cody Beck

Address: 1555 S. Rainbow Blvd

City: Las Vegas

State: NV

Zip: 89146

Phone Number: 702-804-2000

Fax Number: 702-804-2299

Property Owner: Howard Hughes Company LLC, Developer: Pulte Homes

Address: 7255 S. Tenaya Way #200

City: Las Vegas

State: NV

Zip: 89113

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

☒ _____ Design Manual **Standard Form 1** with the engineer's seal and signature.

☒ _____ Design Manual **Standard Form 4**.

☒ _____ 2 copies of the 24" x 36" Drainage Plan.

_____ NA A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

Yes No

☒ _____ A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.

☒ _____ A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes No

- ☒ _____ Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
- ☒ _____ On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
- ☒ _____ Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

Yes No

- ☒ _____ Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
- ☒ _____ Minimum scale: 1" = 60'.
- ☒ _____ Project name.
- ☒ _____ Vicinity Map with local and major cross streets.
- ☒ _____ Revision box.
- ☒ _____ North arrow and bar scale.
- ☒ _____ Engineer's/consultant's address and phone number.
- ☒ _____ Elevation datum and benchmark.
- ☒ _____ Legend for symbols and abbreviations.
- ☒ _____ Cut/fill scarps, where applicable.
- ☒ _____ Street names, grades, widths.
- ☒ _____ Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
- ☒ _____ Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.
- _____ NA _____ Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
- ☒ _____ Proposed typical street sections.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

 NA 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 Q100 and V100 and D100 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.

 NA 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.

 NA 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.

 NA Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.

X Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.

 NA Building and/or lot numbers.

 NA 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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

- ☐ NA For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
- ☒ ☐ Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q100 flows.
- ☒ ☐ Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
- ☐ NA Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes No

- ☒ ☐ Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
- ☒ ☐ 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.
- ☒ ☐ 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.
- ☒ ☐ Use of correct precipitation values in and around the McCarran Airport rainfall area.
- ☒ ☐ A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
- ☒ ☐ A summary table of stormwater flows showing basin area, Q10 and Q100 for both individual basins and combined basin flows, where applicable.
- ☒ ☐ Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
- ☒ ☐ On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
- ☐ NA Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
☐	<u>NA</u>	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
<u>X</u>	☐	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q100 and Q10 flows representing the worst case for interior and all perimeter streets. Q100 d x v < 8. Q10 d x v < 6 and 12 foot dry lane for rights-of-way > 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
<u>X</u>	☐	A summary table of interior and exterior street capacity calculations showing the street name, Q100 flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
☐	<u>NA</u>	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
☐	<u>NA</u>	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
☐	<u>NA</u>	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q100 weir height or flow depth, whichever is greater.
☐	<u>NA</u>	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.
<u>X</u>	☐	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
<u>X</u>	☐	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
<u>X</u>	☐	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
☐	<u>NA</u>	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

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

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

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
	NA	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.
	NA	All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
	NA	Back of lot elevations and lot drainage pattern for all lots including common lots.
X		Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	NA	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.
	NA	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	
	NA	Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
X		Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
	NA	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.
	NA	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.
	NA	Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
	NA	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.
	NA	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.

764-A174-001

November 17, 2020

Oh Sang Kwon, P.E.
City of Las Vegas, Public Works
333 N. Rancho Drive, 7th Floor, Las Vegas, NV 89106

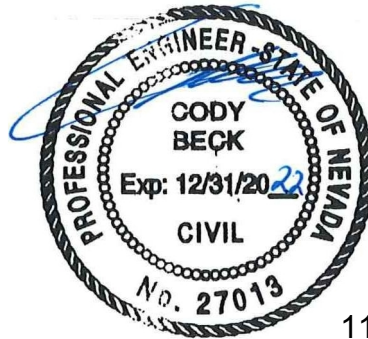
Re: Technical Drainage Study for Summerlin Village 22 Parcel GH Mass Grading

Dear Mr. Kwon,

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

Respectfully submitted,

Cody Beck, P.E.
Flood Control Division



11/25/20



**TECHNICAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 22 PARCEL GH MASS GRADING**

764-A174-001

November 2020

Authored by:

Nelson Baggs, E.I.

Prepared for:

**Pulte Homes
7255 S Tenaya Way #200
Las Vegas, Nevada 89113
Phone: (702) 914-4800**

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I. INTRODUCTION

Pulte Homes is proposing to mass grade Parcels G and H within Summerlin Village 22. The project is identified as Summerlin Village 22 Parcel GH Mass Grading (hereafter referred to as the project). Summerlin Village 22 is located southwest of the Lake Mead Boulevard and 215 Beltway intersection. Within Summerlin Village 22, Parcels G and H are located on the east side of Desert Foothills Drive between Clowder Pass Way and Kestrel Creek Avenue. The purpose of this report is to accompany the improvement plans, to provide detailed hydrologic and hydraulic analyses for the site, and to determine adequate protection for the project from offsite and onsite flows. The following tasks were performed in the preparation of this study:

- Determine the FEMA floodplain designation for the project site.
- Identify CCRFCD regional facilities adjacent or affected by the project.
- Review pertinent approved drainage studies in the area for evaluation of drainage impacts affecting the project.
- Estimate runoff generated for the peak 10-year and 100-year return period storms
- Recommend drainage facilities required to protect the project from storm runoff.

II. LOCATION AND DESCRIPTION OF IMPROVEMENTS

The proposed site is located within Sections 15 and 23, Township 20 South, Range 59 East on APNs 137-15-810-008, and 137-23-210-001 within the jurisdictional limits of the City of Las Vegas (CLV). Please refer to Figure 1 in Appendix D for location of the project. For this study, the proposed improvements consist of the mass grading of the site. Exported dirt from the mass grading will be stockpiled on the Project Site. A separate technical drainage study for the stockpile will be submitted following the approval of this Study.

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

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

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

Figures 3 and 4, included in Appendix D are based on information provided in the CCRFCD 2018 Las Vegas Valley Master Plan Update (Reference 2, hereafter referred to as the 2018 MPU). Figure 3 shows the project site in relation to the 2018 MPU subbasins and land use for the area. Figure 4 shows the project site in relation to CCRFCD facilities in the area according to the 2018 MPU. As shown on Figure 4, the Project Site is not adjacent to existing or proposed CCRFCD facilities.

V. REFERENCED STUDIES

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

the pertinence of each of the referenced items is as follows:

- *Summerlin West Planning Area Master Plan Update #2* (Reference 3, hereinafter referred to as The Summerlin West MPU Study) was approved by the City of Las Vegas on May 22, 2018 and provides the master plan for the Summerlin West area.
- *Master Conceptual Drainage Study for Summerlin West Village 22* (Reference 4, hereinafter referred to as the V22 Study) was approved by the City of Las Vegas on January 23, 2020 and provides the overall plan for Summerlin Village 22 and provides ultimate condition hydrology for the Site.
- *Technical Drainage Study for Summerlin Village West 22 Desert Foothills Drive Fleet Wing Avenue to Lake Mead Boulevard* (Reference 5, hereinafter referred to as the Desert Foothills Study) was conditionally approved by the City of Las Vegas on March 23, 2020 and provides the design for the storm drain in Desert Foothills as well as the stub that will collect the flow from the G and H parcels. Note that this study revised the V22 Study drainage pattern to drain parcels G and H to the stub in Desert Foothills instead of to 2 stubs extending from Kestrel Creek Avenue.
- *Summerlin West V22 – Kettle Ridge Drive (Street J) and Scurry Bend Drive (Street N) Street Improvements (both from Lake Mead Blvd. to Fleet Wing Ave.)* (Reference 6, hereinafter referred to as the Kettle Study) provides the design for the roadway west of the Project Site.
- *Summerlin West V22 – Clowder Pass Way (Street H) Desert Foothills Drive to Kettle Ridge Drive (Street J)* (Reference 7, hereinafter referred to as the Clowder Study) provides the design for the roadway south of the Project Site.
- *Summerlin West V22 –Kestrel Creek Avenue Desert Foothills Drive to Kettle Ridge Drive* (Reference 8, hereinafter referred to as the Kestrel Study) provides the design for the roadway north of the Project Site. Note parcels G and H were revised to drain to the stub extending from Desert Foothills instead of to the Kestrel Creek storm drain system.

VI. HYDROLOGY

The methodology presented in this study is in compliance with the HCDDM.

Model Description: The watersheds were modeled using the SCS Unit Hydrograph method within the Army Corps of Engineers HEC-1 Flood Hydrograph package.

Drainage Areas and Flow Patterns: Flow patterns have been determined from 1-ft aerial topography for the project site, proposed grading, and reference material. In general, the Project Site drains east to a stub extending from Desert Foothills Drive.

Precipitation: The precipitation value for the Project Site was referenced from the V22 Master Study. Since the drainage area for the project is less than 8 square miles, an SDN 3 design storm was selected for use in the HEC-1 computer model. Additionally, no depth-area-reduction (DARF) were utilized in computing runoff values due to the drainage area being less than 0.5 square miles. Refer to Appendix A for hydrologic information.

Soils: Soils information for the Project Site was referenced from the V22 Master Study. The entire Project Site consists of soil type 155 which consists of 100 percent Hydrologic Soil Group D.

Curve Numbers (CN): A proposed condition hydrologic analyses was performed for this study. A curve number of 94 was used for the onsite basin derived from Table 602 of the

HCDDM using a newly graded land use and Hydrologic Soil Group D. An annotated Table 602 from the HCDDM is included in the appendix.

VII. EXISTING DRAINAGE CONDITION

In the existing condition, the Project Site is undeveloped with all adjacent roadways constructed. A 30" RCP stub with a 4'x12' inlet extending from Desert Foothills drive (designed with the Desert Foothills Study) collects all the runoff from the site. Note that the Desert Foothills Study revised the drainage pattern for parcels G and H to drain to the Desert Foothills storm drain system instead of to the storm drain in Kestrel Creek. The existing condition was referenced from the Kestrel Study with the exception that Clowder Pass Way has also been constructed. Practically all flow upstream of the site is cut off by storm drain in Kettle Ridge Drive. The only flow adjacent to the site is minor flow generated within the adjacent streets that remains offsite. Pertinent reference material has been provided in the appendix.

VIII. PROPOSED CONDITION

In the proposed condition the Project Site has been rough graded to match the ultimate condition flow pattern. The Site drains to the existing inlet extending from Desert Foothills as it does in the existing and ultimate condition. Note that the site produces less runoff than the ultimate condition, which the inlet and storm drain were designed for, therefore the site does not negatively impact downstream improvements or facilities. An inlet and inlet control calculation has been provided to ensure the runoff will be conveyed into the existing storm drain system. Hydraulic calculations and pertinent reference material have been provided in the appendix.

IX. ULTIMATE DRAINAGE CONDITION

In the ultimate condition, the site and surrounding areas will be developed similarly to what was shown in the V22 Master Study with the exception of the revised drainage patterns per the adjacent street studies. The Project Site will be developed with single family residential improvements for which a technical drainage study will be submitted following this study and a stockpile study. Pertinent reference material from the V22 Master Study and adjacent street studies have been provided in the appendix.

X. CONCLUSIONS AND RECOMMENDATIONS

1. Methodology used in this report is in compliance with Clark County Regional Flood Control District (CCRFCD) criteria.
2. The project area lies within a designated FEMA Flood Zone X. Therefore, the project is not currently located in a FEMA-designated Special Flood Hazard Area.
3. The site is not adjacent to existing or proposed CCRFCD facilities.
4. The proposed drainage patterns in this report are generally consistent with all referenced studies.
5. The proposed development does not adversely impact the drainage patterns and downstream properties or facilities.

XI. REFERENCES

1. Clark County Regional Flood Control District. *Hydrologic Criteria and Drainage Design Manual*. August 1999.
2. CCRFCD 2013 Las Vegas Valley Master Plan Update. 2013.
3. VTN. *Summerlin West Planning Area Master Plan Update #2*. February 2020.
4. VTN. *Master Conceptual Drainage Study for Summerlin West Village 22*. Jan 2020.
5. Atkins. *Technical Drainage Study for Summerlin Village West 22 Desert Foothills Drive Fleet Wing Avenue to Lake Mead Boulevard*. March 2020.
6. Atkins. *Summerlin West V22 – Kettle Ridge Drive (Street J) and Scurry Bend Drive (Street N) Street Improvements (both from Lake Mead Blvd. to Fleet Wing Ave.)*. March 2019.
7. Atkins. *Summerlin West V22 – Clowder Pass Way (Street H) Desert Foothills Drive to Kettle Ridge Drive (Street J)*. May 2020.
8. Atkins. *Summerlin West V22 –Kestrel Creek Avenue Desert Foothills Drive to Kettle Ridge Drive*. August 2020.

APPENDIX LAYOUT

<i>Appendix A</i>	Hydrologic Calculations and Information 1. Table 602 – from the CCRFCD Manual 2. Standard Form 4 (Proposed Condition) 3. HEC-1 Results (Proposed Condition)
<i>Appendix B</i>	Hydraulic Calculations and Information 1. Normal Depth Calculations 2. Riprap Sizing Calculation 3. Inlet Control Calculation 4. Inlet Calculation
<i>Appendix C</i>	Referenced Materials and Supporting Documents 1. Master Plan Update Summerlin West Planning Area a. CLV Approval Letter b. Village Boundaries Map c. Land Use Map 2. Master Conceptual Drainage Study for Summerlin West Village 22 a. CLV Approval Letter b. Curve Number Calculations c. Standard Form 4 d. HEC-1 Model (Ultimate Condition) e. Figure 6 Ultimate Condition Basin Map f. Figure 7 Facilities Map 3. Summerlin Village West 22 Desert Foothills Drive Fleet Wing Avenue to Lake Mead Boulevard a. CLV Approval Letter b. CCRFCD Concurrence c. Curve Number Calculations d. Standard Form 4 (Interim Condition) e. HEC-1 Model (Interim Condition) f. Street Normal Depth Calculations g. WSPG Models h. Figure 3 Hydrology Workmap i. Figure 3 Hydrology Workmap (Facilities) j. Improvement Plan Sheets: 1, 7, 16, 24

-
4. Summerlin West Village 22 Kettle Ridge Drive (Street J)
Fleet Wing Avenue (Street G) to Lake Mead Boulevard
 - a. CLV Approval Letter
 - b. Curve Number Calculations
 - c. Standard Form 4 (Interim Condition)
 - d. HEC-1 Model (Interim Condition)
 - e. Street Normal Depth Calculations
 - f. Figure 3 Hydrology Workmap
 - g. Figure 4 Hydraulic Workmap
 5. Summerlin West Village 22 Clowder Pass Way (Street H)
Desert Foothills Drive to Kettle Ridge Drive (Street J)
 - a. CLV Approval Letter
 - b. Text Excerpt
 - c. Curve Number Calculations
 - d. Standard Form 4 (Interim Condition)
 - e. HEC-1 Model (Interim Condition)
 - f. Street Normal Depth Calculations
 - g. Figure 3 Hydrology Workmap
 - h. Figure 4 Hydraulic Workmap
 6. Summerlin Village West 22 Kestrel Creek Avenue
Desert Foothills Drive to Kettle Ridge Drive
 - a. CLV Approval Letter
 - b. Curve Number Calculations
 - c. Standard Form 4 (Interim Condition)
 - d. HEC-1 Model (Interim Condition)
 - e. Street Normal Depth Calculations
 - f. Figure 3 Hydrology Workmap
 - g. Figure 4 Hydraulic Workmap

Appendix D

Drainage Figures and Plans

1. Figure 1 Vicinity Map
 2. Figure 2 FEMA FIRM Map
 3. Figure 3 MPU 2018 Subbasin Map
 4. Figure 4 MPU 2018 Facility Map
 5. Figure 5 Proposed Condition Drainage Map
-

APPENDIX A



RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.) ³ :					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ⁴ ...		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas

Newly graded areas (pervious areas only, no vegetation) ⁵	77	86	91	94
--	----	----	----	----

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

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

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

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

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

Revision	Date



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL STANDARD FORM 4

Project Name & Number: Summerlin Village 22 Parcel GH Mass Grading 764-A174-001

Description: Proposed Condition

By: NB

Date: 11/17/2020

[illegible]

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JUN 1998
*   VERSION 4.1
*
* RUN DATE 12NOV20 TIME 15:27:58
*
*****

PROP.OUT

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

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X X XXXXXX XXXX X
X X X X X XX
X X X X X
XXXXXX XXXX X XXXX X
X X X X X
X X X X X
X X XXXXXX XXXX XXX

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

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

*** FREE ***

```

1 ID *****
2 ID * .....: *
3 ID * : .....: *
4 ID * : Summerlin Village 22 : *
5 ID * : Parcel GH Mass Grading : *
6 ID * : Porposed Conditions : *
7 ID * : .....: *
8 ID * : RETURN PERIOD _ _ _ 100 & 10 -YEAR : *
9 ID * : DISTRIBUTION _ _ _ 6-HOUR SDN3 : *
10 ID * : PROJECT NO _ _ _ 764.A174.001 : *
11 ID * : FILENAME _ _ _ PROP.H1 : *
12 ID * : DATE MODELED _ _ _ 11/12/2020 : *
13 ID * : MODELED BY _ _ _ NB : *
14 ID * : .....: *
15 ID * : .....: *
16 ID * : .....: *
17 ID *****
18 ID
19 ID JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
20 ID
21 ID DESIGN STORM DARF
22 ID
23 ID 100-YR 1.00
24 ID 10-YR 0.57
25 ID
26 IT 5 0 0 300
27 IO 5 0 0
28 IN 5 0 0
29 JR PREC 1 0.57
*

```

```

30 KK ON1
31 PB 3.41
32 BA 0.0222
33 PC 0.000 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
34 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
35 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
36 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
37 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
38 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
39 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
40 PC 0.998 0.999 1.000
41 LS 0 94.0
42 UD .076
*
43 ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT

LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW PROP.OUT
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
30 ON1

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 12NOV20 TIME 15:27:58 *

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

* : *
* : *
* : Summerlin Village 22 : *
* : Parcel GH Mass Grading : *
* : Porposed Conditions : *
* : : *
* : RETURN PERIOD _ _ _ 100 & 10 -YEAR : *
* : DISTRIBUTION _ _ _ 6-HOUR SDN3 : *
* : PROJECT NO _ _ _ 764.A174.001 : *
* : FILENAME _ _ _ PROP.H1 : *
* : DATE MODELED _ _ _ 11/12/2020 : *
* : MODELED BY _ _ _ NB : *
* : : *
* : *
* : : *

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

DESIGN STORM	DARF
100-YR	1.00
10-YR	0.57

27 IO OUTPUT CONTROL VARIABLES

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

IT HYDROGRAPH TIME DATA

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

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

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

JP MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION

RATIOS OF PRECIPITATION
1.00 .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	RATIO 2
				1.00	.57

PROP.OUT

HYDROGRAPH AT

+	ON1	.02	1	FLOW	55.	29.
				TIME	3.50	3.50

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

APPENDIX B

Worksheet for SECTION 1 (MAX SLOPE)

Results

Velocity	6.46	ft/s
Velocity Head	0.65	ft
Specific Energy	0.86	ft
Froude Number	2.51	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.21	ft
Critical Depth	0.39	ft
Channel Slope	9.70	%
Critical Slope	0.01268	ft/ft

Cross Section for SECTION 1 (MAX SLOPE)

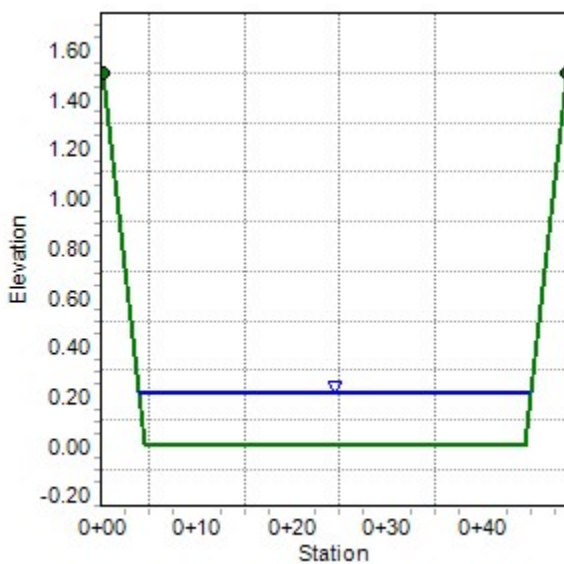
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	9.70	%
Normal Depth	0.21	ft
Discharge	55.00	ft ³ /s

Cross Section Image



Worksheet for SECTION 1 (MIN SLOPE)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.80	%
Discharge	55.00	ft ³ /s
Section Definitions		

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

0+00.0	1.50
0+04.5	0.00
0+44.5	0.00
0+49.0	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 1.50)	(0+49.0, 1.50)	0.025

Options

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

Results

Normal Depth	0.44	ft
Elevation Range	0.00 to 1.50	ft
Flow Area	18.25	ft²
Wetted Perimeter	42.79	ft
Hydraulic Radius	0.43	ft
Top Width	42.65	ft
Normal Depth	0.44	ft
Critical Depth	0.39	ft
Critical Slope	0.01268	ft/ft

Worksheet for SECTION 1 (MIN SLOPE)

Results

Velocity	3.01	ft/s
Velocity Head	0.14	ft
Specific Energy	0.58	ft
Froude Number	0.81	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.39	ft
Channel Slope	0.80	%
Critical Slope	0.01268	ft/ft

Cross Section for SECTION 1 (MIN SLOPE)

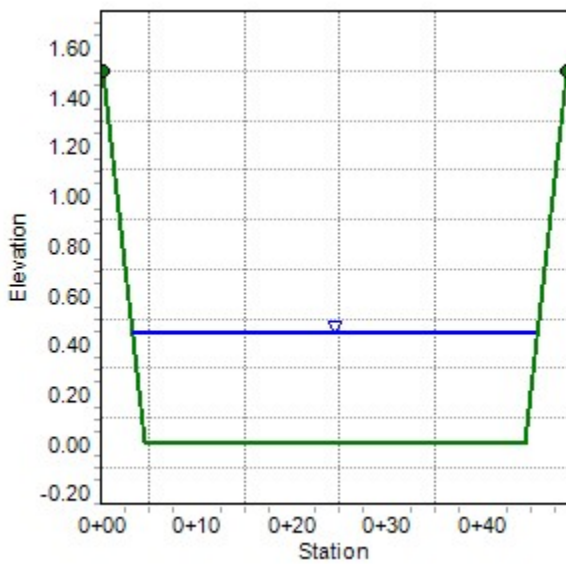
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.80	%
Normal Depth	0.44	ft
Discharge	55.00	ft ³ /s

Cross Section Image



Worksheet for SECTION 6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.00	%
Discharge	55.00	ft ³ /s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.0	1.17
0+03.0	0.17
0+20.0	0.00
0+37.0	0.17
0+40.0	1.17

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 1.17)	(0+40.0, 1.17)	0.037

Options

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

Results

Normal Depth	0.41	ft
Elevation Range	0.00 to 1.17	ft
Flow Area	11.18	ft²
Wetted Perimeter	35.51	ft
Hydraulic Radius	0.31	ft
Top Width	35.43	ft
Normal Depth	0.41	ft
Critical Depth	0.52	ft

Worksheet for SECTION 6

Results

Critical Slope	0.02682	ft/ft
Velocity	4.92	ft/s
Velocity Head	0.38	ft
Specific Energy	0.78	ft
Froude Number	1.54	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.41	ft
Critical Depth	0.52	ft
Channel Slope	7.00	%
Critical Slope	0.02682	ft/ft

Cross Section for SECTION 6

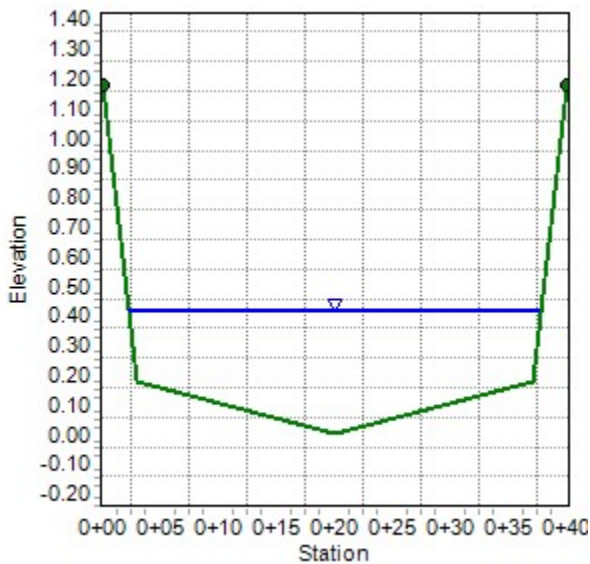
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.00	%
Normal Depth	0.41	ft
Discharge	55.00	ft ³ /s

Cross Section Image



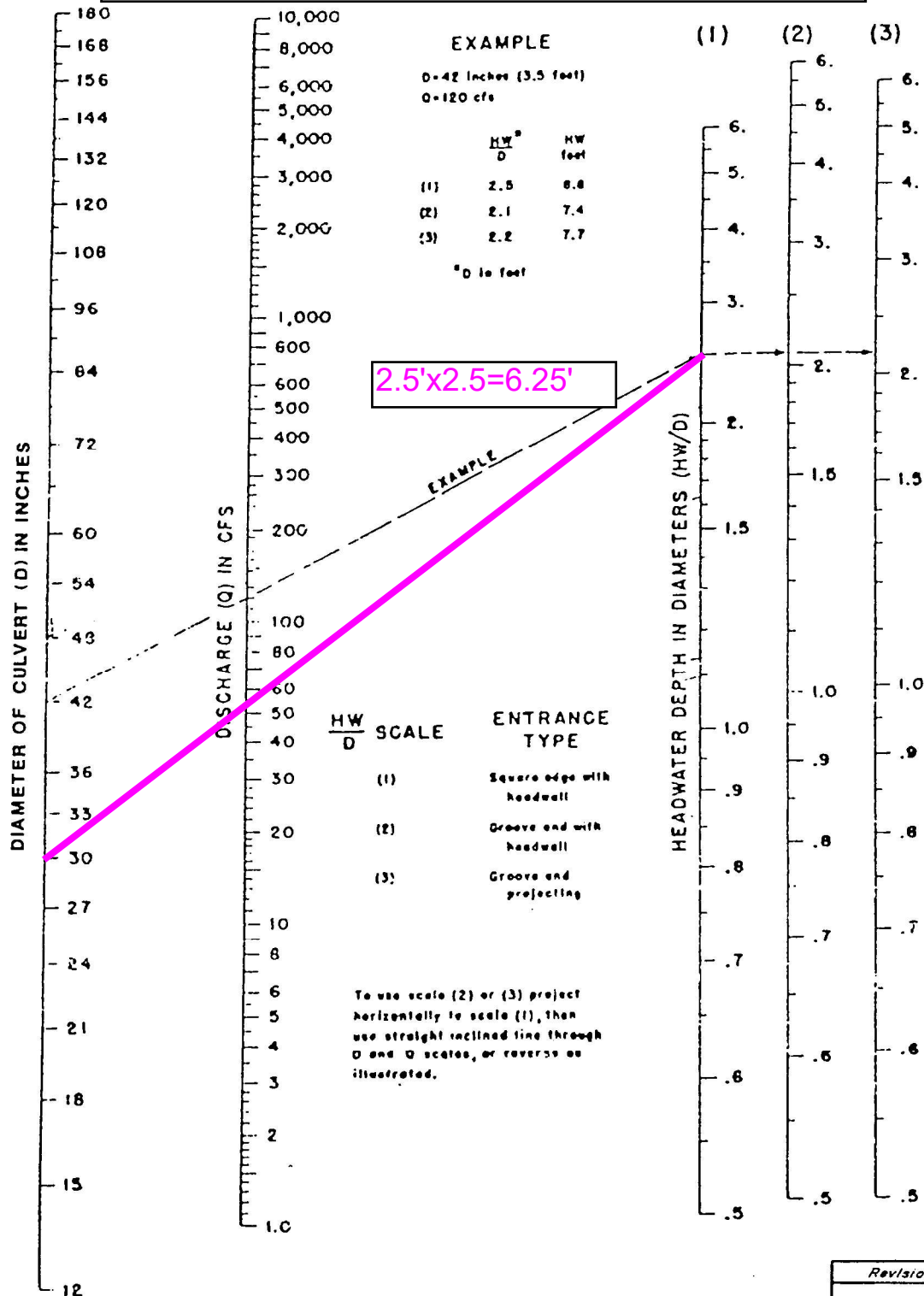
	Channel Protection Sizing Using Equation 718	
	Known:	
	V= Velocity (fps)	5.6
	Sg= Specific Gravity of Rock (typ=2.5)	2.5
	s= Longitudinal Channel Slope (ft/ft)	0.070
	$d_{50} = ((vel * S^{0.17}) / (3 * (Sg - 1)))^2$	
	Solve For:	
	d ₅₀ =	8 inches
	thickness=	15 inches

	Channel Protection Sizing Using Equation 718	
	Known:	
	d50= Riprap size (in)	8
	Sg= Specific Gravity of Rock (typ=2.5)	2.5
	s= Longitudinal Channel Slope (ft/ft)	0.070
	$Vel = 3 * (d_{50}^{0.5}) * (Sg - 1) / (S^{0.17})$	
	Solve For:	
	Max Allowable Velocity=	5.77 fps

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

30" RCP EXTENDING FROM DESERT FOOTHILLS



Revision	Date



Drop Inlet Sizing Calculation

Project Name: SUMMERLIN VILLAGE 22 PARCEL GH MASS GRADING

By: NB

Date: 11/17/2020

Grate Inlet Headwater Depth EXISTING 4'X12' NDOT TYPE 2		
Known:		
Q=	Flow (cfs)	55
W=	Width of Grate (ft)	4.0
L=	Length of Grate (ft)	12.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50
Weir Conditions:		
$H_w = (Q / (C_w * P))^{2/3}$		
Cw=	Weir Coefficient	3.0
P=	Perimeter of grate (ft)	32.0
Pc=	Perimeter (w/clogging) (ft)	16.0
Hw=	Headwater depth (ft)	1.10
Orifice Conditions:		
$H_w = (Q / (C_o * A_c))^2 / 2 * g$		
Co=	Orifice Coefficient	0.65
Ag=	Grate Area (ft ²)	48.0
Gf=	Grate Opening Factor	0.80
Ac=	Grate Open Area (w/ clogging) (ft ²)	19.2
Hw=	Headwater depth (ft)	0.30
Worst Case Scenario Occurs Under Weir Conditions		
Headwater Depth (ft) = 1.1		

APPENDIX C

Addendum #1 to Update #2 to the FLOOD CONTROL MASTER PLAN UPDATE

SUMMERLIN WEST PLANNING AREA

Las Vegas, Nevada

W.O. # 7809

Prepared for:

The Howard Hughes Company, LLC

Submitted to:

Public Works Department
City of Las Vegas



CITY OF LAS VEGAS			DATE:
INTER-OFFICE MEMORANDUM			February 27, 2020
TO: Land Development Services Department of Building & Safety			FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: Summerlin West Planning Area Master Plan - Update #2			COPIES TO: VTN Nevada
Cross Streets:	West of I-215 between Lake Mead Boulevard and Charleston Boulevard		The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS4926M.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017 & more		CCRFCFCD
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 #
1 st Submittal	10/9/2017 & 10/25/2017	11/8/2017	Not Approved	\$400.00	490518: \$400
2 nd Submittal	12/6/2017	12/20/2017 & 1/10/2018	Not Approved	\$400.00	492005: \$400
3 rd Submittal	2/27/2018	3/24/2018	Not Approved	\$400.00	493739: \$400
4 th Submittal & Supplement	4/23/2018 & 5/22/2018	5/22/2018	See Comments Below	\$400.00	495223: \$400
CCPW & CCRFCFCD	7/30/2018	7/30/2018	Concurrence Recv'd	N/C	N/C
5 th Submittal	1/3/2019 (Paid on 1/7/2019)	1/30/2019	Not Approved	\$100.00	502286: \$100
6 th Submittal	2/19/2019	3/13/2019	Conditional Approval	\$400.00	503267: \$400
CCPW & CCRFCFCD	4/15/2019	4/17/2019	Concurrence Recv'd	N/C	N/C
7 th Submittal	10/28/2019	12/2/2019	Not Approved	\$100.00	3625174: \$100
8 th Submittal – Mass Grading	11/19/2019 & 11/27/2019	11/25/2019	Conditionally Approved	\$100.00	3645141: \$100
9 th Submittal & Supplement	12/17/2019 & 1/21/2020	1/21/2019	Conditional Approval	\$400.00	3679639: \$400
Revised Memo	1/23/2020	1/23/2020	Conditional Approval	N/C	N/C
CCRFCFCD	2/24/2020	2/27/2020	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	\$2,700.00	----

REMARKS:

9th Submittal: Addendum & Supplement to Update #2

8th Submittal: Update for Mass Grading ONLY within V21 and V25

7th Submittal: Update #2 to refine the overall drainage basins model

5th & 6th Submittals: Update #1 & Addendum #1 to address Land Use Changes in the Summerlin West Planning Area

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

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

Note that the Clark County Regional Flood Control District (District) has begun efforts to update the *Hydrologic Criteria and Drainage Design Manual* (HCDDM) and is requesting participation from the engineering community. The District is collecting comments and suggestions on errors, clarifications, or changes needed to the current Manual and/or content and usability enhancements to be incorporated into the updated Manual. Additional information on procedures and deadline to provide feedback and comments are available online at (<http://www.ccrfcd.org/hcddmupdate.html>).

1. The subject Update #2 to the Summerlin West Planning Area is premised on the *DB5 Modifications* (ie, Enhancement) for regulating the downstream outflows. A technical drainage study for *DB5 Modifications* must be submitted for review and approval prior to any upstream Villages development with the exception of Villages 21 and 22.

The following comments are repeated until they are complete:

1. Flood Control supports the Mass Grading concept with the understanding that these are interim improvements and are the responsibility of the Master Developer. Mass Grading shall not place any fill material in the proposed embankment area of the detention basin. State Dam Safety Permit approval is required prior to any other detention basin work.
2. The Mass Grading Plans shall be revised to show no grading work within the area of the future detention basin embankment & spillway areas. This exclusion area needs to be clearly delineated on the plans and added as a Note on each Sheet of the Grading Plans.
3. Howard Hughes Company (Summerlin) is solely responsible for the maintenance and erosion control of the interim facilities based upon the Mass Grading.

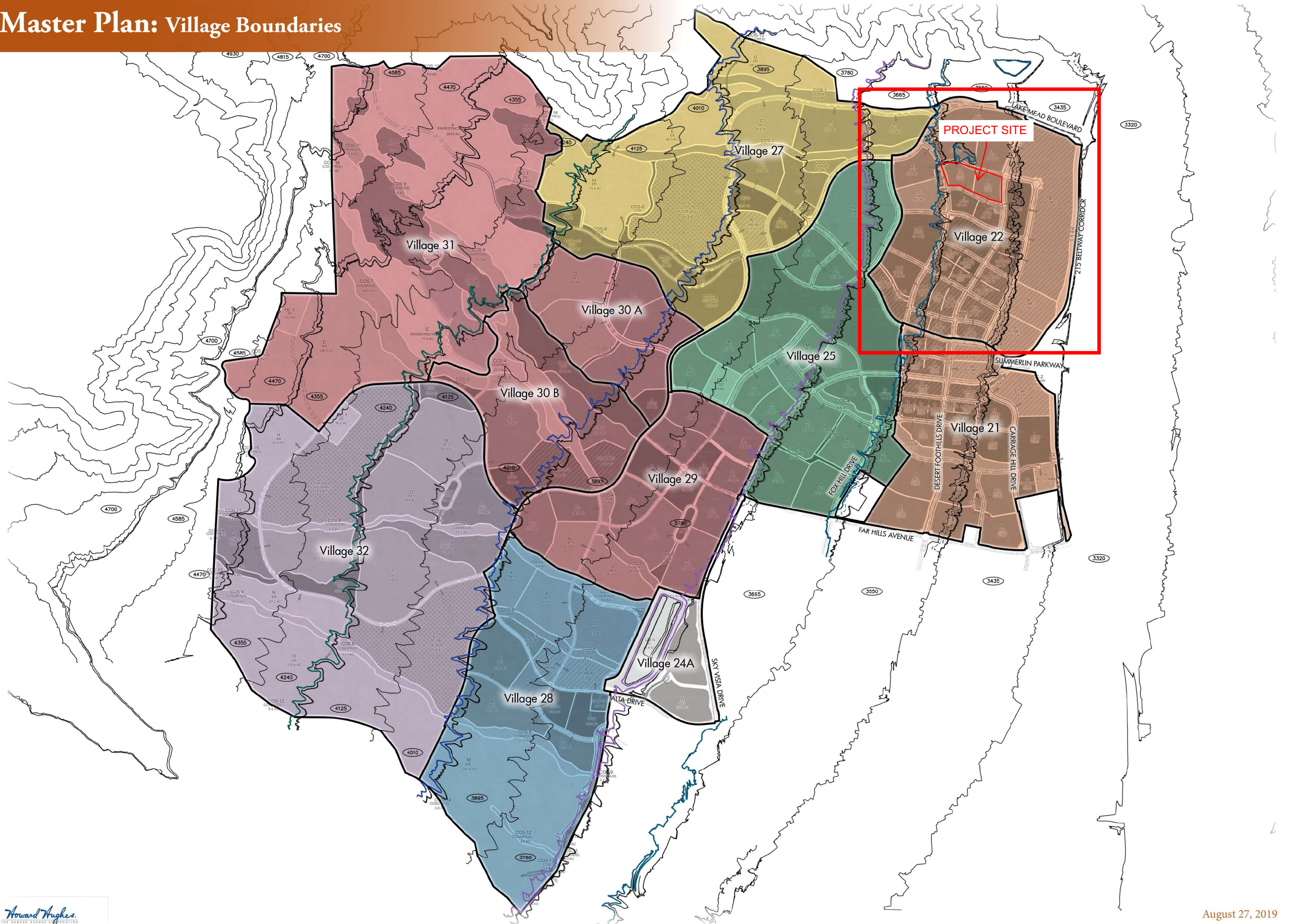
NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

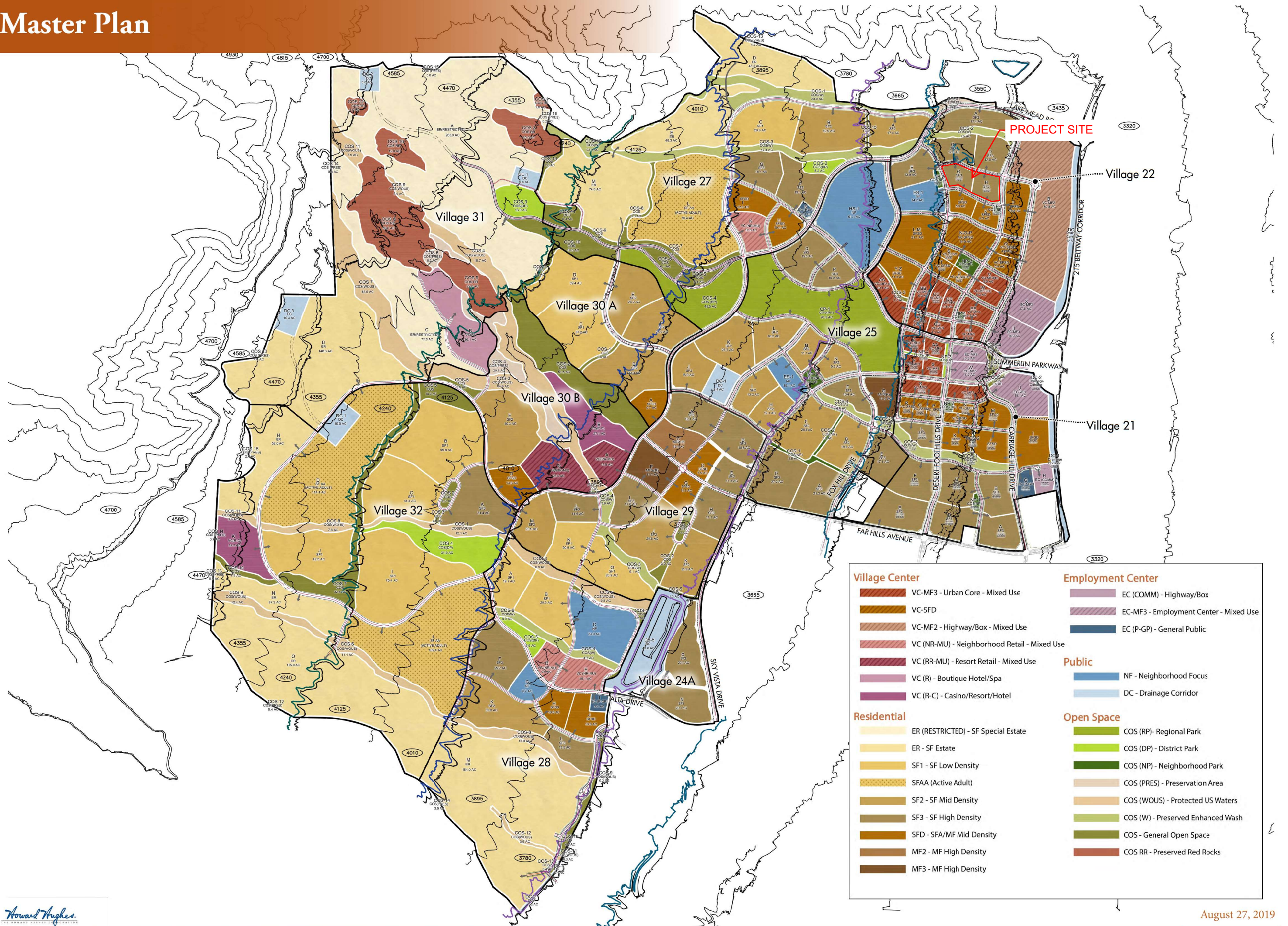
END OF REMARKS
WSP/AYS/PBJ

T/R/S: T21S/R69E/22
AREA K-22

Master Plan: Village Boundaries



Master Plan



Update #2 to the Master Conceptual Drainage Study for

Summerlin West Village 22

Las Vegas, Nevada

W.O. # 7861-3A

Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works



CITY OF LAS VEGAS			DATE:
INTER-OFFICE MEMORANDUM			January 23, 2020
TO: Land Development Services Department of Building & Safety			FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: Master Conceptual Drainage Study for – Update #2 Summerlin West Village 22			COPIES TO: VTN Nevada
Cross Streets:	I-215 Western Beltway & Summerlin Parkway		Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5005H.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006, 137-23-101-002		CCRFCFCD
Zoning Action:	MDR-73901		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 #
1 st Submittal	6/12/2018	6/28/2018 & 7/13/2018	Not Approved	\$400.00	49696: \$400
2 nd Submittal	7/31/2018	8/22/2018	Not Approved	\$400.00	497790: \$400
3 rd Submittal	11/5/2018	11/27/2018	Conditional Approval	\$400.00	500639: \$400
Memo Revision	12/3/2018	12/3/2018	Conditional Approval	N/C	N/C
CCRFCFCD	1/10/2019	1/10/2019	Concurrence Recv'd	N/C	N/C
4 th Submittal	2/12/2019	3/6/2019	Not Approved	\$100.00	503164: \$100
5 th Submittal	3/21/2019	4/4/2019	Conditional Approval	\$400.00	3057847: \$400
CCPW & CCRFCFCD	4/25/2019 & 5/23/2019	5/29/2019	Concurrence Received	N/C	N/C
6 th Submittal	11/13/2019	12/10/2019	Conditional Approval	\$100.00	3644006: \$100
Memo Revision	12/12/2019	12/12/2019	Conditional Approval	N/C	N/C
CCPW & CCRFCFCD	1/13/2020 & 1/16/2020	1/23/2020	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	\$1,800.00	

REMARKS:

6th Submittal: Update #2 to address Village 22 Overall Development Plan changes

4th & 5th Submittals: Update #1 & Addendum #1 to revise Village 22 in accordance to the Update of the latest overall Summerlin West Master Plan Drainage Study

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

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

1. The *Grand Park Detention Basin* is proposed to regulate and meter outflow to match the previously approved downstream flow conditions at the junction of *Far Hills* storm drain and the *Beltway Channel*. Without the *Grand Park Detention Basin*, there will be a net increase in flows at the *Beltway Channel* downstream of *Far Hills* intersection exceeding the previously approved flow.

A technical drainage study for the analysis, design and construction plans for the *Grand Park Detention Basin* must be submitted and approved by the City prior to the individual onsite parcel developments.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
WSP/AYS

T/R/S: T20S/R59E/14
AREA K-14

PARCELS G & H CONSIST OF SOIL TYPE 155

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
ES-1	155	100%				100%		95.0
G	155	100%				100%		95.0
H	155	100%				100%		95.0
I	152	15%		100%				92.0
	155	85%		100%				
J	152	2%				100%		95.0
	155	98%				100%		
K	152	38%				100%		95.0
	155	62%				100%		
L	155	87%				100%		94.6
	502	13%				100%		
M	155	76%				100%		94.3
	502	24%				100%		
N	152	3%				100%		95.0
	155	97%				100%		
O	155	100%		95%		5%		92.2
P	155	100%		95%		5%		92.2
Q	155	100%		95%		5%		92.2
R	155	77%		95%		5%		94.3
	502	23%		95%		5%		
S	155	35%		95%		5%		88.3
	502	65%		95%		5%		
T	502	100%				100%		92.0
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	156	14%				100%		92.4
	502	86%				100%		
Z	156	27%		100%				87.6
	502	73%		100%				
AA	156	100%	100%					93.0
BB	156	24%	40%			60%		91.0
	502	76%	40%			60%		
CC	156	16%	40%			60%		90.7
	502	84%	40%			60%		

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)

REFERENCED ULTIMATE CONDITION HYDROLOGY

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

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

$$V1 = 148 * S^{1/2} \quad V2 = 294 * S^{1/2} \quad k = 0.0132C_n - 0.39$$

$$V1 = 202 * S^{1/2} \quad V2 = 306 * S^{1/2}$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG.	Cn	K	AREA Ac.	AREA MI^2	LENGTH Ft	SLOPE %	Ti Min.	LENGTH Ft.	SLOPE %	V1 fps (9a)	V2 fps (9b)	Tt Min.	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
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

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

$$V1 = 148 * S^{1/2} \quad V2 = 294 * S^{1/2} \quad k = 0.0132C_n - 0.39$$

$$V1 = 202 * S^{1/2} \quad V2 = 306 * S^{1/2}$$

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

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

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

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X X XXXXXX XXXX X
X X X X X XX
X X X X X
XXXXXX XXXX X XXXX X
X X X X X
X X X X X
X X XXXXXX XXXX XXX

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

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

*** FREE ***

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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
7 ID
8 ID *****
9 ID * UPDATE #2 - SUMMERLIN WEST VILLAGE 22 *
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
*

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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
*

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

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```

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
*

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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
 *

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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
 *

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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
*

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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
 *

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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
 *

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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
 *

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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
 *

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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
 *

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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
 *

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HEC-1 INPUT

PAGE 14

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
 *

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HEC-1 INPUT

PAGE 15

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
*

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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 CDESS
 601 RD 390 0.005 0.015 0 CIRC 3.5
 *
 602 KK DESS
 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.....				
	V				
	V				
98	RCG				
101			H		
106	CH.....				
	V				
	V				
109	RCH				
112		STH			
118			J		
123		CJ.....			
		V			
		V			
126		RCJ			
129			K		
134				DES2	
139		CDES2.....			
		V			
		V			
142		RCDES2			
145	CP2.....				
	V				
	V				
148	RCP2				
151		CARR1			
156			I		
161				N-O-P	
166					NP-1
171					STG2
177				CSTG2.....	
180					DES3
185				CP3.....	
				V	
				V	
188				RCP3	
191					STG3

196	.	.	.	.	CSTG3.....			
	.	.	.	.	.			
199	.	.	.	.	.	Q		
	.	.	.	.	.	.		
204	.	.	.	.	.	.	R	
	.	.	.	.	.	.	.	
209	.	.	.	.	.	CQR.....		
	.	.	.	.	.	.		
212	.	.	.	.	.	.	CARR2	
	.	.	.	.	.	.	.	
217	.	.	.	.	.	CCARR2.....		
	.	.	.	.	.	V		
	.	.	.	.	.	V		
220	.	.	.	.	.	RCCARR2		
	.	.	.	.	.	.		
223	.	.	.	.	.	CP4.....		
	.	.	.	.	.	V		
	.	.	.	.	.	V		
226	.	.	.	.	.	RCP4		
	.	.	.	.	.	.		
229	.	.	.	.	.	CP5.....		
	.	.	.	.	.	.		
232	.	.	II	.	.	.		
	.	.	.	.	.	.		
237	.	.	.	X	.	.		
	.	.	.	.	.	.		
242	.	.	.	.	.	B		
	.	.	.	.	.	.		
247	.	.	.	.	.	DC-1		
	.	.	.	.	.	.		
252	.	.	.	.	.	.	COS-4	
	.	.	.	.	.	.	.	
257	.	.	DUMMY1A.....	.	.	.		
	.	.	.	.	.	.		
261	.	.	.	COS-1	.	.		
	.	.	.	.	.	.		
266	DUMMY1.....	.	.	.	.	.		
	.	.	.	.	.	.		
270	.	27-F	.	.	.	.		
	.	.	.	.	.	.		
275	.	.	27-COS2	.	.	.		
	.	.	.	.	.	.		
280	.	.	.	LM2	.	.		
	.	.	.	.	.	.		
285	.	CLM2.....	.	.	.	.		
	.	.	.	.	.	.		
288	.	.	27-COS3	.	.	.		
	.	.	.	.	.	.		
293	.	COFF.....	.	.	.	.		
	.	V	.	.	.	.		
	.	V	.	.	.	.		
297	.	RCOFF	.	.	.	.		
	.	.	.	.	.	.		
300	.	.	E	.	.	.		
	.	.	.	.	.	.		
305	.	.	.	STJ1	.	.		
	.	.	.	.	.	.		
311	.	CSTJ1.....	.	.	.	.		
	.	V	.	.	.	.		
	.	V	.	.	.	.		
314	.	RCSTJ1	.	.	.	.		
	.	.	.	.	.	.		
317	.	.	NP-2	.	.	.		
	.	.	.	.	.	.		
322	.	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
	.	.	.

442	.	.	.	CVW.....
	.	.	.	
445	.	.	.	CARR3
	.	.	.	V
	.	.	.	V
450	.	.	.	RCARR3
	.	.	.	
	.	.	.	
453	.	CCARR3.....		
	.	.		
	.	.		
456	.	.	STE3	
	.	.	.	
	.	.	.	
461	.	CP8.....		
	.	.	.	
	.	.	.	
	.	.	.	
464	.	RCP8		
	.	.		
	.	.		
467	.	.	EE	
	.	.	.	
	.	.	.	
472	.	CEE.....		
	.	.	.	
	.	.	.	
	.	.	.	
475	.	RCP8		
	.	.		
	.	.		
478	.	.	NP-3	
	.	.	.	
	.	.	.	
483	.	.	.	STEE3
	.	.	.	
	.	.	.	
488	.	.	CSTEE3.....	
	.	.	.	
	.	.	.	
	.	.	.	
491	.	CP9.....		
	.	.	.	
	.	.	.	
	.	.	.	
494	.	RCP9		
	.	.		
	.	.		
497	.	.	HH	
	.	.	.	
	.	.	.	
502	.	.	.	CARR4
	.	.	.	
	.	.	.	
507	.	DUMMY2.....		
	.	.		
	.	.		
510	.	.	25-HS1B	
	.	.	.	
	.	.	.	
515	.	.	.	STN2
	.	.	.	
	.	.	.	
	.	.	.	
520	.	.	CSTN2.....	
	.	.	.	
	.	.	.	
	.	.	.	
523	.	.	RCSTN2	
	.	.	.	
	.	.	.	
	.	.	.	
526	.	.	.	Y-Z
	.	.	.	
	.	.	.	
531	.	.	.	STE1
	.	.	.	
	.	.	.	
	.	.	.	
536	.	.	CSTE1.....	
	.	.	.	
	.	.	.	
	.	.	.	
539	.	.	RCSTE1	
	.	.	.	
	.	.	.	
	.	.	.	
542	.	.	.	COS-3
	.	.	.	
	.	.	.	
547	.	.	.	STJ3
	.	.	.	
	.	.	.	
	.	.	.	
552	.	.	CSTJ3.....	
	.	.	.	
	.	.	.	
	.	.	.	
555	.	.	.	AA
	.	.	.	
	.	.	.	
	.	.	.	


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560      .      .      DUMMY3.....
      .      .      .
563      .      .      .      STE2
      .      .      .      .
568      .      .      .      .      BB
      .      .      .      .      .
573      .      .      .      CBB.....
      .      .      .      .
575      .      .      .      .      T
      .      .      .      .      .
580      .      .      .      CT.....
      .      .      .      .
582      .      .      .      .      CC
      .      .      .      .      .
587      .      .      .      CCC.....
      .      .      .      V
      .      .      .      V
589      .      .      .      RCCC
      .      .      .      .
592      .      .      .      .      DD
      .      .      .      .      .
597      .      .      .      CDD.....
      .      .      .      V
      .      .      .      V
599      .      .      .      RCDD
      .      .      .      .
602      .      .      .      .      DESS
      .      .      .      .      .
607      .      .      .      CDESS.....
      .      .      .      V
      .      .      .      V
609      .      .      .      RCDESS
      .      .      .      .
612      .      .      .      .      STEE2
      .      .      .      .      .
617      .      .      .      CSTEE2.....
      .      .      .      .
619      .      .      .      .      GG
      .      .      .      .      .
624      .      .      .      CGG.....
      .      .      .      .
626      .      .      .      .      FF
      .      .      .      .      .
631      .      .      DUMMY4.....

```

(***) 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)

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

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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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				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 TIME	191. 3.50
HYDROGRAPH AT					
+	STI	.00	1	FLOW TIME	11. 3.50
HYDROGRAPH AT					
+	C	.02	1	FLOW TIME	51. 3.50
2 COMBINED AT					
+	CSTI	.02	1	FLOW TIME	62. 3.50
HYDROGRAPH AT					
+	G	.01	1	FLOW TIME	30. 3.50
2 COMBINED AT					
+	CG	.03	1	FLOW TIME	92. 3.50
ROUTED TO					
+	RCG	.03	1	FLOW TIME	91. 3.50
HYDROGRAPH AT					
+	H	.01	1	FLOW TIME	33. 3.50
2 COMBINED AT					
+	CH	.05	1	FLOW TIME	124. 3.50
ROUTED TO					
+	RCH	.05	1	FLOW TIME	123. 3.50
HYDROGRAPH AT					
+	STH	.00	1	FLOW TIME	10. 3.50
HYDROGRAPH AT					
+	J	.01	1	FLOW TIME	24. 3.50
2 COMBINED AT					
+	CJ	.01	1	FLOW TIME	34. 3.50
ROUTED TO					
+	RCJ	.01	1	FLOW TIME	33. 3.50
HYDROGRAPH AT					
+	K	.01	1	FLOW TIME	22. 3.50
HYDROGRAPH AT					
+	DES2	.00	1	FLOW TIME	13. 3.50
3 COMBINED AT					
+	CDES2	.03	1	FLOW TIME	68. 3.50
ROUTED TO					
+	RCDES2	.03	1	FLOW TIME	66. 3.50
2 COMBINED AT					
+	CP2	.07	1	FLOW TIME	189. 3.50
ROUTED TO					
+	RCP2	.07	1	FLOW TIME	184. 3.50
HYDROGRAPH AT					
+	CARR1	.01	1	FLOW TIME	29. 3.50
HYDROGRAPH AT					
+	I	.02	1	FLOW TIME	38. 3.50
HYDROGRAPH AT					
+	N-O-P	.02	1	FLOW TIME	49. 3.50

HYDROGRAPH AT +	NP-1	.00	1	FLOW TIME	6. 3.50
HYDROGRAPH AT +	STG2	.00	1	FLOW TIME	13. 3.50
3 COMBINED AT +	CSTG2	.03	1	FLOW TIME	68. 3.50
HYDROGRAPH AT +	DES3	.00	1	FLOW TIME	9. 3.50
2 COMBINED AT +	CP3	.03	1	FLOW TIME	77. 3.50
ROUTED TO +	RCP3	.03	1	FLOW TIME	76. 3.50
HYDROGRAPH AT +	STG3	.00	1	FLOW TIME	3. 3.50
2 COMBINED AT +	CSTG3	.03	1	FLOW TIME	79. 3.50
HYDROGRAPH AT +	Q	.01	1	FLOW TIME	17. 3.50
HYDROGRAPH AT +	R	.01	1	FLOW TIME	20. 3.50
2 COMBINED AT +	CQR	.01	1	FLOW TIME	37. 3.50
HYDROGRAPH AT +	CARR2	.01	1	FLOW TIME	15. 3.50
2 COMBINED AT +	CCARR2	.02	1	FLOW TIME	52. 3.50
ROUTED TO +	RCCARR2	.02	1	FLOW TIME	51. 3.50
2 COMBINED AT +	CP4	.05	1	FLOW TIME	131. 3.50
ROUTED TO +	RCP4	.05	1	FLOW TIME	127. 3.50
4 COMBINED AT +	CP5	.15	1	FLOW TIME	379. 3.50
HYDROGRAPH AT +	II	.03	1	FLOW TIME	61. 3.50
HYDROGRAPH AT +	X	.03	1	FLOW TIME	60. 3.50
HYDROGRAPH AT +	B	.13	1	FLOW TIME	304. 3.50
HYDROGRAPH AT +	DC-1	.02	1	FLOW TIME	36. 3.67
HYDROGRAPH AT +	COS-4	.00	1	FLOW TIME	2. 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 TIME	220. 3.50
HYDROGRAPH AT +	STG1	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CSTG1	.09	1	FLOW TIME	229. 3.50
2 COMBINED AT +	CP6	.21	1	FLOW TIME	532. 3.50
ROUTED TO +	RCP6	.21	1	FLOW TIME	518. 3.50
HYDROGRAPH AT +	L-M	.03	1	FLOW TIME	81. 3.50
HYDROGRAPH AT +	STJ2	.00	1	FLOW TIME	13. 3.50
3 COMBINED AT +	CSTJ2	.25	1	FLOW TIME	612. 3.50
ROUTED TO +	RCSTJ2	.25	1	FLOW TIME	602. 3.50
HYDROGRAPH AT +	STF	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CSTF	.25	1	FLOW TIME	610. 3.50
HYDROGRAPH AT +	U	.01	1	FLOW TIME	11. 3.50
HYDROGRAPH AT +	DES4	.00	1	FLOW TIME	8. 3.50
2 COMBINED AT +	CDES4	.01	1	FLOW TIME	19. 3.50
HYDROGRAPH AT +	S	.00	1	FLOW TIME	10. 3.50
2 COMBINED AT +	CS	.01	1	FLOW TIME	29. 3.50
2 COMBINED AT +	CP7	.27	1	FLOW TIME	639. 3.50
ROUTED TO +	RCP7	.27	1	FLOW TIME	632. 3.50
HYDROGRAPH AT +	STF2	.00	1	FLOW TIME	5. 3.50
2 COMBINED AT +	CSTF2	.27	1	FLOW TIME	637. 3.50
ROUTED TO +	RCSTF2	.27	1	FLOW TIME	623. 3.50
HYDROGRAPH AT +	V	.01	1	FLOW TIME	17. 3.50
HYDROGRAPH AT +	W	.01	1	FLOW TIME	19. 3.50

2 COMBINED AT					
+	CVW	.02	1	FLOW TIME	36. 3.50
HYDROGRAPH AT					
+	CARR3	.00	1	FLOW TIME	8. 3.50
ROUTED TO					
+	RCARR3	.00	1	FLOW TIME	8. 3.50
3 COMBINED AT					
+	CCARR3	.29	1	FLOW TIME	667. 3.50
HYDROGRAPH AT					
+	STE3	.00	1	FLOW TIME	6. 3.50
2 COMBINED AT					
+	CP8	.29	1	FLOW TIME	673. 3.50
ROUTED TO					
+	RCP8	.29	1	FLOW TIME	664. 3.50
HYDROGRAPH AT					
+	EE	.01	1	FLOW TIME	25. 3.50
2 COMBINED AT					
+	CEE	.30	1	FLOW TIME	689. 3.50
ROUTED TO					
+	RCP8	.30	1	FLOW TIME	680. 3.50
HYDROGRAPH AT					
+	NP-3	.00	1	FLOW TIME	2. 3.50
HYDROGRAPH AT					
+	STEE3	.00	1	FLOW TIME	5. 3.50
2 COMBINED AT					
+	CSTEE3	.00	1	FLOW TIME	7. 3.50
2 COMBINED AT					
+	CP9	.30	1	FLOW TIME	688. 3.50
ROUTED TO					
+	RCP9	.30	1	FLOW TIME	678. 3.50
HYDROGRAPH AT					
+	HH	.01	1	FLOW TIME	20. 3.50
HYDROGRAPH AT					
+	CARR4	.00	1	FLOW TIME	10. 3.50
3 COMBINED AT					
+	DUMMY2	.32	1	FLOW TIME	708. 3.50
HYDROGRAPH AT					
+	25-HS1B	.02	1	FLOW TIME	48. 3.50
HYDROGRAPH AT					
+	STN2	.01	1	FLOW TIME	19. 3.50
2 COMBINED AT					
+	CSTN2	.03	1	FLOW TIME	67. 3.50
ROUTED TO					
+	RCSTN2	.03	1	FLOW TIME	65. 3.50
HYDROGRAPH AT					
+	Y-Z	.02	1	FLOW TIME	42. 3.50

HYDROGRAPH AT +	STE1	.00	1	FLOW TIME	8. 3.50
3 COMBINED AT +	CSTE1	.05	1	FLOW TIME	115. 3.50
ROUTED TO +	RCSTE1	.05	1	FLOW TIME	107. 3.50
HYDROGRAPH AT +	COS-3	.00	1	FLOW TIME	4. 3.50
HYDROGRAPH AT +	STJ3	.00	1	FLOW TIME	14. 3.50
3 COMBINED AT +	CSTJ3	.05	1	FLOW TIME	126. 3.50
HYDROGRAPH AT +	AA	.02	1	FLOW TIME	33. 3.50
2 COMBINED AT +	DUMMY3	.07	1	FLOW TIME	159. 3.50
HYDROGRAPH AT +	STE2	.00	1	FLOW TIME	8. 3.50
HYDROGRAPH AT +	BB	.01	1	FLOW TIME	23. 3.50
2 COMBINED AT +	CBB	.01	1	FLOW TIME	31. 3.50
HYDROGRAPH AT +	T	.01	1	FLOW TIME	13. 3.50
2 COMBINED AT +	CT	.02	1	FLOW TIME	44. 3.50
HYDROGRAPH AT +	CC	.01	1	FLOW TIME	19. 3.50
2 COMBINED AT +	CCC	.03	1	FLOW TIME	63. 3.50
ROUTED TO +	RCCC	.03	1	FLOW TIME	60. 3.50
HYDROGRAPH AT +	DD	.01	1	FLOW TIME	17. 3.50
2 COMBINED AT +	CDD	.03	1	FLOW TIME	77. 3.50
ROUTED TO +	RCDD	.03	1	FLOW TIME	74. 3.50
HYDROGRAPH AT +	DE55	.00	1	FLOW TIME	7. 3.50
2 COMBINED AT +	CDE55	.04	1	FLOW TIME	81. 3.50
ROUTED TO +	RCDE55	.04	1	FLOW TIME	80. 3.50
HYDROGRAPH AT +	STEE2	.00	1	FLOW	8.

				TIME	3.50
2 COMBINED AT					
+	CSTEE2	.04	1	FLOW TIME	88.3.50
HYDROGRAPH AT					
+	GG	.01	1	FLOW TIME	21.3.50
2 COMBINED AT					
+	CGG	.05	1	FLOW TIME	109.3.50
HYDROGRAPH AT					
+	FF	.01	1	FLOW TIME	15.3.50
3 COMBINED AT					
+	DUMMY4	.12	1	FLOW TIME	282.3.50

1

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION PEAK	INTERVAL TIME TO PEAK	VOLUME
		(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

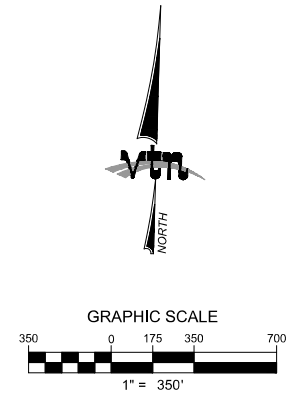
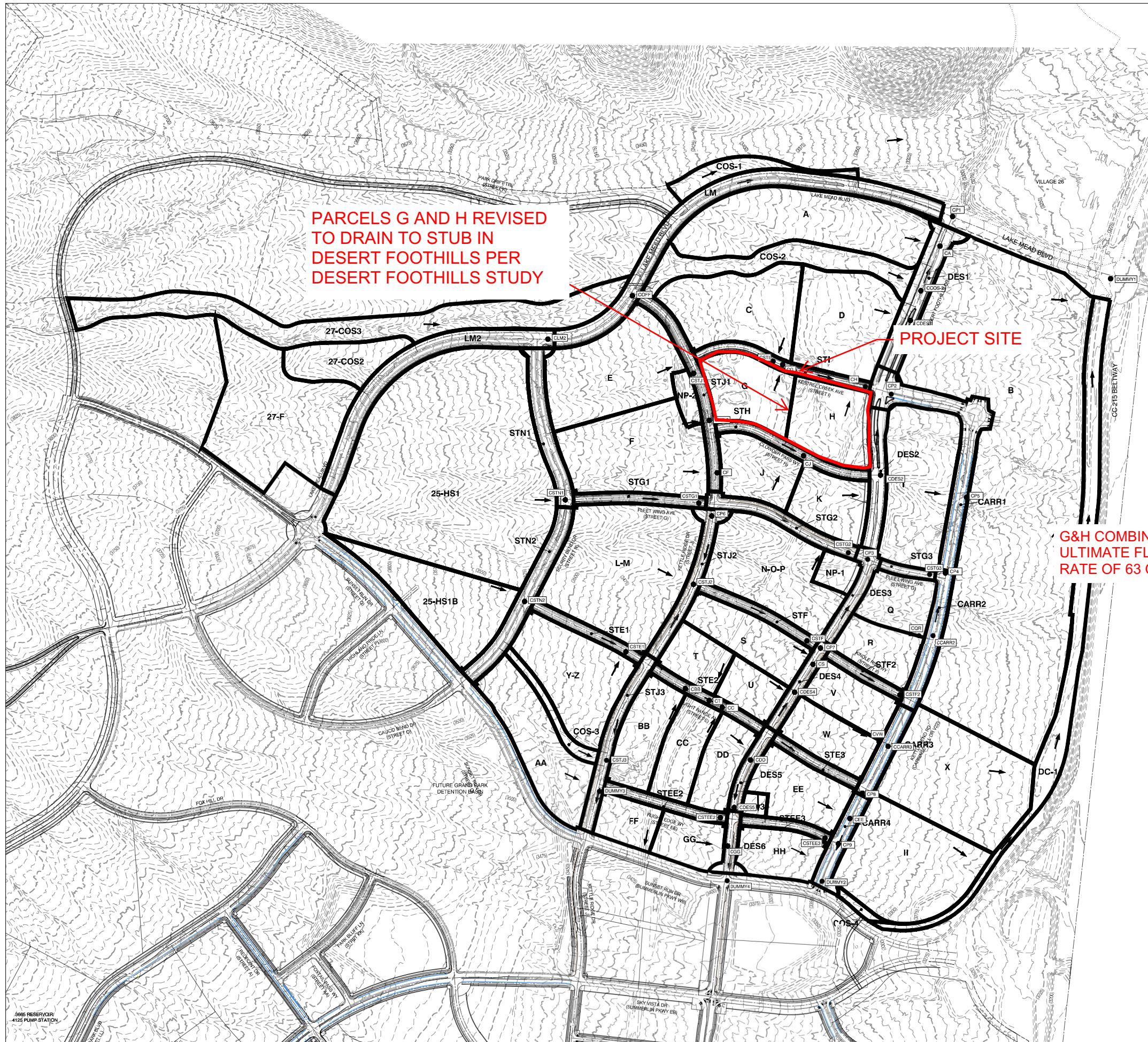
FOR PLAN = 1 RATIO= .00
RCDD MANE .73 75.16 210.34 2.43 5.00 74.39 210.00 2.43

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
RCDESS 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 ***



LEGEND

- BASIN BOUNDARY
- 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	LM1	3.61	13
D	11.96	50	STN1	-	244
DES1	4.46	20	STG1	1.85	8
CDES1	-	70	CSTG1	-	229
COS-2	7.51	22	CP6	-	532
CCOS-2	-	89	LM	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
COR	-	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	CB3	-	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
COFF	-	185	CDD	-	77
E	13.91	58	DESS	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			

THE HOWARD HUGHES COMPANY, LLC
1801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

FIGURE 6
ULTIMATE CONDITION BASIN MAP

DRAWN BY: OCT 2019
DESIGNED BY:
CHECKED BY:

PROJECT NO: 7801
SCALE: 1" = 350' HORIZ.
N/A VERT.

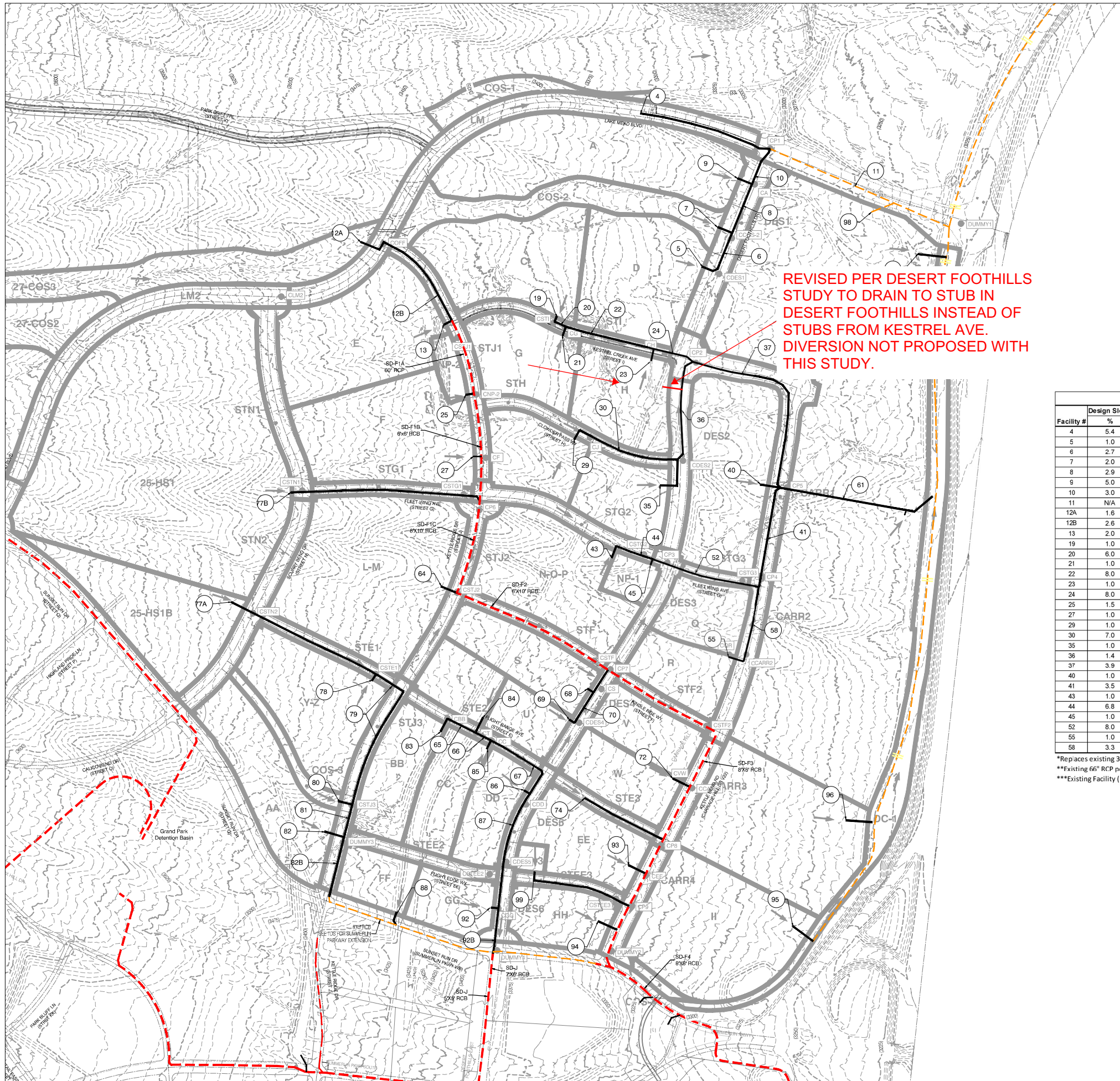
SHEET
OF SHEETS
DRAWING NO.

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146
PH: (702) 975-7500 FAX: (702) 982-2597 WEB: WWW.VTNV.COM
CONSULTING ENGINEERS, PLANNERS, AND SURVEYORS



SUMMERLIN WEST VILLAGE 22

H:\7801 Village 22 Master Drawings\UPP\6 - Figures\Figure 6 - Village 22 Drainage Basin Map.dwg



REVISED PER DESERT FOOTHILLS
STUDY TO DRAIN TO STUB IN
DESERT FOOTHILLS INSTEAD OF
STUBS FROM KESTREL AVE.
DIVERSION NOT PROPOSED WITH
THIS STUDY.

GRAPHIC SCALE
300 0 150 300 600
1" = 300'

NORTH

LEGEND

- CCRFCD STORM DRAIN ALIGNMENT
- EXISTING FACILITY
- VILLAGE 22 LOCAL STORM DRAIN
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- LOCAL FACILITY DESIGNATION
- DEVELOPED CONDITION FLOW ARROW

VILLAGE 22 LOCAL FLOOD PROTECTION FACILITIES											
Facility #	Design Slope %	Q100 cfs	Tributary Basin/CP	Velocity ft/s	Facility	Facility #	Design Slope %	Q100 cfs	Tributary Basin/CP	Velocity ft/s	Facility
4	5.4	36	LM	18.02	24" RCP	61	6.6	379	CP5	29.52	6x6" RCB
5	1.0	50	D	13.29	30" RCP	64	1.0	81	L-M	11.63	42" RCP
6	2.7	70	CDES1	16.60	30" RCP	65	6.9	31	CBB	18.97	30" RCP
7	2.0	22	COS-2	11.00	30" RCP	66	4.3	44	CT	17.48	30" RCP
8	2.9	89	CCOS-2	17.78	36" RCP	67	8.0	63	CCC	24.12	30" RCP
9	5.0	68	A	20.46	30" RCP	68	1.0	10	S	6.90	30" RCP
10	3.0	156	CA	20.48	42" RCP	69	1.0	11	U	7.08	30" RCP
11	N/A	191	CP1	N/A	EX 66" RCP**	70	2.1	19	CDES4	10.77	30" RCP
12A	1.6	53	V27-COS3	12.61	48" RCP	72	6.1	36	CVW	18.89	30" RCP
12B	2.6	185	COFF	20.31	54" RCP	74	7.7	6	STE3	12.27	30" RCP
13	2.0	58	E	13.47	30" RCP	77A	1.0	67	CSTN2	10.75	36" RCP
19	1.0	51	C	10.49	42" RCP	77B	5.0	244	CSTN1	28.12	48" RCP
20	6.0	62	CST1	21.33	42" RCP	78	1.0	42	Y-Z	9.51	30" RCP
21	1.0	30	G	9.19	36" RCP	79	4.5	115	CSTE1	22.30	36" RCP
22	8.0	92	CG	26.39	42" RCP	79B	0.5	115	CSTE1	8.38	5x5" RCB
23	1.0	33	H	9.29	30" RCP	80	8.0	4	COS-3	11.01	30" RCP
24	8.0	124	CH	28.56	42" RCP	81	0.5	126	CSTJ3	8.56	5x5" RCB
25	1.5	5	NP-2	6.39	36" RCP	82	1.0	33	AA	9.29	30" RCP
27	1.0	59	F	10.65	36" RCP	83	1.0	23	BB	8.60	30" RCP
29	1.0	24	J	8.68	30" RCP	84	1.0	13	T	7.41	30" RCP
30	7.0	34	CJ	19.55	30" RCP	85	1.0	19	CC	8.19	30" RCP
35	1.0	22	K	8.50	30" RCP	86	1.0	17	DD	7.96	30" RCP
36	1.4	68	CDES2	12.78	42" RCP	87	1.0	77	DDD	11.52	42" RCP
37	3.9	189	CP2	24.25	54" RCP	88	1.0	15	FF	7.70	30" RCP
40	1.0	38	I	9.49	30" RCP	92	2.7	21	GG	12.13	30" RCP
41	3.5	131	CP4	21.14	42" RCP	93	1.0	25	EE	8.77	30" RCP
43	1.0	49	N-O-P	10.31	36" RCP	94	1.0	20	HH	8.30	30" RCP
44	6.8	68	CSTG2	23.10	36" RCP	95	1.0	61	II	10.96	42" RCP
45	1.0	6	NP-1	5.97	30" RCP	96	1.0	60	X	10.68	36" RCP
52	8.0	79	CSTG3	25.51	36" RCP	97	1.5	304	B	18.49	60" RCP
55	1.0	37	CQR	9.46	30" RCP	98	N/A	138	N/A	N/A	EX 48" RCP***
58	3.3	52	CCARR2	16.49	30" RCP	99	1.0	2	NP-3	8.55	30" RCP

*Replaces existing 30" RCP stub provided in Lake Mead Study
**Existing 66" RCP per Lake Mead Blvd Study
***Existing Facility (Per Lake Mead Blvd Study) can accept 138 cfs and may be used for flexibility

THE HOWARD HUGHES CORPORATION
1000 WEST CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89135

FIGURE 7
LOCAL STORM DRAIN
FACILITIES MAP

SUMMERLIN WEST VILLAGE 22

DRAWN BY: JUNE 2019
DESIGNED BY: JUNE 2019
CHECKED BY: JUNE 2019
PROJECT NO: SCALE: 1"=300' HORZ. VERT. NA
SHEET OF SHEETS
DRAWING NO.

STUDY THAT DIVERTED FLOW FROM PARCEL G THROUGH H
WITH BOTH PARCELS DRAINING TO THE STUB IN DESERT FOOTHILLS
AND PROVIDED THE ANALYSIS.

Summerlin Village West 22

Desert Foothills Drive Fleet Wing Avenue to Lake Mead Boulevard

May 2020

Update #1

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 24, 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 V22 – Desert Foothills Drive Street Improvements from Lake Mead Boulevard to Fleet Wing Avenue (Street G)	
Cross Streets:	Lake Mead Boulevard & Desert Foothill Drive	COPIES TO:
File Number:	F:\Depot\DSMemos\DS5170D.doc	Atkins
Parcel Number:	137-14-401-006 & 137-23-101-002	Howard Hughes Company, LLC
Zoning Action:	N/A	Bart Anderson, P.E., DevCo
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES X	NO

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	8/5/2019	9/5/2019	Not Approved	\$400.00	3518204: \$400
2 nd Submittal	10/16/2019	11/7/2019	Not Approved	\$400.00	3612960: \$400
Supplement	11/14/2019	12/2/2019	Conditional Approval	N/C	N/C
CCRFGD	3/23/2020	3/24/2020	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	\$800.00	----

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:
	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.
X	is conditionally approved subject to the following conditions:

The engineer shall submit a supplement to address the two remaining requests below prior to the final approval of the subject drainage study:

- Second Request:** Drop inlets deeper than 10' require special structural design and structural calculations. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the Building Department for processing. The engineer must provide a copy of Building Department approval of the structures to Flood Control prior to final acceptance of the drainage study.
- Second Request: Sheet 20/33, Sheet 21/33** and all pertinent sheets: SDMH #1 which ties the existing 66"-RCP in Lake Mead Boulevard and the proposed 54"-RCP in Desert Foothills Drive is noted to be constructed by the subject project. However, shouldn't it that SDMH #1 be already constructed by the "Summerlin West V22 – Lake Mead Boulevard (Desert Foothills Drive to Kettle Ridge Drive)" project which should go prior to the subject improvements?

The response was that the manhole SDMH #1 will be constructed and break into an existing 66" - RCP with the proposed subject improvements.

It appears that pipe to pipe (new to existing) connections will be required. Provide connection detail in the next submittal.

A supplemental **Sheet 33/38** was submitted on November 14, 2019, **Detail Section E/33** must include detail of reinforcement connection from the existing pipe to the new manhole wall. Structural calculations must be approved by *City Building Department* prior to the final approval of the drainage study.

The following conditions are repeated until they are complete:

3. The subject street improvement of *Desert Foothills Drive* is premised on the existence of *Lake Mead Boulevard* and *Kettle Ridge Drive* on the north and west for flood cut-off protection. The subject drainage study will not be approved prior to the final approval of the technical drainage studies of "Summerlin West V22 – *Lake Mead Boulevard (Desert Foothills Drive to Kettle Ridge Drive)*" and "Summerlin West V22 – *Kettle Ridge Drive (Lake Mead Boulevard to Fleet Wing Avenue)*".
4. The project proposes to build temporary drainage facilities, ie, berms/swales along the west side of *Desert Foothills Drive* 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.

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/14

AREA K-14

REGIONAL FLOOD CONTROL DISTRICT



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

BOARD OF DIRECTORS

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City of Boulder City

March 23, 2020

Mr. Oh Sang Kwon, P.E.
City of Las Vegas Department of Public Works
333 North Rancho Drive
Las Vegas, NV 89106

**DISTRICT CONCURRENCE: SUMMERLIN WEST V22 - DESERT FOOTHILLS
DRIVE STREET IMPROVEMENTS FROM LAKE
MEAD BOULEVARD TO FLEET WING AVENUE
(STREET G)
(DS5170C) (RFCD No. 20-12455)**

Dear Mr. Kwon:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated August 5, 2019, Addendum No. 1 dated October 16, 2019, and Supplement No. 1 dated November 14, 2019 for above-mentioned project as submitted by ATKINS. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Department of Public Works dated December 2, 2019.

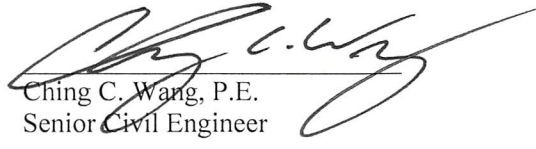
District concurs with acceptance of this Technical Drainage Study by City of Las Vegas Department of Public Works.

District's review of this project was limited to issues of Regional Flood Control Significance as defined in *Uniform Regulations for the Control of Drainage*.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by ATKINS may be superseded. Compliance with regulatory elements and design standards specified in *Uniform Regulations for the Control of Drainage* does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for information, data, or conclusions presented by consulting engineers. We, therefore, make no warranties, either expressed or implied, in conducting this review.

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

BY:


Ching C. Wang, P.E.
Senior Civil Engineer

CCW:jb

c: Molly Anderson, P.E., Atkins

P:\Letters and Memos\Local Drainage\Land Development & Drainage\2020\L-20-12455.doc

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

REFERENCED DESERT FOOTHILLS BASIN

SUMMERLIN WEST VILLAGE 22

Desert Foothills Drive
Fleet Wing Avenue (Street G) to Lake Mead Boulevard

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
DFD-1E	7	Public Facility and Residential, 8-12 units/acre	1155	94	51040	50996	100.1%	100.1%	94.08	94.08	94.1
DFD-1W	7	Public Facility and Residential, 8-12 units/acre	1155	94	77745	77732	100.0%	100.0%	94.02	94.02	94.0
DFD-2E	7	Public Facility and Residential, 8-12 units/acre	1155	94	31655	31520	100.4%	100.4%	94.40	94.40	94.4
DFD-2W	7	Public Facility and Residential, 8-12 units/acre	1155	94	60106	60103	100.0%	100.0%	94.01	94.01	94.0
DFD-3E	7	Public Facility and Residential, 8-12 units/acre	1152	94	14564	69448	21.0%	21.0%	19.71	19.71	
DFD-3E	7	Public Facility and Residential, 8-12 units/acre	1155	94	54877	69448	79.0%	100.0%	74.28	93.99	94.0
DFD-3W	7	Public Facility and Residential, 8-12 units/acre	1155	94	68139	68128	100.0%	100.0%	94.02	94.02	94.0
DFD-4W	7	Public Facility and Residential, 8-12 units/acre	1152	94	25426	48365	52.6%	52.6%	49.42	49.42	
DFD-4W	7	Public Facility and Residential, 8-12 units/acre	1155	94	22935	48365	47.4%	100.0%	44.57	93.99	94.0
INT-DFD1	1	Undeveloped Land, Open Desert	1155	88	507613	507613	100.0%	100.0%	88.00	88.00	88.0
INT-DFD2	1	Undeveloped Land, Open Desert	1155	88	1080951	1080552	100.0%	100.0%	88.03	88.03	88.0
INT-DFD3	1	Undeveloped Land, Open Desert	1155	88	732272	732304	100.0%	100.0%	88.00	88.00	88.0
INT-DFD4	1	Undeveloped Land, Open Desert	1155	88	604767	604786	100.0%	100.0%	88.00	88.00	88.0
INT-DFD5	1	Undeveloped Land, Open Desert	1152	88	146310	726424	20.1%	20.1%	17.72	17.72	
INT-DFD5	1	Undeveloped Land, Open Desert	1155	88	580116	726424	79.9%	100.0%	70.28	88.00	88.0

REFERENCED DESERT FOOTHILLS BASIN

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL TIME OF CONCENTRATION



TDS for Summerlin West Village 22
Desert Foothills Drive (Fleet Wing Avenue to Lake Mead Boulevard)
INTERIM CONDITION

BY: KSP
DATE: 5/7/20

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag
DESIG: (1)	DEV./EX. (D or E)	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
DFD-1E	D	94.1	0.852	1.17	0.00183	40	2.0	2.2	715	2.3	3.0	4.6	3.5	5.8	14.2	0.058
DFD-1W	D	94.0	0.851	1.78	0.00279	40	2.0	2.2	730	2.3	3.0	4.6	3.6	5.8	14.3	0.058
DFD-2E	D	94.4	0.856	0.72	0.00113	40	2.0	2.2	455	2.8	3.4	5.1	2.2	4.4	12.8	0.05*
DFD-2W	D	94.0	0.851	1.38	0.00216	40	2.0	2.3	520	2.8	3.4	5.1	2.5	4.8	13.1	0.05*
DFD-3E	D	94.0	0.851	1.59	0.00249	40	2.0	2.3	1120	1.0	2.0	3.1	7.5	9.8	16.4	0.098
DFD-3W	D	94.0	0.851	1.56	0.00244	40	2.0	2.2	620	1.2	2.2	3.4	4.4	6.6	13.7	0.066
DFD-4W	D	94.0	0.851	1.11	0.00173	40	2.0	2.3	575	1.0	2.0	3.1	4.5	6.8	13.4	0.068
INT-DFD1	E	88.0	0.772	11.65	0.01821	250	8.0	4.7	1360	7.2	4.0	7.9	3.9	8.6	N/A	0.10**
INT-DFD2	E	88.0	0.772	24.81	0.03876	500	6.0	7.3	1560	6.5	3.8	7.5	4.6	11.8	N/A	0.118
INT-DFD3	E	88.0	0.772	16.81	0.02627	500	5.0	7.7	1415	6.1	3.7	7.3	4.4	12.1	N/A	0.121
INT-DFD4	E	88.0	0.772	13.88	0.02169	285	7.0	5.2	910	8.0	4.2	8.3	2.8	8.0	N/A	0.10**
INT-DFD5	E	88.0	0.772	16.68	0.02606	260	13.5	4.0	1295	8.0	4.6	8.3	3.4	7.4	N/A	0.10**

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

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

V1 = 20.2*(S/100)^{1/2}

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.

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 07MAY20 TIME 10:33:53
*
*****

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

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

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

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

*** FREE ***

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1 ID TECHNICAL DRAINAGE STUDY
2 ID SUMMERLIN VILLAGE 22
3 ID DESERT FOOTHILLS DRIVE (FLEET WING AVE TO LAKE MEAD BLVD)
4 ID INTERIM CONDITION
5 ID 100-YEAR 6-HR STORM
6 ID SDN #3 STORM DISTRIBUTION
7 ID JUNE 2019
8 ID INT_DFD2KCA.DAT
9 ID ATKINS MODELED BY LARA HOCKENSMITH
10 ID CHECKED BY MOLLY ANDERSON
11 ID JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES
12 ID
13 ID AREA (SQUARE MILES) DARF
14 ID
15 ID 0 - 0.5 0.99
16 ID Estimated 10-year 0.57
17 ID
18 IT 5 0 0 300
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 0.99 0.57
*
22 KKINT-DFD5
23 BA 0.02606
24 PB 3.40
25 PC 0.000 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 1.000
33 LS 0 88.0
34 UD 0.100
*
35 KK DFD-4W
36 BA 0.00173
37 PB 3.38
38 LS 0 94.0
39 UD 0.068
*
40 KK CP1.1
41 HC 2
*

```

1 HEC-1 INPUT PAGE 2

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

42 KKINT-DFD4
43 BA 0.02169
44 PB 3.41
45 LS 0 88.0
46 UD 0.100
*

47 KK DFD-3E
48 BA 0.00249
49 PB 3.38
50 LS 0 94.0
51 UD 0.098
*

52 KK CP1.2
53 HC 3
*

54 KK DFD-3W
55 BA 0.00244
56 PB 3.38
57 LS 0 94.0
58 UD 0.066
*

59 KK CP1.3
60 HC 2
*
61 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
22 INT-DFD5
.
35 . DFD-4W
.
40 CP1.1.....
.
42 . INT-DFD4
.
47 . . DFD-3E
.
52 CP1.2.....
.
54 . DFD-3W
.
59 CP1.3.....

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 07MAY20 TIME 10:33:53 *
*

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

TECHNICAL DRAINAGE STUDY
SUMMERLIN VILLAGE 22
DESERT FOOTHILLS DRIVE (FLEET WING AVE TO LAKE MEAD BLVD)
INTERIM CONDITION
100-YEAR 6-HR STORM
SDN #3 STORM DISTRIBUTION
JUNE 2019
INT_DFD2KCA.DAT
ATKINS MODELED BY LARA HOCKENSMITH
CHECKED BY MOLLY ANDERSON
JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES

AREA (SQUARE MILES) DARF

0 - 0.5 0.99
Estimated 10-year 0.57

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

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

 COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRES-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	RATIO 2
				.99	.57
HYDROGRAPH AT					
+	INT-DFD5	.03	1	FLOW	50.
				TIME	22.
				3.50	3.50
HYDROGRAPH AT					
+	DFD-4W	.00	1	FLOW	4.
				TIME	2.
				3.50	3.50
2 COMBINED AT					
+	CP1.1	.03	1	FLOW	54.
				TIME	24.
				3.50	3.50
HYDROGRAPH AT					
+	INT-DFD4	.02	1	FLOW	42.
				TIME	18.
				3.50	3.50
HYDROGRAPH AT					
+	DFD-3E	.00	1	FLOW	6.
				TIME	3.
				3.50	3.50
3 COMBINED AT					
+	CP1.2	.05	1	FLOW	101.
				TIME	45.
				3.50	3.50
HYDROGRAPH AT					
+	DFD-3W	.00	1	FLOW	6.
				TIME	3.
				3.50	3.50
2 COMBINED AT					
+	CP1.3	.05	1	FLOW	108.
				TIME	49.
				3.50	3.50

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

ADJACENT SECTION IN DESERT FOOTHILLS

Worksheet for DFD-3W 100YR

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.010 ft/ft
Discharge	6.30 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.83
0+08	0.50
0+09	0.50
0+09	0.00
0+10	0.13
0+10	0.17
0+35	0.70

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.83)	(0+10, 0.17)	0.013
(0+10, 0.17)	(0+35, 0.70)	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	0.44 ft
Elevation Range	0.0 to 1.8 ft
Flow Area	2.3 ft ²
Wetted Perimeter	14.6 ft
Hydraulic Radius	0.15 ft
Top Width	14.16 ft
Normal Depth	0.44 ft
Critical Depth	0.47 ft
Critical Slope	0.007 ft/ft
Velocity	2.79 ft/s
Velocity Head	0.12 ft
Specific Energy	0.56 ft
Froude Number	1.232
Flow Type	Supercritical

Worksheet for DFD-3W 100YR

GVF Input Data

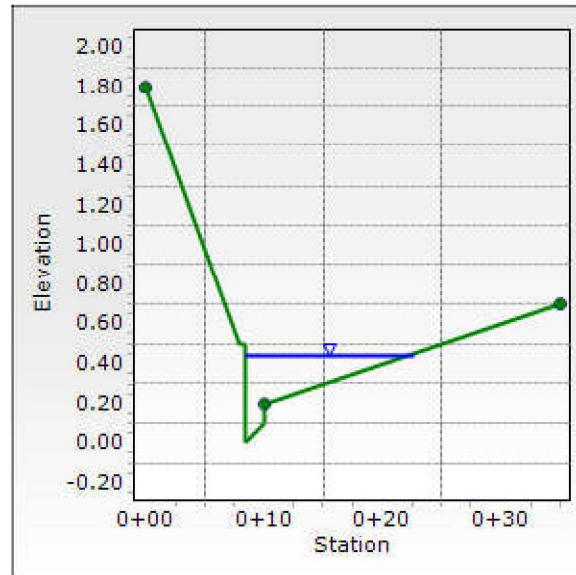
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

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	0.44 ft
Critical Depth	0.47 ft
Channel Slope	0.010 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for DFD-3W 100YR

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.010 ft/ft
Normal Depth	0.44 ft
Discharge	6.30 cfs



EXISTING ONSITE INLET

Worksheet for SDDI#12 - 100 yr - 4x12 Grate in Sag

Project Description		
Solve For	Spread	
Input Data		
Discharge	63.00 cfs	 SIZED TO COLLECT ULTIMATE CONDITION RUNOFF
Left Side Slope	3.000 H:V	
Right Side Slope	3.000 H:V	
Bottom Width	4.00 ft	
Grate Width	4.00 ft	
Grate Length	12.0 ft	
Local Depression	0.0 in	
Local Depression Width	0.0 in	
Grate Type	P-50 mm x 100 mm (P-1- 7/8"-4")	
Clogging	50.0 %	
Results		
Spread	9.0 ft	
Depth	0.8 ft	
Wetted Perimeter	9.2 ft	
Top Width	8.95 ft	
Open Grate Area	19.2 ft ²	
Active Grate Weir Length	28.0 ft	

ULTIMATE CONDITION WSPG MODEL FOR STORM DRAIN IN DESERT FOOTHILLS

DFD2KCA_ULT.WSW

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T1 SUMMERLIN WEST VILLAGE 22
T2 T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADDENDUM #1
T3 ATKINS / Ultimate CONDITIONS
SO -191.33 3316.19 54 3318.99
REM ##### Tailwater Daylights. Elev. solved for in flowmaster 54" pipe 2% 200cfs
R -191.33 3316.19 54 .013 .000 00.0 0
TS -4.00 3320.01 54
REM ##### Stub Ultimate Condition Cap #1 Street I (Kestrel Creek)
JX 0.00 3320.11 48 36 .013 62.00 3320.20 38.0
R 1.00 3320.14 48 .013 .000 15.0 1
R 2.00 3320.17 48 .013 .000 15.0 0
R 3.00 3320.19 48 .013 .000 15.0 0
R 4.00 3320.21 48 .013 .000 14.0 0
REM ##### SDMH#12 DS
R 72.84 3321.92 48 .013 .000 11.67 0
R 75.84 3322.02 48 .013 .000 11.67 1
R 78.84 3322.12 48 .013 .000 11.66 0
REM ##### SDMH#12 US
REM ##### SDMH#13 DS JX SDDI# 11/12/13
R 136.89 3323.55 48 .013 .000 04.00 0
JX 139.89 3323.65 48 30 24.013 68.0 5.0 3323.75 3323.75 90.0-75.0 .000
TS 142.89 3323.75 42 .013 .000 04.00 1
REM ##### SDMH#13 US JX SDDI# 11/12/13
REM ##### SDMH#14 DS
R 293.48 3327.14 42 .013 .000 02.50 0
R 296.48 3327.24 42 .013 .000 00.00 1
R 299.48 3327.34 42 .013 .000 02.50 0
REM ##### SDMH#14 US
REM ##### SDMH#15 DS
R 607.21 3330.48 42 .013 .000 15.00 0
R 609.21 3330.54 42 .013 .000 15.00 0
R 610.21 3330.58 42 .013 .000 15.00 1
R 611.21 3330.61 42 .013 .000 15.00 0
R 612.21 3330.65 42 .013 .000 15.00 0
R 613.21 3330.68 42 .013 .000 11.00 0
REM ##### SDMH#15 US
REM ##### SDMH#16 DS JX Cap#2 Street H (Clowder Pass)
R 643.21 3331.04 42 .013 .000 15.00 0
R 644.21 3331.07 42 .013 .000 15.00 0
R 645.21 3331.10 42 .013 .000 15.00 0
JX 646.21 3331.14 42 30 .013 14.0 3331.24 90.0
TS 647.21 3331.17 30 .013 .000 15.00 0
R 648.21 3331.20 30 .013 .000 15.00 0
R 649.21 3331.24 30 .013 .000 08.00 1
REM ##### SDMH#16 US JX Cap#2 Street H (Clowder Pass)
REM ##### SDMH#17 DS
R 711.35 3332.26 30 .013 .000 00.00 0
R 714.35 3332.36 30 .013 .000 03.00 1
R 717.35 3332.46 30 .013 .000 00.00 0
REM ##### SDMH#17 US
REM ##### SDMH#18 DS
R 811.17 3333.96 30 .013 .000 00.00 0
R 812.17 3333.99 30 .013 .000 15.00 0
R 813.17 3334.03 30 .013 .000 15.00 0
R 814.17 3334.06 30 .013 .000 15.00 1
R 815.17 3334.09 30 .013 .000 15.00 0
R 816.17 3334.12 30 .013 .000 15.00 0
R 817.17 3334.16 30 .013 .000 15.00 0
REM ##### SDMH#18 US
REM ##### SDDI#14 JX DS
R 831.77 3334.57 30 .013 .000 00.00 0
JX 834.77 3334.67 30 30 .013 03.0 3335.61 00.0
R 837.77 3334.77 30 .013 .000 00.00 1
REM ##### SDDI #14 JX US

```

MAINLINE
JUNCTION
WHERE FLOW
FROM PROJECT
SITE ENTERS
SYSTEM

DFD2KCA_ULT.WSW

R		903.77	3336.15	30	.013				
SH		906.77	3336.15	30					
CD	24	4	0	.000	2.000	.000	.000	.000	.00
CD	30	4	0	.000	2.500	.000	.000	.000	.00
CD	36	4	0	.000	3.000	.000	.000	.000	.00
CD	42	4	0	.000	3.500	.000	.000	.000	.00
CD	48	4	0	.000	4.000	.000	.000	.000	.00
CD	54	4	0	.000	4.500	.000	.000	.000	.00
CD	60	4	0	.000	5.000	.000	.000	.000	.00
CD	66	3	0	0.000	6.000	6.000			
CD	106	3	0	0.000	10.00	6.000			
Q			046.00	.0					

.000 00.00 0

DFD2KCA_ULT.OUT

FILE: DFD2KCA_ULT.WSW

W S P G W - CIVILDESIGN Version 14.08

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 5-11-2020 Time:11:49:42

SUMMERLIN WEST VILLAGE 22

T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADD

EN ATKINS / Ultimate CONDITIONS

```

*****
Station | Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt | | No Wth
      | Elev | (FT) | Elev | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
      |-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
L/Elem | Ch Slope | | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|
-191.330 | 3316.190 | 3.051 | 3319.241 | 198.00 | 17.25 | 4.62 | 3323.86 | .00 | 4.02 | 4.20 | 4.500 | .000 | .00 | 0 | .0
TRANS STR | .0204 | | | | | | .0143 | 2.69 | 3.05 | 1.84 | .014 | .00 | .00 | PIPE
-4.000 | 3320.010 | 4.022 | 3324.032 | 198.00 | 13.20 | 2.71 | 3326.74 | .00 | 4.02 | 2.77 | 4.500 | .000 | .00 | 0 | .0
JUNCT STR | .0250 | | | | | | .0090 | .04 | 4.02 | 1.00 | .013 | .00 | .00 | PIPE
.000 | 3320.110 | 5.565 | 3325.675 | 136.00 | 10.82 | 1.82 | 3327.49 | .00 | 3.47 | .00 | 4.000 | .000 | .00 | 0 | .0
1.000 | .0298 | | | | | | .0090 | .01 | 5.56 | .00 | 2.11 | .013 | .00 | .00 | PIPE
1.000 | 3320.140 | 5.725 | 3325.865 | 136.00 | 10.82 | 1.82 | 3327.68 | .00 | 3.47 | .00 | 4.000 | .000 | .00 | 0 | .0
1.000 | .0300 | | | | | | .0090 | .01 | 5.72 | .00 | 2.11 | .013 | .00 | .00 | PIPE
2.000 | 3320.170 | 5.794 | 3325.964 | 136.00 | 10.82 | 1.82 | 3327.78 | .00 | 3.47 | .00 | 4.000 | .000 | .00 | 0 | .0
1.000 | .0200 | | | | | | .0090 | .01 | 5.79 | .00 | 2.39 | .013 | .00 | .00 | PIPE
3.000 | 3320.190 | 5.873 | 3326.063 | 136.00 | 10.82 | 1.82 | 3327.88 | .00 | 3.47 | .00 | 4.000 | .000 | .00 | 0 | .0
1.000 | .0200 | | | | | | .0090 | .01 | 5.87 | .00 | 2.39 | .013 | .00 | .00 | PIPE
4.000 | 3320.210 | 5.946 | 3326.156 | 136.00 | 10.82 | 1.82 | 3327.97 | .00 | 3.47 | .00 | 4.000 | .000 | .00 | 0 | .0
68.840 | .0248 | | | | | | .0090 | .62 | 5.95 | .00 | 2.23 | .013 | .00 | .00 | PIPE
72.840 | 3321.920 | 4.923 | 3326.843 | 136.00 | 10.82 | 1.82 | 3328.66 | .00 | 3.47 | .00 | 4.000 | .000 | .00 | 0 | .0
3.000 | .0334 | | | | | | .0090 | .03 | 4.92 | .00 | 2.04 | .013 | .00 | .00 | PIPE
75.840 | 3322.020 | 5.010 | 3327.031 | 136.00 | 10.82 | 1.82 | 3328.85 | .00 | 3.47 | .00 | 4.000 | .000 | .00 | 0 | .0
3.000 | .0334 | | | | | | .0090 | .03 | 5.01 | .00 | 2.04 | .013 | .00 | .00 | PIPE

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DFD2KCA_ULT.OUT

FILE: DFD2KCA_ULT.WSW

W S P G W - CIVILDESIGN Version 14.08

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 5-11-2020 Time:11:49:42

SUMMERLIN WEST VILLAGE 22

T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADD

EN ATKINS / Ultimate CONDITIONS

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/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
78.840	3322.120	5.007	3327.127	136.00	10.82	1.82	3328.95	.00	3.47	.00	4.000	.000	.00	0 .0
58.050	.0246					.0090	.52	5.01	.00	2.24	.013	.00	.00	PIPE
136.890	3323.550	4.122	3327.672	136.00	10.82	1.82	3329.49	.00	3.47	.00	4.000	.000	.00	0 .0
JUNCT STR	.0333					.0054	.02	4.12	.00		.013	.00	.00	PIPE
139.890	3323.650	6.890	3330.540	63.00	5.01	.39	3330.93	.00	2.39	.00	4.000	.000	.00	0 .0
TRANS STR	.0334					.0029	.01	6.89	.00		.013	.00	.00	PIPE
142.890	3323.750	6.578	3330.328	63.00	6.55	.67	3330.99	.00	2.49	.00	3.500	.000	.00	0 .0
150.590	.0225					.0039	.59	6.58	.00	1.58	.013	.00	.00	PIPE
293.480	3327.140	3.784	3330.924	63.00	6.55	.67	3331.59	.00	2.49	.00	3.500	.000	.00	0 .0
3.000	.0334					.0039	.01	3.78	.00	1.41	.013	.00	.00	PIPE
296.480	3327.240	3.729	3330.969	63.00	6.55	.67	3331.64	.00	2.49	.00	3.500	.000	.00	0 .0
3.000	.0334					.0039	.01	3.73	.00	1.41	.013	.00	.00	PIPE
299.480	3327.340	3.647	3330.987	63.00	6.55	.67	3331.65	.00	2.49	.00	3.500	.000	.00	0 .0
28.589	.0102					.0039	.11	3.65	.00	1.99	.013	.00	.00	PIPE
328.069	3327.632	3.500	3331.132	63.00	6.55	.67	3331.80	.00	2.49	.00	3.500	.000	.00	0 .0
39.175	.0102					.0036	.14	3.50	.00	1.99	.013	.00	.00	PIPE
367.244	3328.031	3.176	3331.207	63.00	6.87	.73	3331.94	.00	2.49	2.03	3.500	.000	.00	0 .0
9.932	.0102					.0035	.03	3.18	.57	1.99	.013	.00	.00	PIPE

MAINLINE
JUNCTION
WHERE FLOW
FROM PROJECT
SITE ENTERS
SYSTEM

DFD2KCA_ULT.OUT

FILE: DFD2KCA_ULT.WSW

W S P G W - CIVILDESIGN Version 14.08

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 5-11-2020 Time:11:49:42

SUMMERLIN WEST VILLAGE 22

T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADD

EN ATKINS / Ultimate CONDITIONS

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*****
Station | Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height | Base Wt | | No Wth
      | Elev | (FT) | Elev | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
L/Elem | Ch Slope | | | | | | | | | | | | | | |
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
377.176 | 3328.133 | 3.072 | 3331.205 | 63.00 | 7.04 | .77 | 3331.97 | .00 | 2.49 | 2.29 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
HYDRAULIC JUMP
377.176 | 3328.133 | 1.994 | 3330.127 | 63.00 | 11.12 | 1.92 | 3332.05 | .00 | 2.49 | 3.47 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
61.853 | .0102 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
439.029 | 3328.764 | 1.994 | 3330.758 | 63.00 | 11.12 | 1.92 | 3332.68 | .00 | 2.49 | 3.47 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
168.181 | .0102 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
607.210 | 3330.480 | 1.973 | 3332.453 | 63.00 | 11.27 | 1.97 | 3334.43 | .00 | 2.49 | 3.47 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
2.000 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
609.210 | 3330.540 | 2.001 | 3332.541 | 63.00 | 11.08 | 1.91 | 3334.45 | .00 | 2.49 | 3.46 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
1.000 | .0400 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
610.210 | 3330.580 | 2.024 | 3332.604 | 63.00 | 10.93 | 1.85 | 3334.46 | .00 | 2.49 | 3.46 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
1.000 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
611.210 | 3330.610 | 2.041 | 3332.651 | 63.00 | 10.82 | 1.82 | 3334.47 | .00 | 2.49 | 3.45 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
1.000 | .0398 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
612.210 | 3330.650 | 2.068 | 3332.718 | 63.00 | 10.65 | 1.76 | 3334.48 | .00 | 2.49 | 3.44 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
1.000 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
613.210 | 3330.680 | 2.089 | 3332.769 | 63.00 | 10.52 | 1.72 | 3334.49 | .00 | 2.49 | 3.43 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
18.734 | .0120 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |

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DFD2KCA_ULT.OUT

FILE: DFD2KCA_ULT.WSW

W S P G W - CIVILDESIGN Version 14.08

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 5-11-2020 Time:11:49:42

SUMMERLIN WEST VILLAGE 22

T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADD

EN ATKINS / Ultimate CONDITIONS

```

*****
Station | Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height | Base Wt | | No Wth
      | Elev | (FT) | Elev | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
L/Elem | Ch Slope | | | | | | | | | | | | | | |
*****
631.944 | 3330.905 | 2.171 | 3333.076 | 63.00 | 10.05 | 1.57 | 3334.64 | .00 | 2.49 | 3.40 | 3.500 | .000 | .00 | 0 | .0
      | 11.266 | .0120 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
643.210 | 3331.040 | 2.262 | 3333.302 | 63.00 | 9.58 | 1.43 | 3334.73 | .00 | 2.49 | 3.35 | 3.500 | .000 | .00 | 0 | .0
      | 1.000 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
644.210 | 3331.070 | 2.323 | 3333.394 | 63.00 | 9.29 | 1.34 | 3334.73 | .00 | 2.49 | 3.31 | 3.500 | .000 | .00 | 0 | .0
      | .601 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
644.811 | 3331.088 | 2.381 | 3333.469 | 63.00 | 9.04 | 1.27 | 3334.74 | .00 | 2.49 | 3.26 | 3.500 | .000 | .00 | 0 | .0
      | .399 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
645.210 | 3331.100 | 2.487 | 3333.588 | 63.00 | 8.61 | 1.15 | 3334.74 | .00 | 2.49 | 3.17 | 3.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
JUNCT STR | .0398 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
646.210 | 3331.140 | 3.527 | 3334.667 | 49.00 | 5.09 | .40 | 3335.07 | .00 | 2.19 | .00 | 3.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
TRANS STR | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
647.210 | 3331.170 | 2.933 | 3334.103 | 49.00 | 9.98 | 1.55 | 3335.65 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | 1.000 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
648.210 | 3331.200 | 2.994 | 3334.194 | 49.00 | 9.98 | 1.55 | 3335.74 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | 1.000 | .0400 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
649.210 | 3331.240 | 3.086 | 3334.326 | 49.00 | 9.98 | 1.55 | 3335.87 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
62.140 | .0164 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |

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DFD2KCA_ULT.OUT

FILE: DFD2KCA_ULT.WSW

W S P G W - CIVILDESIGN Version 14.08
Program Package Serial Number: 7271

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WATER SURFACE PROFILE LISTING

Date: 5-11-2020 Time:11:49:42

SUMMERLIN WEST VILLAGE 22

T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADD

EN ATKINS / Ultimate CONDITIONS

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/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
711.350	3332.260	2.953	3335.213	49.00	9.98	1.55	3336.76	.00	2.29	.00	2.500	.000	.00	0 .0
3.000	.0334					.0143	.04	2.95	.00	1.47	.013	.00	.00	PIPE
714.350	3332.360	2.988	3335.348	49.00	9.98	1.55	3336.90	.00	2.29	.00	2.500	.000	.00	0 .0
3.000	.0333					.0143	.04	2.99	.00	1.48	.013	.00	.00	PIPE
717.350	3332.460	2.931	3335.391	49.00	9.98	1.55	3336.94	.00	2.29	.00	2.500	.000	.00	0 .0
75.593	.0160					.0143	1.08	2.93	.00	1.94	.013	.00	.00	PIPE
792.943	3333.668	2.801	3336.469	49.00	9.98	1.55	3338.02	.00	2.29	.00	2.500	.000	.00	0 .0
HYDRAULIC JUMP														
792.943	3333.668	1.785	3335.453	49.00	13.07	2.65	3338.11	.00	2.29	2.26	2.500	.000	.00	0 .0
18.227	.0160					.0196	.36	1.78	1.79	1.94	.013	.00	.00	PIPE
811.170	3333.960	1.768	3335.728	49.00	13.21	2.71	3338.44	.00	2.29	2.28	2.500	.000	.00	0 .0
1.000	.0300					.0198	.02	1.77	1.82	1.53	.013	.00	.00	PIPE
812.170	3333.990	1.772	3335.762	49.00	13.17	2.69	3338.46	.00	2.29	2.27	2.500	.000	.00	0 .0
1.000	.0400					.0196	.02	1.77	1.81	1.39	.013	.00	.00	PIPE
813.170	3334.030	1.781	3335.811	49.00	13.10	2.66	3338.48	.00	2.29	2.26	2.500	.000	.00	0 .0
HYDRAULIC DROP														
813.170	3334.030	2.882	3336.912	49.00	9.98	1.55	3338.46	.00	2.29	.00	2.500	.000	.00	0 .0
1.000	.0300					.0143	.01	2.88	.00	1.53	.013	.00	.00	PIPE

DFD2KCA_ULT.OUT

FILE: DFD2KCA_ULT.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 6

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 5-11-2020 Time:11:49:42

SUMMERLIN WEST VILLAGE 22

T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADD

EN ATKINS / Ultimate CONDITIONS

```

*****
Station | Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt | | No Wth
      | Elev | (FT) | Elev | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
      |-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
L/Elem | Ch Slope | | | | | | | | | | | | | | |
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|
      | | | | | | | | | | | | | | |
814.170 | 3334.060 | 3.020 | 3337.080 | 49.00 | 9.98 | 1.55 | 3338.63 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
1.000 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
815.170 | 3334.090 | 3.081 | 3337.171 | 49.00 | 9.98 | 1.55 | 3338.72 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
1.000 | .0300 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
816.170 | 3334.120 | 3.141 | 3337.261 | 49.00 | 9.98 | 1.55 | 3338.81 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
1.000 | .0398 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
817.170 | 3334.160 | 3.192 | 3337.352 | 49.00 | 9.98 | 1.55 | 3338.90 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
14.600 | .0281 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
831.770 | 3334.570 | 2.991 | 3337.561 | 49.00 | 9.98 | 1.55 | 3339.11 | .00 | 2.29 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
JUNCT STR | .0333 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
834.770 | 3334.670 | 3.287 | 3337.957 | 46.00 | 9.37 | 1.36 | 3339.32 | .00 | 2.24 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
3.000 | .0334 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
837.770 | 3334.770 | 3.292 | 3338.063 | 46.00 | 9.37 | 1.36 | 3339.43 | .00 | 2.24 | .00 | 2.500 | .000 | .00 | 0 | .0
      | | | | | | | | | | | | | | |
66.000 | .0209 | | | | | | | | | | | | | | |
      | | | | | | | | | | | | | | |
903.770 | 3336.150 | 2. | | | | | | | | | | | | | |

```

ULTIMATE CONDITION WSPG MODEL FOR STUB

DFD2KCA_ULT_SDDI_11_12

```
T1 SUMMERLIN WEST VILLAGE 22
T2 T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADDENDUM #1
T3 ATKINS / Ultimate CONDITIONS CAP #1
SO 139.89 3323.65 48 3330.54
REM ##### JX DS SDMH#13
R 142.89 3323.75 30 .013 .000 00.00 1
REM ##### JX US SDMH#13
REM ##### JX DS SDDI #11
R 181.59 3326.87 30 .013 .000 00.00 0
JX 184.59 3326.97 30 30 .013 05.0 3326.97 .00.0
R 187.59 3327.07 30 .013 .000 00.00 1
REM ##### JX US SDDI #11
REM ##### JX DS SDDI #12
R 264.31 3330.50 30 .013 .000 00.00 1
SH 267.31 3330.50 30
CD 24 4 0 .000 2.000 .000 .000 .000 .00
CD 30 4 0 .000 2.500 .000 .000 .000 .00
CD 36 4 0 .000 3.000 .000 .000 .000 .00
CD 42 4 0 .000 3.500 .000 .000 .000 .00
CD 48 4 0 .000 4.000 .000 .000 .000 .00
CD 54 4 0 .000 4.500 .000 .000 .000 .00
CD 60 4 0 .000 5.000 .000 .000 .000 .00
CD 66 3 0 0.000 6.000 6.000
CD 106 3 0 0.000 10.00 6.000
Q 063.00 .0
```

DESIGN FLOW
RATE GREATER
THAN PROPOSED



DFD2KCA_ULT_SDDI_11_12.OUT

FILE: DFD2KCA_ULT_SDDI_11_12.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 5-11-2020 Time: 1:32:36

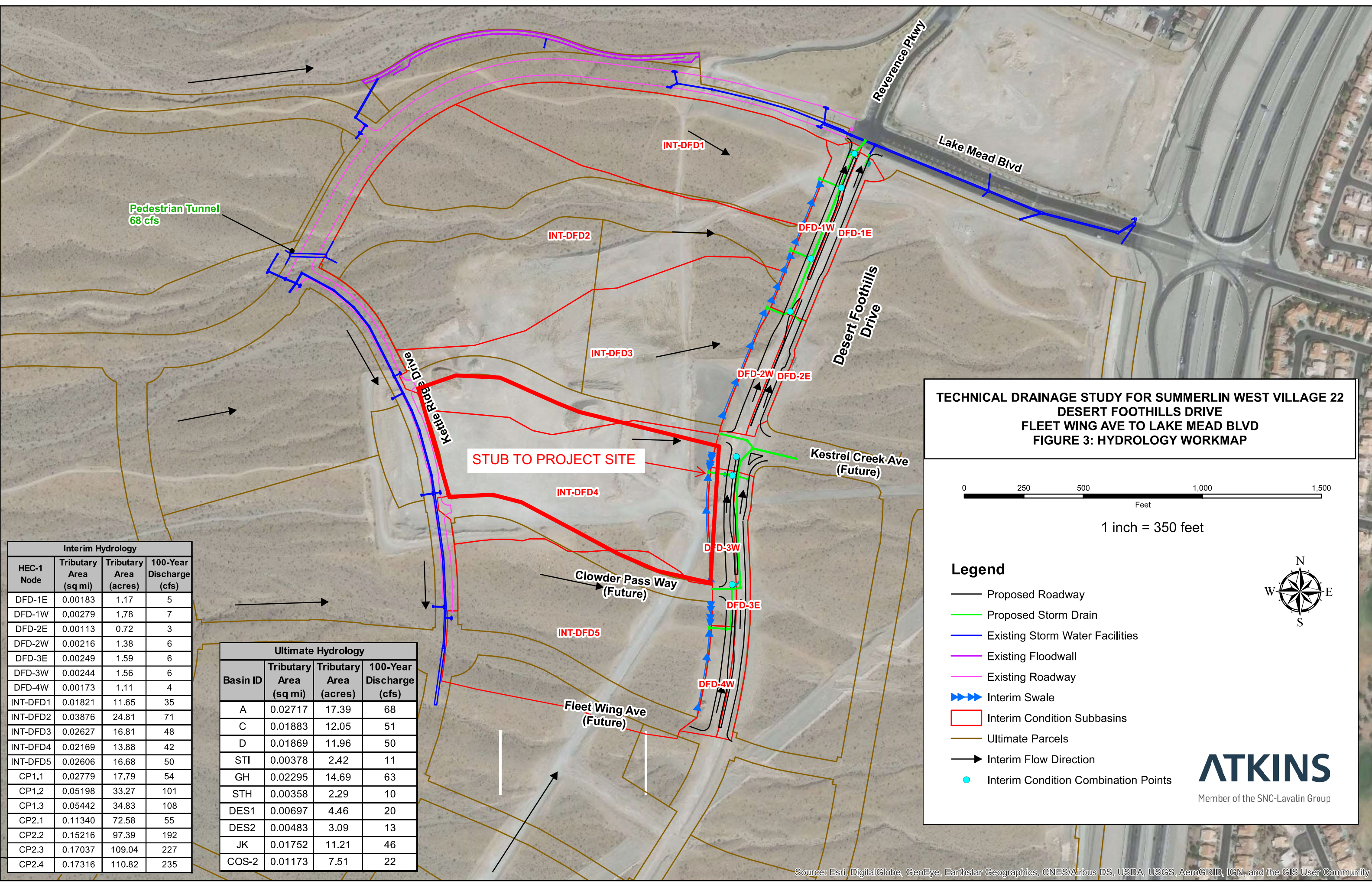
SUMMERLIN WEST VILLAGE 22

T2 DESERT FOOTHILLS DRIVE - CLOWDER PASS WAY TO KESTREL CREEK AVENUE ADD

EN ATKINS / Ultimate CONDITIONS CAP #1

*****																	*****	
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/ 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				
*****																	*****	
139.890	3323.650	6.890	3330.540	68.00	13.85	2.98	3333.52	.00	2.43	.00	2.500	.000	.00	0	.0			
	3.000	.0334				.0275	.08	6.89	.00	1.87	.013	.00	.00	PIPE				
142.890	3323.750	7.021	3330.771	68.00	13.85	2.98	3333.75	.00	2.43	.00	2.500	.000	.00	0	.0			
	38.700	.0806				.0275	1.06	7.02	.00	1.37	.013	.00	.00	PIPE				
181.590	3326.870	4.965	3331.835	68.00	13.85	2.98	3334.81	.00	2.43	.00	2.500	.000	.00	0	.0			
JUNCT STR	.0333					.0255	.08	4.97	.00		.013	.00	.00	PIPE				
184.590	3326.970	5.754	3332.724	63.00	12.83	2.56	3335.28	.00	2.41	.00	2.500	.000	.00	0	.0			
	3.000	.0334				.0236	.07	5.75	.00	1.76	.013	.00	.00	PIPE				
187.590	3327.070	5.852	3332.922	63.00	12.83	2.56	3335.48	.00	2.41	.00	2.500	.000	.00	0	.0			
	76.720	.0447				.0236	1.81	5.85	.00	1.58	.013	.00	.00	PIPE				
264.310	3330.500	4.360	3334.860	63.00	12.83	2.56	3337.42	.00	2.41	.00	2.500	.000	.00	0	.0			
	3.000	.0447				.0287	2.20	4.36	.00	1.58	.013	.00	.00	PIPE				
267.310	3330.500	4.360	3334.860	63.00	12.83	2.56	3337.42	.00	2.41	.00	2.500	.000	.00	0	.0			

Pedestrian Tunnel
68 cfs



TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22
DESERT FOOTHILLS DRIVE
FLEET WING AVE TO LAKE MEAD BLVD
FIGURE 3: HYDROLOGY WORKMAP



1 inch = 350 feet

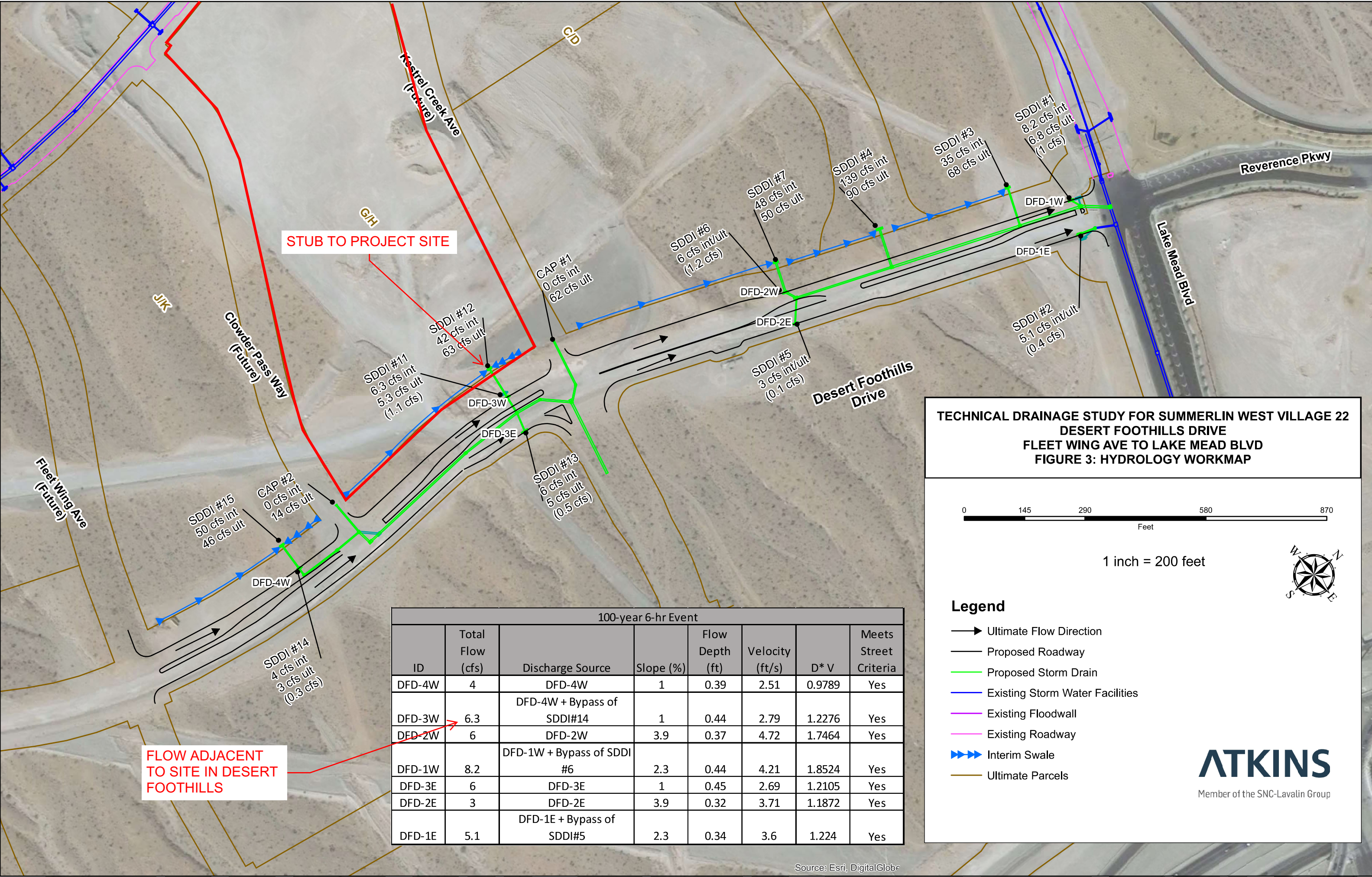
Legend

- Proposed Roadway
- Proposed Storm Drain
- Existing Storm Water Facilities
- Existing Floodwall
- Existing Roadway
- Interim Swale
- Interim Condition Subbasins
- Ultimate Parcels
- Interim Flow Direction
- Interim Condition Combination Points



Interim Hydrology			
HEC-1 Node	Tributary Area (sq mi)	Tributary Area (acres)	100-Year Discharge (cfs)
DFD-1E	0.00183	1.17	5
DFD-1W	0.00279	1.78	7
DFD-2E	0.00113	0.72	3
DFD-2W	0.00216	1.38	6
DFD-3E	0.00249	1.59	6
DFD-3W	0.00244	1.56	6
DFD-4W	0.00173	1.11	4
INT-DFD1	0.01821	11.65	35
INT-DFD2	0.03876	24.81	71
INT-DFD3	0.02627	16.81	48
INT-DFD4	0.02169	13.88	42
INT-DFD5	0.02606	16.68	50
CP1.1	0.02779	17.79	54
CP1.2	0.05198	33.27	101
CP1.3	0.05442	34.83	108
CP2.1	0.11340	72.58	55
CP2.2	0.15216	97.39	192
CP2.3	0.17037	109.04	227
CP2.4	0.17316	110.82	235

Ultimate Hydrology			
Basin ID	Tributary Area (sq mi)	Tributary Area (acres)	100-Year Discharge (cfs)
A	0.02717	17.39	68
C	0.01883	12.05	51
D	0.01869	11.96	50
STI	0.00378	2.42	11
GH	0.02295	14.69	63
STH	0.00358	2.29	10
DES1	0.00697	4.46	20
DES2	0.00483	3.09	13
JK	0.01752	11.21	46
COS-2	0.01173	7.51	22



SHEET INDEX		
1	COVER SHEET	
2	LEGEND AND ABBREVIATIONS	
3	GENERAL NOTES	
4	DEMOLITION PLAN	
5	HORIZONTAL CONTROL PLAN	
6	HORIZONTAL CONTROL PLAN	
7	MASTER DRAINAGE PLAN	
8	MASTER DRAINAGE PLAN	
9	MASTER WATER PLAN	
10	MASTER SEWER PLAN	
11	ROADWAY GRADING PLAN	BEGIN TO STA. 259+00
12	ROADWAY PLAN AND PROFILE	BEGIN TO STA. 259+00
13	ROADWAY GRADING PLAN	STA. 259+00 TO STA. 263+50
14	ROADWAY PLAN AND PROFILE	STA. 259+00 TO STA. 263+50
15	ROADWAY GRADING PLAN	STA. 263+50 TO STA. 268+00
16	ROADWAY PLAN AND PROFILE	STA. 263+50 TO STA. 268+00
17	ROADWAY GRADING PLAN	STA. 268+00 TO STA. 272+50
18	ROADWAY PLAN AND PROFILE	STA. 268+00 TO STA. 272+50
19	ROADWAY GRADING PLAN	STA. 272+50 TO STA. 277+00
20	ROADWAY PLAN AND PROFILE	STA. 272+50 TO STA. 277+00
21	ROADWAY GRADING PLAN	STA. 277+00 TO END
22	ROADWAY PLAN AND PROFILE	STA. 277+00 TO END
23	INTERSECTION PLAN AND PROFILE	
24	STORM DRAIN LATERAL PROFILES	
25	STORM DRAIN LATERAL PROFILES	
26	WATER LATERAL PROFILES	
27	WATER LATERAL PROFILES	
28	STREETLIGHT PLAN	
29	STREETLIGHT PLAN	
30	SIGNAGE AND STRIPING PLAN	
31	SIGNAGE AND STRIPING PLAN	
32	TRAFFIC SIGNAL NOTES	
33	UNDERGROUNDS	
34	TRAFFIC SIGNAL PLAN	
35	TRAFFIC SIGNAL PLAN DETAILS - D1	
36	TRAFFIC SIGNAL PLAN DETAILS - D2	
37	TRAFFIC SIGNAL PLAN	
38	TRAFFIC SIGNAL PLAN DETAILS - D3	
39	TRAFFIC SIGNAL PLAN DETAILS - D4	
40	TYPICAL SECTION	
41	STORM DRAIN DETAILS	
42	STREETLIGHT DETAILS	
44	WATER DETAILS	
45	INTERSECTION DETAILS	DESERT FOOTHILLS DR & CLOWDER PASS WAY
46	INTERSECTION DETAILS	DESERT FOOTHILLS DR & CLOWDER PASS WAY
47	INTERSECTION DETAILS	DESERT FOOTHILLS DR & KESTREL CREEK AVE
49	INTERSECTION DETAILS	DESERT FOOTHILLS DR & LAKE MEAD BLVD
50	INTERSECTION DETAILS	DESERT FOOTHILLS DR & LAKE MEAD BLVD
51	INTERSECTION DETAILS	DESERT FOOTHILLS DR & LAKE MEAD BLVD

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 NOT 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](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.

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.

PROPOSED RIGHT-OF-WAY ACREAGE
5.25 AC.

PROPOSED DISTURBED AREA ACREAGE
12.97 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 & DECEMBER 30, 2019

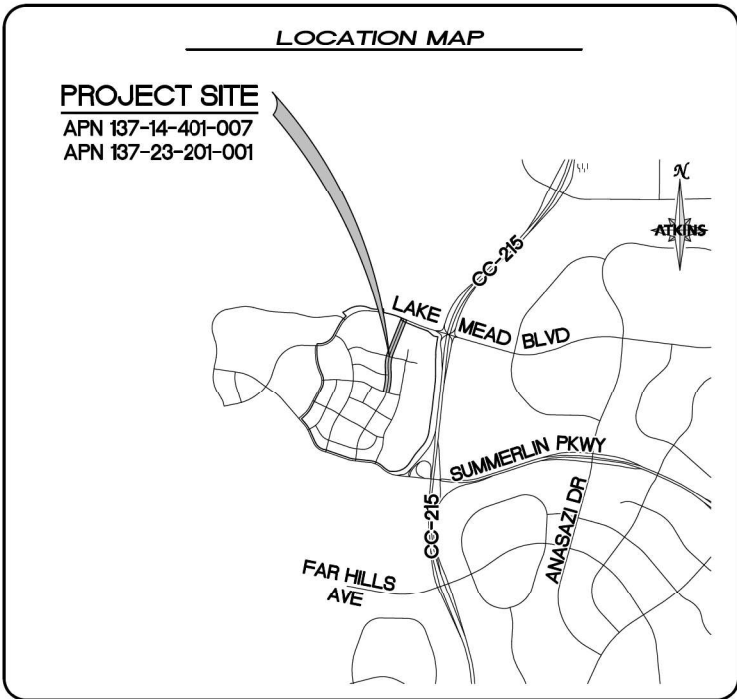
SUMMERLIN WEST VILLAGE 22 IMPROVEMENT PLANS FOR: DESERT FOOTHILLS DRIVE FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD FUTURE SID PROJECT APN: 137-14-401-007 AND 137-23-201-001

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

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) 587-9429.

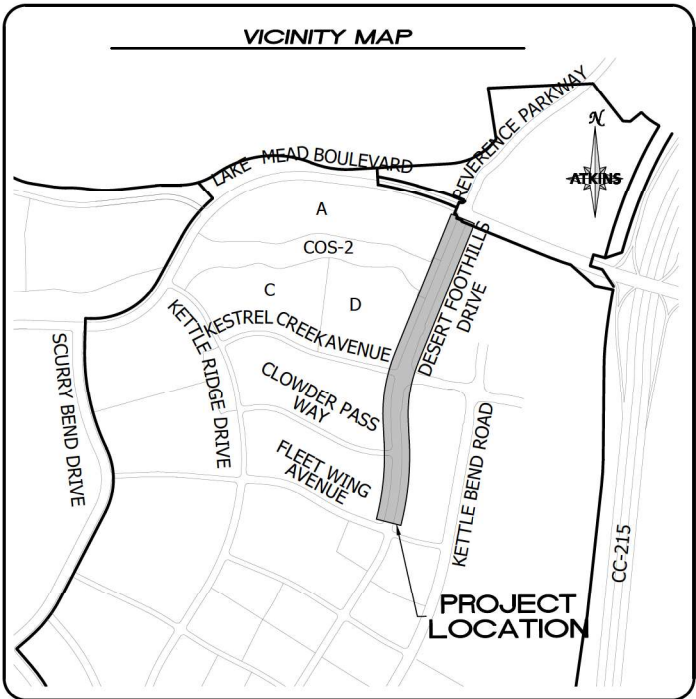


ENGINEER / CONSULTANT

CIVIL
CONTACT: DAVID WILSON P.E.
ATKINS
2270 CORPORATE CIRCLE SUITE 200
HENDERSON, NEVADA 89074
(702) 263-7275

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.



APPROVALS	
HOWARD HUGHES COMPANY LLC, A DELAWARE LIMITED LIABILITY COMPANY	
KEVIN T. ORROCK, VICE PRESIDENT	DATE
STEVEN FORD, P.E. #012175 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	
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. 136925	FIRST APPROVED DATE:
LWWVD APPROVED FIRE FLOW 1500	GPM AT 20PSI RESIDUAL
SHEETS: 1-42	
NV ENERGY	
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	
COX COMMUNICATIONS OF LAS VEGAS, INC	

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 (FT/US)

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 FT/US)

EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FT/US)

SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:

- 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
- 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.

T215,R59E,S03

LEGAL DESCRIPTION

BEING A PORTION OF LOT 2 AS SHOWN ON THE MAP THEREOF IN BOOK 123 OF PLATS, PAGE 08, OFFICIAL RECORDS, CITY OF LAS VEGAS CLARK COUNTY, NEVADA.

FAST
Call before you Dig
1-702-432-6300

Call before you Dig
1-800-642-2444

CALL BEFORE YOU DIG
1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL A. BATES
No. 18725
CIVIL

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ: NONE
VERT: NONE

1078165
CIV L19-02745
DATE: MAY, 2020
DRAWING NO.
1 / 51

05/26/2020

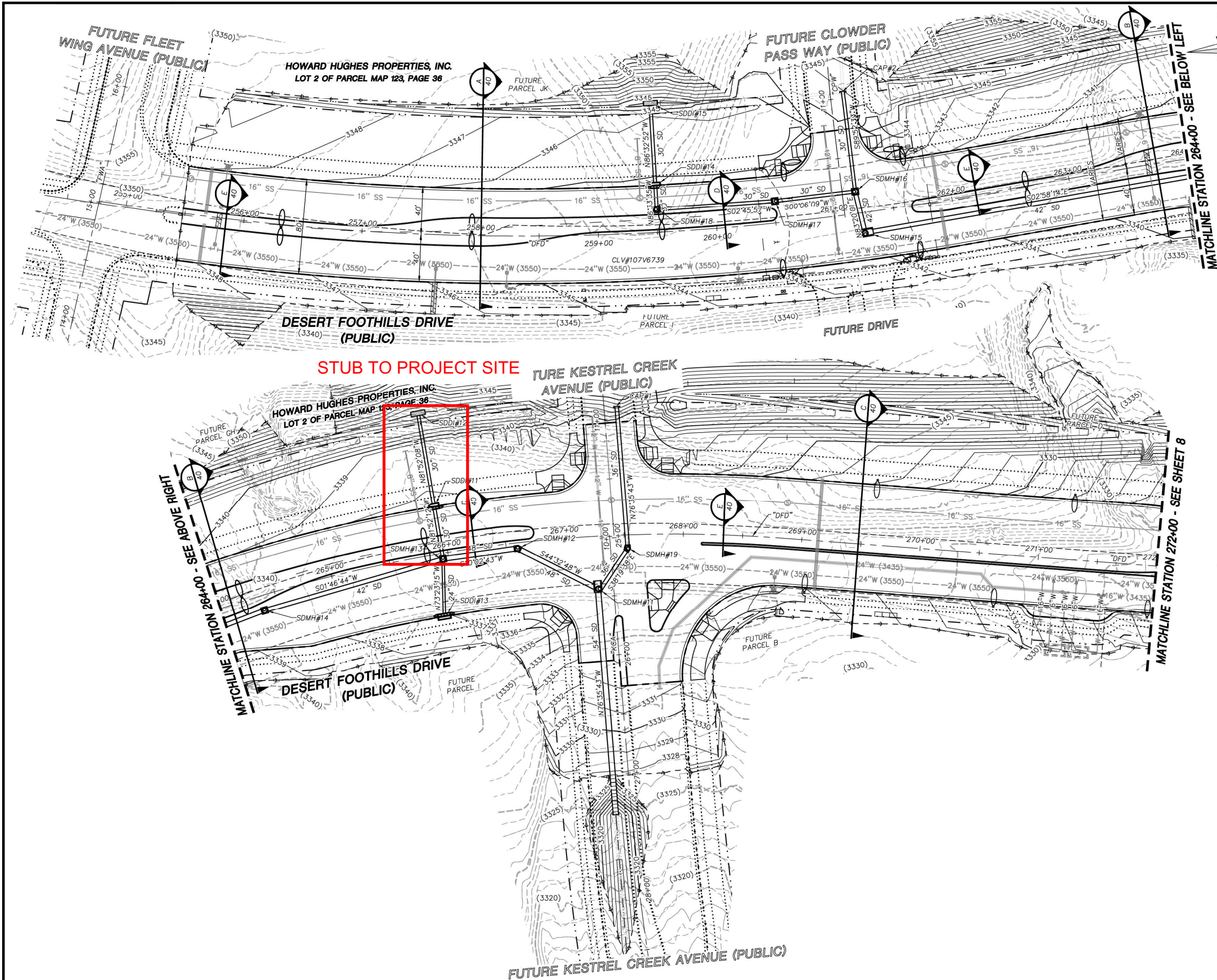
ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7275
Fax: +1702.263.7200

SUMMERLIN

SUMMERLIN WEST VILLAGE 22
DESERT FOOTHILLS DRIVE
FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD
COVER SHEET

REV. DESCRIPTION BY DATE APPROVAL

JOE NO. 100060652



SUMMARY OF QUANTITIES

DESCRIPTION	QUANTITY	UNIT
DRAINAGE		
7.5' TYPE "CM2" DROP INLET	4	EACH
10' TYPE "CM" DROP INLET	2	EACH
12.5' TYPE "CM" DROP INLET	1	EACH
4' X 12' TYPE 2 DROP INLET	4	EACH
4' X 16' TYPE 2 DROP INLET	1	EACH
48" TYPE II MANHOLE	9	EACH
60" TYPE III MANHOLE	6	EACH
24" CLASS III RCP SD	170	LF
30" CLASS III RCP SD	564	LF
36" CLASS III RCP SD	163	LF
42" CLASS III RCP SD	679	LF
42" CLASS IV RCP SD	270	LF
48" CLASS III RCP SD	64	LF
48" CLASS IV RCP SD	76	LF
54" CLASS IV RCP SD	739	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.

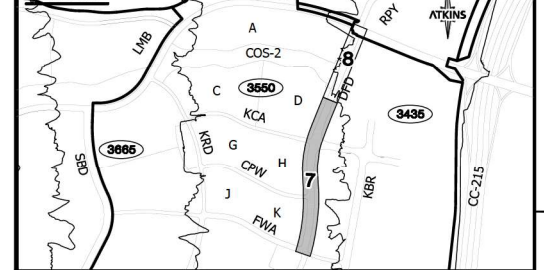
STORM DRAIN NOTES

- SEE PROFILE SHEETS FOR CONSTRUCTION NOTES AND INFORMATION RELATED TO PIPE SIZE (INNER DIAMETER), MANHOLE BASE SIZE (INSIDE DIMENSIONS), AND DROP INLET LENGTHS (CURB OPENING).
- ALL STORM DRAIN MATERIAL TO BE CLASS III REINFORCED CONCRETE PIPE, UNLESS OTHERWISE NOTED IN PROFILES.
- CONTRACTOR TO PROVIDE 6" MINIMUM OF CLEARANCE BETWEEN OUTSIDE OF PIPE TO INSIDE WALL OF STORM DRAIN STRUCTURES.

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= 57,900 CU YDS
FILL= 7,200 CU YDS

KEYMAP



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.



ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
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Fax: +1702.263.7200

SUMMERLIN

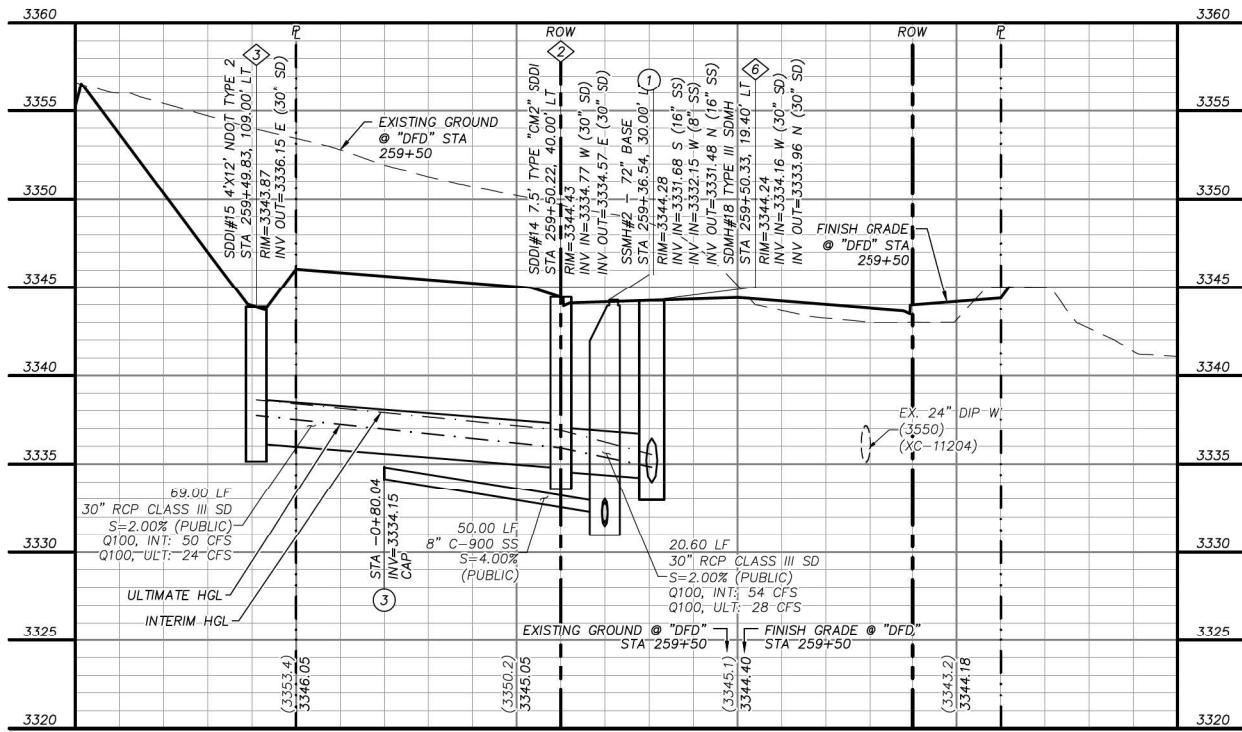
SUMMERLIN WEST VILLAGE 22
DESERT FOOTHILLS DRIVE
FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD
MASTER DRAINAGE PLAN

DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
DATE: MAY, 2020
DRAWING NO.: 100060652
HORIZ.: 1"=40'
VERT.: NONE

1078165
CLV L19-02745
DATE: MAY, 2020
DRAWING NO.: 100060652
HORIZ.: 1"=40'
VERT.: NONE

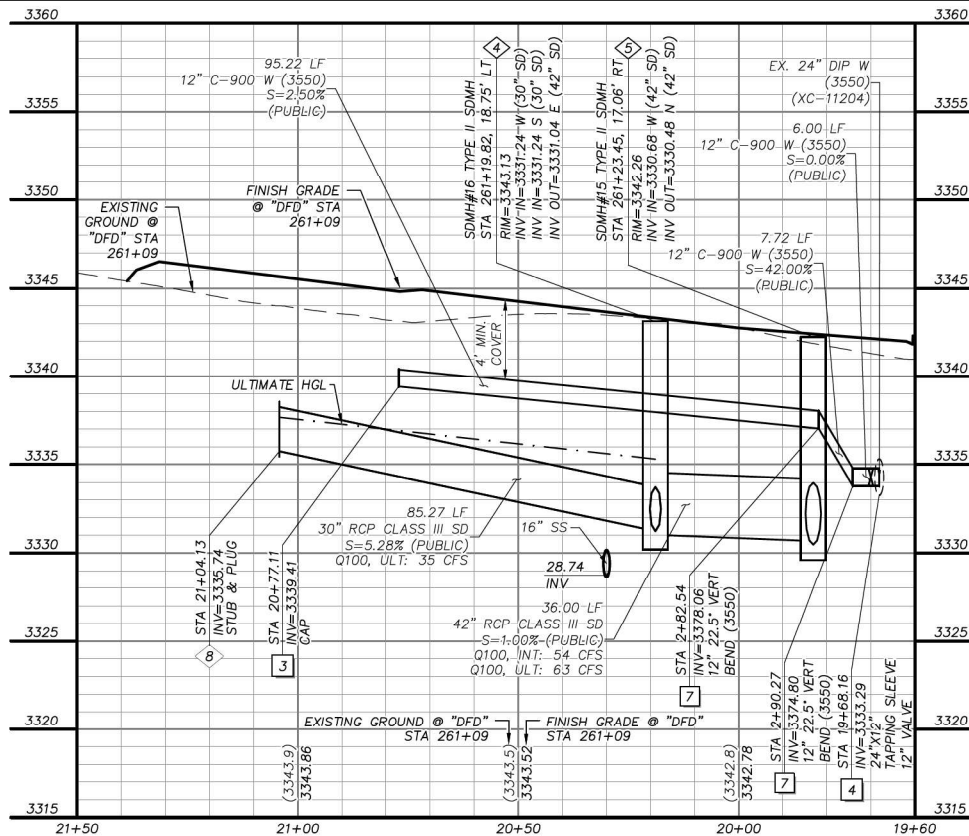
05/26/2020

100060652



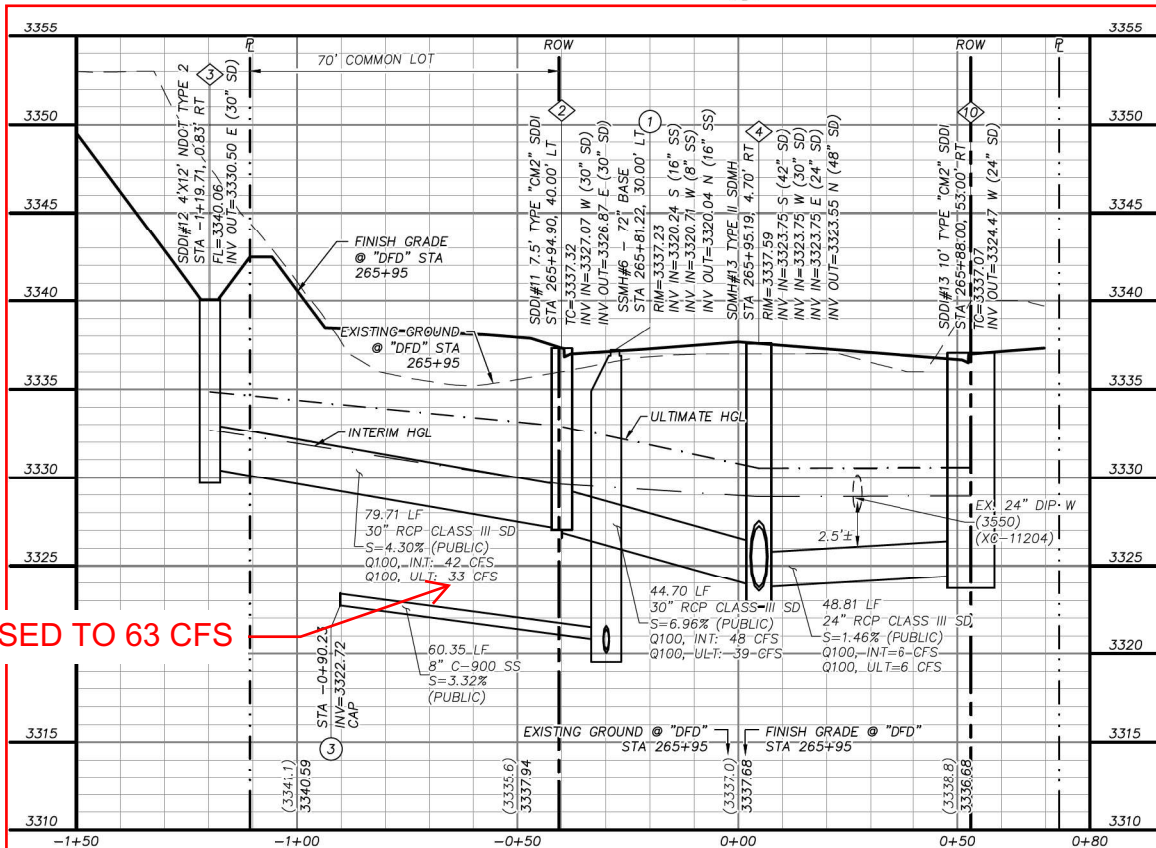
STORM DRAIN LATERAL PROFILE

"DFD" STA. 259+50 SEE SHEET 14



STORM DRAIN LATERAL PROFILE

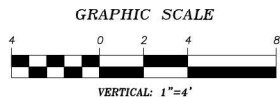
"DFD" STA. 261+09 SEE SHEET 14



STORM DRAIN LATERAL PROFILE

"DFD" STA. 265+95 SEE SHEET 16

REVISED TO 63 CFS



APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

PROJECT NO. 136925 FIRST APPROVED DATE: LVVWD APPROVED FIRE FLOW 1500 GPM AT 20 PSI RESIDUAL

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: D36R (REVISED 2008) NAVD83 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



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.



DESIGNED BY: N. BARCOS
DRAWN BY: L. MAMACLAY
CHECKED BY: P. BATES
HORIZ: NONE
VERT: 1"=4'
DATE: MAY, 2020
DRAWING NO.: 24/51
JOB NO.: 100060652

SUMMERLIN WEST VILLAGE 22
DESERT FOOTHILLS DRIVE
FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD

STORM DRAIN LATERAL PROFILES

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SUMMERLIN®

REVISIONS
DESCRIPTION
BY
DATE
APPROVAL

STORM DRAIN CONSTRUCTION NOTES

- INSTALL STORM DRAIN. SEE SHEET 41 FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
- INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
- INSTALL NDOT TYPE 2 DROP INLET PER NDOT R-4.2.1 (SEE SHEET 41)
- INSTALL TYPE II SD MANHOLE PER CCAUSD #405
- INSTALL TYPE II SD MANHOLE PER CCAUSD #405.2
- INSTALL TYPE III SD MANHOLE PER CCAUSD #406
- REMOVE CAP AND CONNECT TO EXISTING STORM DRAIN STUB
- STUB & PLUG STORM DRAIN FOR FUTURE CONNECTION PER MANUFACTURER'S PLUG, OR APPROVED EQUAL SEE SHEET 41
- INSTALL RIP-RAP (D50=8", THICKNESS=16")
- INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421 AND DETAIL D ON SHEET 41
- INSTALL TYPE "CM" DROP INLET PER CCAUSD #421 & #422

SEWER CONSTRUCTION NOTES

- INSTALL SEWER MANHOLE PER DCSWCS SD-1 AND SD-4 WITH DUAL CONCENTRIC LIDS PER SD-2 AND WITH CORROSION PROTECTION PER DCSWCS 3.16.8
- INSTALL SEWER MAIN PER DCSWCS SD-17. WHERE CURVED PIPE RADIUS IS LESS THAN 1150', CONSTRUCT IN 10' SECTIONS OF CURVED SEWER PER DCSWCS 2.3.4.5
- STUB AND CAP SEWER PIPE. PLACE 4"x4" POST, DOUGLAS FIR, OVER END OF PIPE AND INSTALL THRUST BLOCK (1 CUBIC FT. MINIMUM).
- CONNECT TO EXISTING SANITARY SEWER MANHOLE. CORE DRILL AND REFORM SSMH BASE PER DCSWCS SD-9, AND ADD CORROSION PROTECTION PER DCSWCS 3.16.8
- ADJUST EXISTING MANHOLE TO GRADE PER DCSWCS SD-5.
- PROTECT SEWER AT UTILITY CROSSING PER DCSWCS SD-19

WATERLINE CONSTRUCTION NOTES

- INSTALL WATER MAIN PER UDACS PLATES #17 AND PLATE #19
- INSTALL 1.5" SERVICE SADDLE PER UDACS PLATE #4
- INSTALL CAP AND 2" MANUAL BLOWOFF ASSEMBLY PER UDACS PLATE #36
- INSTALL TAPPING SLEEVE WITH TAPPING VALVE AND LATERAL PER UDACS PLATES #17, #19, #30, #31, #34, AND #39
- INSTALL DEFLECTION AT PIPE JOINTS (MAXIMUM OF 1')
- INSTALL 5" VERTICAL BEND PER UDACS PLATE #31
- INSTALL 22.5' HORIZONTAL BEND PER UDACS 2.15 AND RESTRAINT JOINTS TABLE ON SHEET 9
- INSTALL 45' HORIZONTAL BEND PER UDACS 2.15 AND RESTRAINT JOINTS TABLE ON SHEET 9
- REMOVE CAP AND 2" BLOWOFF AND CONNECT TO EXISTING WATERLINE STUB
- INSTALL FIRE HYDRANT WITH APPURTENANCES (CONCRETE PAD, LATERAL VALVE, AND TEE) PER UDACS PLATES #30, #31, #39, AND #40
- INSTALL 1-1/2" IRRIGATION MAIN WITH 1-1/2" RPPA PER UDACS PLATES #4 AND #8 WITH CURB STOP
- BACKFILL TRENCH ZONE WITH CLASS I CLSM

CONTROLLED LOW STRENGTH MATERIAL (CLSM)

PROTECT WATERLINES IN PLACE. WHEREVER A WATERLINE IS ABOVE A STORM DRAIN OR SEWER, WHERE COMPACTION REQUIREMENTS UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CLASS II CONTROLLED LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY. ADDITIONAL LOCAL REGULATIONS MAY APPLY PER UDACS 2.22

FOR FIRE HYDRANT PAD ELEVATIONS AND GRADES REFER TO THE FINISHED GRADE INDICATED ON SHEETS 11, 13, 15, 17, 19, 21 AND THE HYDRANT PAD DETAIL ON SHEET 44.

CONTRACTOR SHALL SUBMIT STRUCTURAL CALCULATIONS PREPARED BY A NEVADA LICENSED STRUCTURAL ENGINEER FOR CROSSING WITH WATER WHERE THE TRENCH IS SIX (6) FEET OR GREATER. CONTACT ENGINEERING SERVICES FOR INDICATIONS ON PACKAGE SUBMITTAL. PIPE SUPPORT PLANS MUST BE SUBMITTED A MINIMUM OF 30 DAYS PRIOR TO COMMENCEMENT OF WORK. PIPE SUPPORTS FOR TRANSMISSION MAINS (24-INCH AND LARGER) WILL BE LIMITED TO A MAXIMUM OF 1 WEEK. A SCHEDULE OF WATER MAINS SUPPORTED MUST BE PROVIDED TO LVVWD ENGINEERING SERVICES.

IN AREAS WHERE THE EXCAVATION OR GROUND ELEVATION IS LESS THAN THREE (3) FEET, FROM THE TOP OF THE LVVWD TRANSMISSION MAIN, NO EXCAVATION EQUIPMENT, OTHER THAN HAND HELED EQUIPMENT WILL BE ALLOWED WITHIN TEN (10) FEET OF THE PIPELINE. IN THESE AREAS, THE CONTRACTOR IS TO PLACE A CONCRETE BARRIER, I.E. JERSEY RAIL, TO IDENTIFY AND PROTECT THE "NO EQUIPMENT ZONE". TRANSMISSION MAIN STRUCTURAL SUPPORT.

NOTE: ALL WATERLINE LATERALS ARE CONNECTED TO THE 24" 3550 WATER MAIN.

Summerlin West Village 22

Kettle Ridge Drive (Street J)

Fleet Wing Avenue (Street G) to Lake Mead Boulevard

Scurry Bend Drive (Street N) Rough Grade

Fleet Wing Avenue (Street G) to Lake Mead Boulevard

February 25, 2020

Update #1

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 19, 2019
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	COPIES TO:
	Summerlin West V22 – Kettle Ridge Drive (Street J) and Scurry Bend Drive (Street N) Street Improvements (both from Lake Mead Blvd. to Fleet Wing Ave.)	Atkins
Cross Streets:	Lake Mead Boulevard & Desert Foothill Drive	Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5156E.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006 & 137-23-101-002	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 #
1 st Submittal	7/16/2019	8/8/2019	Not Approved	\$400.00	3490122: \$400
2 nd Submittal	9/11/2019	9/25/2019	Not Approved	\$400.00	3563447: \$400
3 rd Submittal	10/16/2019	10/30/2019	Conditional Approval	\$400.00	3612958: \$400
4 th Submittal & CCRFCD	2/25/2020 & 3/5/2020	3/10/2020	Concurrence Recv'd	\$100.00	3755821: \$100
Supplement	3/18/2020	3/19/2020	See Comments Below	N/C	N/C
TOTAL FEES (LDDRS):				\$1,300.00	----

REMARKS:

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

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

The following conditions are repeated until they are complete:

1. The project proposes to build temporary drainage facilities, ie, berms/swales along the west side of *Scurry Bend Drive* and *Kettle Ridge Drive* and at the southern end of *Kettle Ridge Drive* 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.

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.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
ays

T/R/S: T20S/R59E/14
AREA K-14

SUMMERLIN WEST VILLAGE 22

Kettle Ridge Drive (Street J)
 Lake Mead Boulevard to Fleet Wing Avenue (Street G)
 Scurry Bend Drive (Street N) Rough Grade
 Lake Mead Boulevard to Fleet Wing Avenue (Street G)

KETTLE RIDGE BASIN

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-J1	1	Undeveloped Land, Oper Desert	1155	88	353955	353955	100.0%	100.0%	88.00	88.00	88.0
INT-J2	1	Undeveloped Land, Oper Desert	1155	88	577890	577890	100.0%	100.0%	88.00	88.00	88.0
INT-J3	1	Undeveloped Land, Oper Desert	1155	88	789937	789937	100.0%	100.0%	88.00	88.00	88.0
INT-LMB1	1	Undeveloped Land, Oper Desert	1155	88	2344383	2345443	99.9%	99.9%	87.92	87.92	
INT-LMB1	1	Undeveloped Land, Oper Desert	1191	63	2060	2345443	0.1%	100.0%	0.06	87.98	88.0
INT-N	1	Undeveloped Land, Oper Desert	1155	88	3837752	5233734	73.3%	73.3%	64.53	64.53	
INT-N	1	Undeveloped Land, Oper Desert	1191	63	148364	5233734	2.8%	76.2%	1.79	66.31	
INT-N	1	Undeveloped Land, Oper Desert	1502	73	1247617	5233734	23.8%	100.0%	17.40	83.72	83.7
StrJ-1E	7	Public Facility and Residential, 8-12 units/acre	1155	94	25786	25786	100.0%	100.0%	94.00	94.00	94.0
StrJ-1W	7	Public Facility and Residential, 8-12 units/acre	1155	94	30287	30287	100.0%	100.0%	94.00	94.00	94.0
StrJ-2E	7	Public Facility and Residential, 8-12 units/acre	1155	94	19917	19917	100.0%	100.0%	94.00	94.00	94.0
StrJ-2W	7	Public Facility and Residential, 8-12 units/acre	1155	94	25778	25778	100.0%	100.0%	94.00	94.00	94.0
StrJ-3E	7	Public Facility and Residential, 8-12 units/acre	1155	94	17181	17181	100.0%	100.0%	94.00	94.00	94.0
StrJ-3W	7	Public Facility and Residential, 8-12 units/acre	1155	94	22888	22388	100.0%	100.0%	94.00	94.00	94.0

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

TDS for Summerlin Village 22 West

Kettle Ridge Drive (Street J)

Lake Mead Boulevard to Fleet Wing Avenue (Street G)
& Scurry Bend Drive (Street N) Rough Grade

BY: **MMA**
DATE: **5/2/19**

KETTLE RIDGE BASIN

Lake Mead Boulevard to Fleet Wing Avenue (Street G)
INTERIM CONDITION

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Flag		
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min	Min (13)	Min (14)	Flag= 0.6Tc/60 Hours		
(1)			(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)					
INT-J1	E	88.0	0.772	8.13	0.01270	100	7.0	3.1	1011	6.8	3.9	7.7	3.3	6.4	N/A	0.100**		
INT-J2	E	88.0	0.772	13.27	0.02073	100	10.0	2.7	1216	8.1	4.2	8.4	3.4	6.1	N/A	0.100**		
INT-J3	E	88.0	0.772	18.13	0.02834	100	8.0	3.0	1219	8.0	4.2	8.3	3.4	6.4	N/A	0.100**		
INT-LMB1	E	88.0	0.771	53.87	0.08417	100	6.0	3.3	6217	8.0	4.2	8.3	13.4	16.7	N/A	0.167		
INT-N	E	83.7	0.715	120.15	0.18774	100	8.0	3.5	6,493	7.3	4.0	7.9	14.7	18.1	N/A	0.181		
StrJ-1E	D	94.0	0.851	0.59	0.00093	16	2.0	1.4	639	7.0	5.3	8.1	1.8	3.3	13.6	0.050*		
StrJ-1W	D	94.0	0.851	0.70	0.00109	16	2.0	1.4	611	7.0	5.3	8.1	1.8	3.2	13.5	0.050*		
StrJ-2E	D	94.0	0.851	0.46	0.00071	16	2.0	1.4	468	3.0	3.5	5.3	2.2	3.7	12.7	0.050*		
StrJ-2W	D	94.0	0.851	0.59	0.00093	16	2.0	1.4	533	3.0	3.5	5.3	2.5	3.9	13.1	0.050*		
StrJ-3E	D	94.0	0.851	0.39	0.00062	16	2.0	1.4	403	1.0	2.0	3.1	3.3	4.7	12.3	0.050*		
StrJ-3W	D	94.0	0.851	0.53	0.00082	16	2.0	1.4	474	1.0	2.0	3.1	3.9	5.3	12.7	0.053		
Tc = Ti + Tt Tlag = 0.6 Tc						For the travel time (Tt) calculations,					V1 = 14.8*(S/100)^1/2		Developed		V1 = 20.2*(S/100)^1/2			
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3						V1 applies to the first 500 feet of travel distance;												
K = 0.0132 (CN) - 0.39						V2 applies to the remaining travel distance.					V2 = 29.4*(S/100)^1/2		Developed		V2 = 30.6*(S/100)^1/2			
Tc Check = L/180+10																		
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.

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 22JUN19 TIME 16:33:21 *
*
*****

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*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*
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X X XXXXXXX XXXXX X
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X X X X X
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

*** FREE ***

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1 ID TECHNICAL DRAINAGE STUDY
2 ID SUMMERLIN VILLAGE 22
3 ID KETTLE RIDGE DRIVE (STREET J)
4 ID FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD
5 ID & SCURRY BEND DRIVE (STREET N) ROUGH GRADE
6 ID FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD
7 ID JULY 2019
8 ID
9 ID JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES
10 ID
11 ID AREA (SQUARE MILES) DARF
12 ID
13 ID 0 - 0.5 0.99
14 ID Estimated 10-year 0.57
15 ID
16 IT 5 0 0 300
17 IO 5 0 0
18 IN 5 0 0
19 JR PREC 0.99 0.57
*
20 KK 3-O*
21 KM REFERENCED FROM ADDENDUM #1 TO UPDATE #1 FOR THE MCDS FOR SUMMERLIN WEST VILLA
22 KM WHICH REFERENCED SUBBASIN FROM OVERALL SWPA MPU
23 BA 0.08050
24 PB 3.48
25 PC 0.000 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 1.000
33 LS 0 95.0
34 UD 0.103
*
35 KKINT-LMB1
36 BA 0.08417
37 PB 3.55
38 LS 0 88.0
39 UD 0.167
*
40 KKDIV-LMB1
41 KM FLOW CAPTURED FROM INT-LMB1 INTO STREET J SYSTEM UTILIZING FUTURE LAKE MEAD BO
42 DT DI_DIV
43 DI 0 69 153
44 DQ 0 0 69

```

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
45	KK CP1
46	HC 2
	*
47	KK INT-J1
48	BA 0.01270
49	PB 3.43
50	LS 0 88.0
51	UD 0.100
	*
52	KK StrJ-1E
53	BA 0.00093
54	PB 3.43
55	LS 0 94.0
56	UD 0.050
	*
57	KK StrJ-1W
58	BA 0.00109
59	PB 3.43
60	LS 0 94.0
61	UD 0.050
	*
62	KK CP2
63	HC 4
	*
64	KK INT-J2
65	BA 0.02073
66	PB 3.43
67	LS 0 88.0
68	UD 0.100
	*
69	KK StrJ-2E
70	BA 0.00071
71	PB 3.43
72	LS 0 94.0
73	UD 0.050
	*
74	KK StrJ-2W
75	BA 0.00093
76	PB 3.43
77	LS 0 94.0
78	UD 0.050
	*

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
79	KK CP3
80	HC 4
	*
81	KK INT-J3
82	BA 0.02834
83	PB 3.43
84	LS 0 88.0
85	UD 0.100
	*
86	KK StrJ-3E
87	BA 0.00062
88	PB 3.43
89	LS 0 94.0
90	UD 0.050
	*
91	KK StrJ-3W
92	BA 0.00082
93	PB 3.43
94	LS 0 94.0
95	UD 0.053
	*
96	KK CP4
97	HC 4
	*
98	KK INT-N


```

99      BA 0.18774
100     PB 3.43
101     LS 0      83.7
102     UD 0.181
      *

103     KK      CP5
104     HC      2
      *
105     ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

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

20      3-O*
      .
      .
35      .      INT-LMB1
      .      .
      .      .
42      .      .-----> DI_DIV
40      .      DIV-LMB1
      .      .
      .      .
45      CP1.....
      .
      .
47      .      INT-J1
      .      .
      .      .
52      .      .      StrJ-1E
      .      .      .
      .      .      .
57      .      .      .      StrJ-1W
      .      .      .      .
      .      .      .      .
62      CP2.....
      .
      .
64      .      INT-J2
      .      .
      .      .
69      .      .      StrJ-2E
      .      .      .
      .      .      .
74      .      .      .      StrJ-2W
      .      .      .      .
      .      .      .      .
79      CP3.....
      .
      .
81      .      INT-J3
      .      .
      .      .
86      .      .      StrJ-3E
      .      .      .
      .      .      .
91      .      .      .      StrJ-3W
      .      .      .      .
      .      .      .      .
96      CP4.....
      .
      .
98      .      INT-N
      .      .
      .      .
103     CP5.....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*      JUN 1998
*      VERSION 4.1
*
* RUN DATE 22JUN19 TIME 16:33:21
*
*****

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

```

TECHNICAL DRAINAGE STUDY
 SUMMERLIN VILLAGE 22
 KETTLE RIDGE DRIVE (STREET J)
 FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD

& SCURRY BEND DRIVE (STREET N) ROUGH GRADE
FLEET WING AVENUE (STREET G) TO LAKE MEAD BOULEVARD
JULY 2019

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES

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

17 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPL0T	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						
+	3-O*	.08	1	FLOW TIME	189. 3.50	100. 3.50
HYDROGRAPH AT						
+	INT-LMB1	.08	1	FLOW TIME	153. 3.58	69. 3.58
DIVERSION TO						
+	DI_DIV	.08	1	FLOW TIME	69. 3.58	0. .00
HYDROGRAPH AT						
+	DIV-LMB1	.08	1	FLOW TIME	84. 3.58	69. 3.58
2 COMBINED AT						
+	CP1	.16	1	FLOW TIME	269. 3.50	163. 3.58
HYDROGRAPH AT						
+	INT-J1	.01	1	FLOW TIME	25. 3.50	11. 3.50
HYDROGRAPH AT						
+	SLIJ-1E	.00	1	FLOW TIME	3. 3.50	1. 3.50
HYDROGRAPH AT						
+	StrJ-1W	.00	1	FLOW TIME	3. 3.50	2. 3.50
4 COMBINED AT						
+	CP2	.18	1	FLOW TIME	299. 3.50	175. 3.58

HYDROGRAPH AT						
+	INT-J2	.02	1	FLOW	40.	18.
				TIME	3.50	3.50

HYDROGRAPH AT	StrJ-2E	.00	1	FLOW	2.	1.
+				TIME	3.50	3.50

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

4 COMBINED AT	CP3	.20	1	FLOW	343.	194.
+				TIME	3.50	3.58

HYDROGRAPH AT	INT-J3	.03	1	FLOW	55.	24.
+				TIME	3.50	3.50

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

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

4 COMBINED AT	CP4	.23	1	FLOW	402.	218.
+				TIME	3.50	3.58

HYDROGRAPH AT	INT-N	.19	1	FLOW	270.	104.
+				TIME	3.58	3.58

2 COMBINED AT	CP5	.42	1	FLOW	650.	322.
+				TIME	3.58	3.58

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

ADJACENT SECTION IN KETTLE RIDGE

Worksheet for StrJ-ST2E - 100-year

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.005 ft/ft
Discharge	2.30 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+00	0.00
0+02	0.17
0+17	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+17, 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	4.3 in
Elevation Range	0.00 to 0.50 ft
Flow Area	1.4 ft ²
Wetted Perimeter	11.8 ft
Hydraulic Radius	1.5 in
Top Width	11.40 ft
Normal Depth	4.3 in
Critical Depth	4.0 in
Critical Slope	0.008 ft/ft
Velocity	1.61 ft/s
Velocity Head	0.04 ft
Specific Energy	0.40 ft
Froude Number	0.801
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
------------------	--------

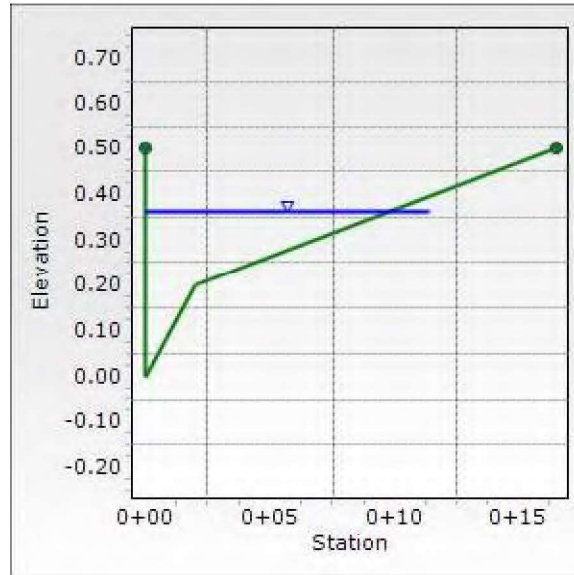
Worksheet for StrJ-ST2E - 100-year

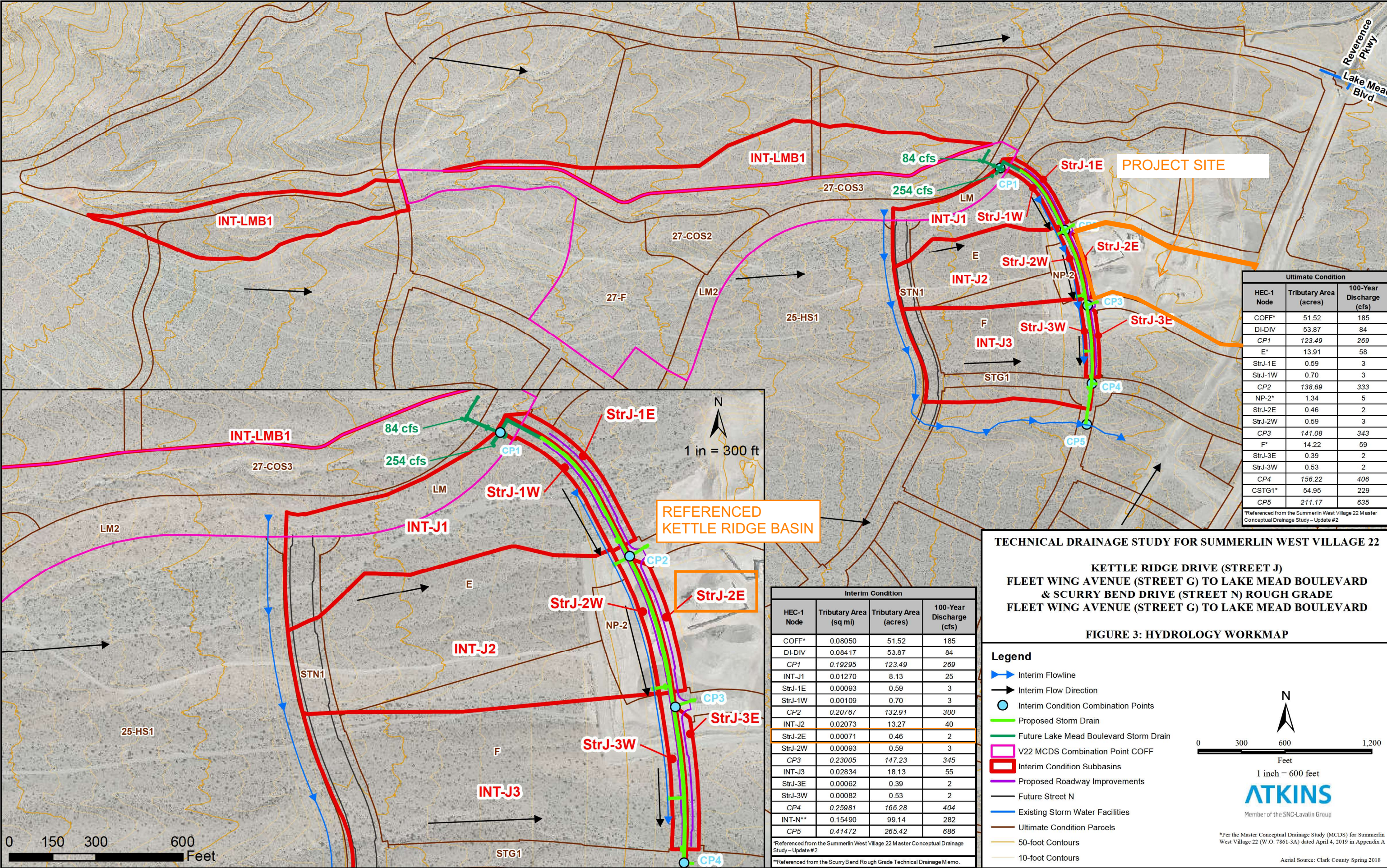
GVF Input Data	
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.3 in
Critical Depth	4.0 in
Channel Slope	0.005 ft/ft
Critical Slope	0.008 ft/ft

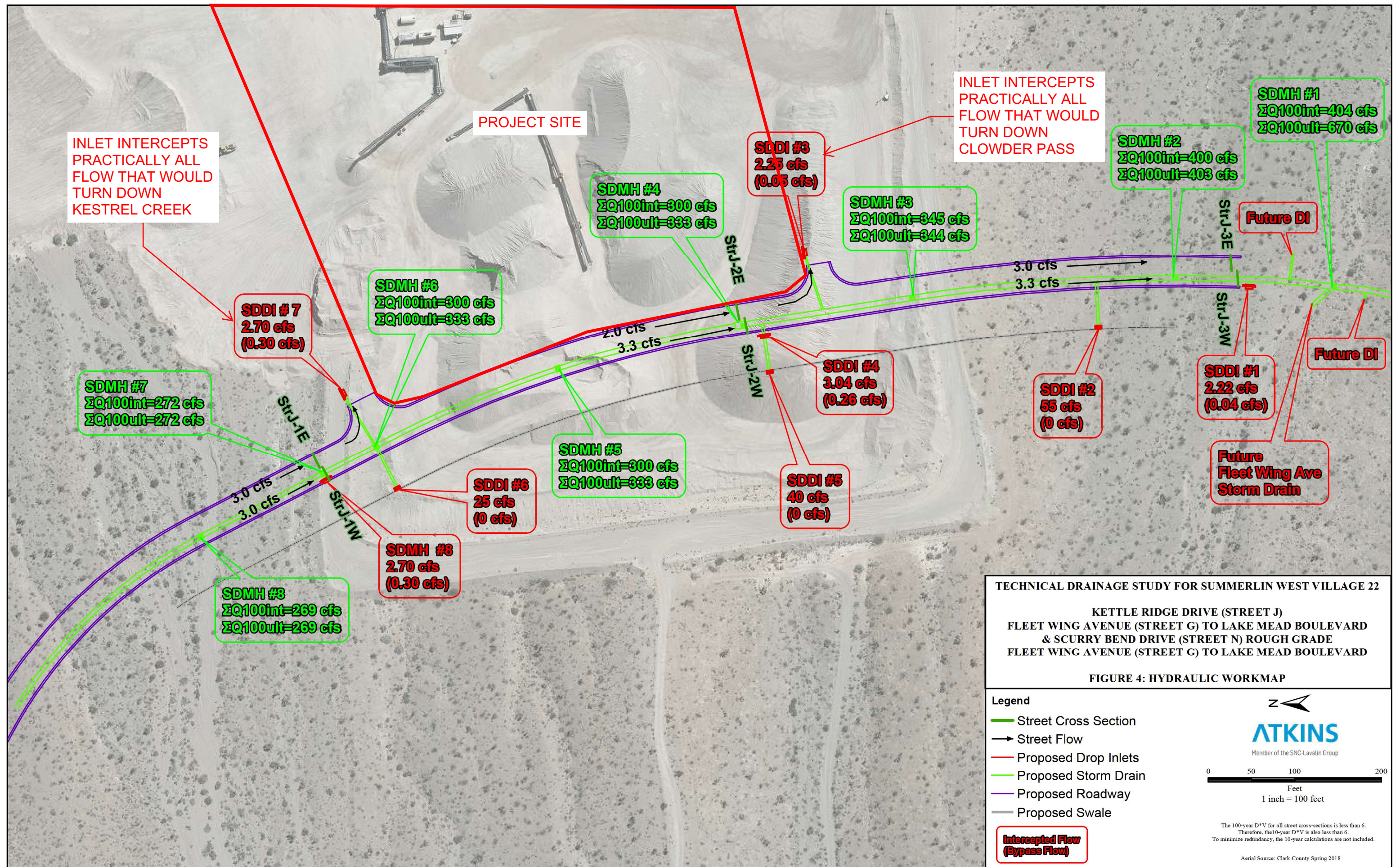
Cross Section for StrJ-ST2E - 100-year

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 ft/ft
Normal Depth	4.3 in
Discharge	2.30 cfs









Summerlin West Village 22

Clowder Pass Way (Street H) Desert Foothills Drive to Kettle Ridge Drive (Street J)

November 20, 2019

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		May 12, 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 V22 - Clowder Pass Way (Street H) (from Desert Foothill Drive to Kettle Ridge Drive <Street J>)		COPIES TO: Atkins
Cross Streets:	Desert Foothill Drive & Clowder Pass Way	Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5220C.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006, 137-23-101-002	
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 #
1 st Submittal	11/20/2019	12/23/2019	Not Approved	\$400.00	3652616: \$400
2 nd Submittal	1/21/2020	2/10/2020	Conditional Approval	\$400.00	3712515: \$400
Supplement	5/12/2020	5/12/2020	See Comments Below	N/C	N/C
				\$800.00	----

REMARKS:

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

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

- The project proposes to build temporary drainage facilities, ie, berms/swales along the north and south sides of *Clowder Pass Way* and two interim berms in *Parcel G* and *Parcel 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.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
HDR/AYS

T/R/S: T20S/R59E/14
AREA K-14

TEXT EXCERPT STATING NO FLOW UPSTREAM WILL ENTER CLOWDER PASS

The proposed Street H 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 (Street J) is to be completed prior to the interim conditions of Clowder Pass Way. Drainage basins to the west of the newly constructed Kettle Ridge Drive will be intercepted before entering Clowder Pass Way in the interim and ultimate conditions. There are no offsite flows tributary to Clowder Pass Way in the interim or ultimate conditions. There are several drainage basins on the north and south side of Clowder Pass Way that collect flows in the interim condition which are either intercepted by interim swales or drop inlets; flows from these adjacent interim subbasins do not drain onto Clowder Pass Way. Interim subbasins INT-H1 and INT-H2 (Figure 3) collect flows in the interim swales to the south of Clowder Pass Way, which drain into the proposed Clowder Pass Way storm drains.

The hydrologic conditions for 10-year and 100-year storm events for the interim and ultimate conditions were modeled using HEC-1. The results are summarized in Table 2 and Figure 3.

The proposed Clowder Pass Way storm drain discharges east to the storm drain facility in Desert Foothills Drive. The tailwater elevation for the hydraulic model was taken from the upstream hydraulic grade line (HGL) in the associated TDS (DS #5170). The plan sheets that reference the HGL information is included in the reference information in Appendix A.

Table 2 – Interim Condition HEC-1 Model Results

Basin ID	Tributary Area (sq mi)	Tributary Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
STH-1N	0.00068	0.43	2	1
STH-1S	0.00072	0.46	2	1
STH-2N	0.00149	0.95	4	2
STH-2S	0.00138	0.88	4	2
INT-H1	0.00836	5.35	16	7
INT-H2	0.00138	1.88	3	1

1.3. Ultimate Condition

The ultimate condition flows were directly referenced from Update #2 to the Village 22 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 Clowder Pass Way 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)
J	0.00925	5.93	24

Summerlin West Village 22

Clowder Pass Way

Collection Subbasins

CN Calculation Summary

REFERENCED CLOWDER PASS BASINS

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
STH-1N	7	Public Facility and Residential, 8-12 units/acre	1155	94	18841	18841	100.0%	100.0%	94.00	94.00	94.0
STH-1S	7	Public Facility and Residential, 8-12 units/acre	1155	94	19966	19966	100.0%	100.0%	94.00	94.00	94.0
STH-2N	7	Public Facility and Residential, 8-12 units/acre	1155	94	41402	41402	100.0%	100.0%	94.00	94.00	94.0
STH-2S	7	Public Facility and Residential, 8-12 units/acre	1155	94	38427	38427	100.0%	100.0%	94.00	94.00	94.0
INT-H1	1	Undeveloped Land, Open Desert	1152	88	786	232979	0.3%	0.3%	0.30	0.30	
INT-H1	1	Undeveloped Land, Open Desert	1155	88	232194	232979	99.7%	100.0%	87.70	88.00	88.0
INT-H2	1	Undeveloped Land, Open Desert	1152	88	81716	81716	100.0%	100.0%	88.00	88.00	88.0

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Summerlin West Village 22

Clowder Pass Way (Street H)

Desert Foothills Drive to Kettle Ridge Drive (Street J)

INTERIM CONDITION

BY:

MMA

DATE:

11/16/19

REFERENCED CLOWDER PASS BASINS

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min	Min	Min	Tlag= 0.6Tc/60 Hours
(1)			(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(13)	(14)	
SH-1N	D	94.0	0.851	0.43	0.00068	19.0	2.0	1.6	390	8.0	5.7	8.7	1.1	2.7	12.3	0.05*
SH-1S	D	94.0	0.851	0.46	0.00072	19.0	2.0	1.6	390	8.0	5.7	8.7	1.1	2.7	12.3	0.05*
SH-2N	D	94.0	0.851	0.95	0.00149	19.0	2.0	1.6	850	8.0	5.7	8.7	2.1	3.7	14.8	0.05*
SH-2S	D	94.0	0.851	0.88	0.00138	19.0	2.0	1.6	850	8.0	5.7	8.7	2.1	3.7	14.8	0.05*
INT-H1	E	88.0	0.772	5.35	0.00836	400.0	6.3	6.4	325	8.0	4.2	8.3	1.3	7.7	N/A	0.10**
INT-H2	E	88.0	0.772	1.88	0.00138	100.0	7.5	3.0	439	7.5	4.1	8.1	1.8	4.8	N/A	0.10**
Tc = Ti + Tt Tlag = 0.6 Tc						For the travel time (Tt) calculations,					V1 = 14.8*(S/100)^1/2		Developed		V1 = 20.2*(S/100)^1/2	
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3						V1 applies to the first 500 feet of travel distance;										
K = 0.0132 (CN) - 0.39						V2 applies to the remaining travel distance.					V2 = 29.4*(S/100)^1/2		Developed		V2 = 30.6*(S/100)^1/2	
Tc Check = L/180+10																
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.

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 16NOV19 TIME 21:19:18 *
*

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

```

      X   X  XXXXXXX  XXXXX      X
      X   X  X      X   X      XX
      X   X  X      X      X
      XXXXXXX  XXXX   X      XXXXX  X
      X   X  X      X      X
      X   X  X      X   X      X
      X   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 TECHNICAL DRAINAGE STUDY
2 ID SUMMERLIN WEST VILLAGE 22
3 ID CLOWDER PASS WAY (STREET H)
4 ID DESERT FOOTHILLS DRIVE TO KETTLE RIDGE DRIVE (STREET J)
5 ID DESIGN STORM 100-YEAR 6 HOUR
6 ID
7 ID JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES
8 ID
9 ID AREA (SQUARE MILES) DARF
10 ID
11 ID 0 - 0.5 0.99
12 ID Estimated 10-year 0.57
13 ID
14 IT 5 0 0 300
15 IO 5 0 0
16 IN 5 0 0
17 JR PREC 0.99 0.57

```

```

18 KK SH-1N
19 BA 0.00068
20 PB 3.42
21 PC 0.000 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
22 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
23 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
24 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
25 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
26 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
27 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
28 PC 0.998 0.999 1.000
29 LS 0 94.0
30 UD 0.050

```

*

```

31 KK SH-2N
32 BA 0.00149
33 PB 3.42
34 LS 0 94.0
35 UD 0.050

```

*

*

```

36 KK SH-1S
37 BA 0.00072
38 PB 3.42
39 LS 0 94.0
40 UD 0.050

```

*

*

1 HEC-1 INPUT PAGE 2

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

41 KK SH-2S
42 BA 0.00138
43 PB 3.42
44 LS 0 94.0
45 UD 0.050
*

46 KK INT-H1
47 BA 0.00836
48 PB 3.42
49 LS 0 88.0
50 UD 0.100
*

51 KK INT-H2
52 BA 0.00138
53 PB 3.42
54 LS 0 88.0
55 UD 0.100
*

56 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
18 SH-1N
.
.
31 . SH-2N
.
.
36 . SH-1S
.
.
41 . SH-2S
.
.
46 . INT-H1
.
.
51 . INT-H2
.
.
.

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 16NOV19 TIME 21:19:18 *

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

TECHNICAL DRAINAGE STUDY
SUMMERLIN WEST VILLAGE 22
CLOWDER PASS WAY (STREET H)
DESERT FOOTHILLS DRIVE TO KETTLE RIDGE DRIVE (STREET J)
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

15 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	RATIO 2
				.99	.57
HYDROGRAPH AT +	SH-1N	.00	1	FLOW TIME	2. 3.50
HYDROGRAPH AT +	SH-2N	.00	1	FLOW TIME	4. 3.50
HYDROGRAPH AT +	SH-1S	.00	1	FLOW TIME	2. 3.50
HYDROGRAPH AT +	SH-2S	.00	1	FLOW TIME	4. 3.50
HYDROGRAPH AT +	INT-H1	.01	1	FLOW TIME	16. 3.50
HYDROGRAPH AT +	INT-H2	.00	1	FLOW TIME	3. 3.50

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

ADJACENT SECTION IN CLOWDER PASS WAY

Worksheet for Clowder Pass Way - STH 2 - 100 yr Ultimate

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.080 ft/ft
Discharge	8.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.50
0+00.5	0.50
0+00.6	0.00
0+02.0	0.10
0+02.0	0.10
0+16.5	0.40
0+31.0	0.10
0+31.0	0.10
0+32.4	0.00
0+32.5	0.50
0+33.0	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.50)	(0+02.0, 0.10)	0.013
(0+02.0, 0.10)	(0+31.0, 0.10)	0.015
(0+31.0, 0.10)	(0+33.0, 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	0.2 ft
Elevation Range	0.0 to 0.5 ft
Flow Area	1.4 ft ²
Wetted Perimeter	16.4 ft
Hydraulic Radius	0.1 ft
Top Width	16.01 ft
Normal Depth	0.2 ft
Critical Depth	0.3 ft
Critical Slope	0.006 ft/ft

Worksheet for Clowder Pass Way - STH 2 - 100 yr Ultimate

Results

Velocity	5.63 ft/s
Velocity Head	0.49 ft
Specific Energy	0.73 ft
Froude Number	3.334
Flow Type	Supercritical

GVF Input Data

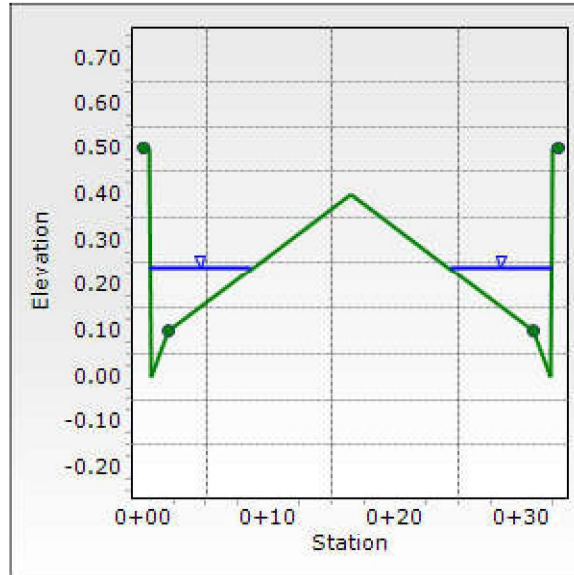
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

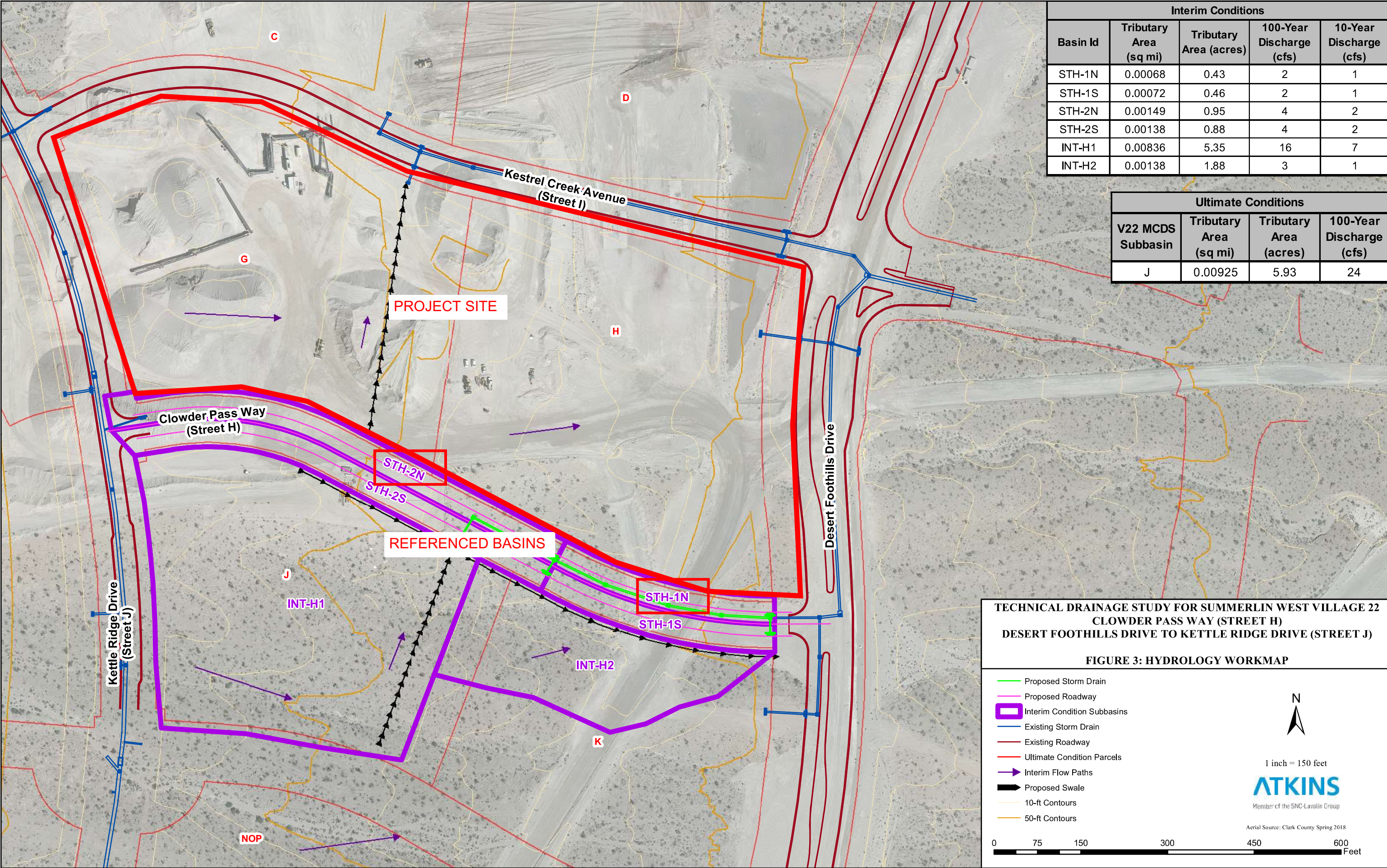
GVF Output Data

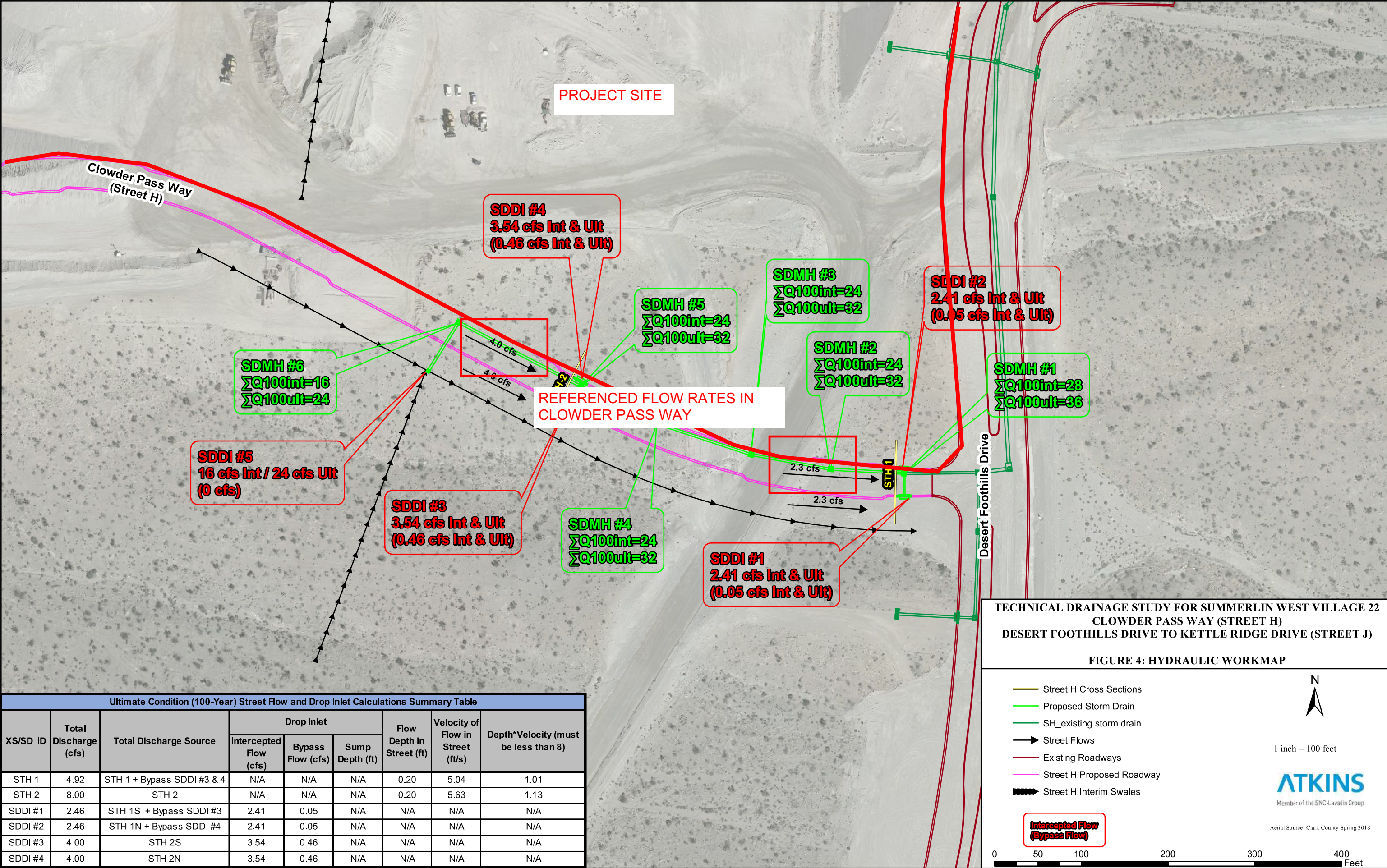
Upstream Depth	0.0 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.2 ft
Critical Depth	0.3 ft
Channel Slope	0.080 ft/ft
Critical Slope	0.006 ft/ft

Cross Section for Clowder Pass Way - STH 2 - 100 yr Ultimate

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.080 ft/ft
Normal Depth	0.2 ft
Discharge	8.00 cfs







Summerlin Village West 22

Kestrel Creek Avenue

Desert Foothills Drive to Kettle Ridge Drive

May 2020

Update #1

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: August 4, 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 V22 – Kestrel Creek Avenue (Street I) (from Desert Foothills Drive to Kettle Ridge Drive <Street J>)		COPIES TO: Atkins
Cross Streets:	Desert Foothill Drive & Kestrel Creek Ave.	Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5171D.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006 & 137-23-101-002	
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 #
1 st Submittal	8/5/2019	9/4/2019	Not Approved	\$400.00	3518203: \$400
2 nd Submittal	10/16/2019	11/6/2019	Not Approved	\$400.00	3612957: \$400
Supplement	11/14/2019	12/2/2019	Approved	N/C	N/C
3 rd Submittal & Supplement	6/2/2020 & 7/22/2020	8/4/2020	See Comments Below	\$100.00	3869189: \$100
			TOTAL FEES (LDDRS):	\$900.00	----

REMARKS:

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

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

- The project proposes to build temporary drainage facilities, ie, berms/swales along the north and south sides of *Kestrel Creek Avenue* 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.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS

ays

T/R/S: T20S/R59E/14
AREA K-14

SUMMERLIN WEST VILLAGE 22
Kestrel Creek Avenue (Street I)
Desert Foothills Drive to Kettle Ridge Drive (Street J)

REFERENCED KESTREL RIDGE BASINS

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
Stl-1N	6	High-Density Residential, 4-8 units per acre (uses 6 units/acre)	1155	91	31821	31821	100.0%	100.0%	91.00	91.00	91.0
Stl-2S	6	High-Density Residential, 4-8 units per acre (uses 6 units/acre)	1155	91	29187	29187	100.0%	100.0%	91.00	91.00	91.0
Stl-1S	6	High-Density Residential, 4-8 units per acre (uses 6 units/acre)	1155	91	32718	32718	100.0%	100.0%	91.00	91.00	91.0
Stl-2N	6	High-Density Residential, 4-8 units per acre (uses 6 units/acre)	1155	91	28940	28940	100.0%	100.0%	91.00	91.00	91.0
Int-I1	1	Undeveloped Land, Open Desert	1155	88	422905	422905	100.0%	100.0%	88.00	88.00	88.0
Int-I2	1	Undeveloped Land, Open Desert	1155	88	31283	31283	100.0%	100.0%	88.00	88.00	88.0
Int-I3	1	Undeveloped Land, Open Desert	1155	88	154039	154039	100.0%	100.0%	88.00	88.00	88.0
Int-I4	1	Undeveloped Land, Open Desert	1155	88	231703	231703	100.0%	100.0%	88.00	88.00	88.0

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Summerlin West Village 22 Kestrel Creek Avenue (Street I) (Desert Foothills Drive to Kettle Ridge Dr (Street J))

DATE: 8/1/19

INTERIM CONDITION

ATKINS

Member of the SNC-Lavalin Group

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tag
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min	Min	Min	Tag= 0.6Tc/60 Hours
(1)			(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(13)	(14)	
Stl-1	D	91.0	0.811	1.48	0.00232	19.0	2.0	1.8	760	6.9	5.3	8.0	2.1	3.9	14.3	0.05*
Stl-2	D	91.0	0.811	1.34	0.00209	19.0	2.0	1.8	660	6.9	5.3	8.0	1.9	3.7	13.8	0.05*
Int-l1	E	88.0	0.772	9.71	0.01517	100.0	7.7	3.0	1600	3.8	2.9	5.7	6.1	9.1	N/A	0.1**
Int-l2	E	88.0	0.772	0.72	0.00112	100.0	7.5	3.0	730	7.5	4.1	8.1	2.5	5.5	N/A	0.1**
Int-l3	E	88.0	0.772	3.54	0.00553	100.0	6.3	3.2	650	5.4	3.4	6.8	2.8	6.0	N/A	0.1**
Int-l4	E	88.0	0.772	5.32	0.00831	100.0	7.0	3.1	1200	6.7	3.8	7.6	3.7	6.8	N/A	0.1**
Tc = Ti + Tt Tag = 0.6 Tc						For the travel time (Tt) calculations,					V1 = 14.8*(S/100)^1/2		Developed		V1 = 20.2*(S/100)^1/2	
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3						V1 applies to the first 500 feet of travel distance;										
K = 0.0132 (CN) - 0.39						V2 applies to the remaining travel distance.					V2 = 29.4*(S/100)^1/2		Developed		V2 = 30.6*(S/100)^1/2	
Tc Check = L/180+10																
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.

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 10JUL19 TIME 13:49:04 *
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*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*
*****

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

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

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

*** FREE ***

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1 ID TECHNICAL DRAINAGE STUDY
2 ID SUMMERLIN WEST VILLAGE 22
3 ID KESTREL CREEK AVENUE (STREET I) (DESERT FOOTHILLS DRIVE TO STREET J)
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-I1
18 BA 0.01517
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 88.0
29 UD 0.1
*
30 KK Int-I3
31 BA 0.00553
32 PB 3.41
33 LS 0 88.0
34 UD 0.1
*
35 KK Int-I2
36 BA 0.00112
37 PB 3.41
38 LS 0 88.0
39 UD 0.1
*
40 KK Int-I4
41 BA 0.00831
42 PB 3.41

```

43 LS 0 88.0
44 UD 0.1
*

1

HEC-1 INPUT

PAGE 2

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

45 KK StI-1
46 BA 0.00232
47 PB 3.41
48 LS 0 91.0
49 UD 0.050
*

50 KK StI-2
51 BA 0.00209
52 PB 3.41
53 LS 0 91.0
54 UD 0.050
*

55 KK CP1
56 HC 6
*
57 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_I1
.
30 . Int-I3
.
35 . . Int-I2
.
40 . . . Int-I4
.
45 StI-1
.
50 StI-2
.
55 CP1.....

(**) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
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*

TECHNICAL DRAINAGE STUDY
SUMMERLIN VILLAGE 22 NORTH
STREET I (DESERT FOOTHILLS DRIVE TO STREET J)
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	RATIO 2
				.99	.57
HYDROGRAPH AT					
+	Int-I1	.02	1	FLOW	29.
				TIME	13.
					3.50
HYDROGRAPH AT					
+	Int-I3	.01	1	FLOW	11.
				TIME	5.
					3.50
HYDROGRAPH AT					
+	Int-I2	.00	1	FLOW	2.
				TIME	1.
					3.50
HYDROGRAPH AT					
+	Int-I4	.01	1	FLOW	16.
				TIME	7.
					3.50
HYDROGRAPH AT					
+	StI-1	.00	1	FLOW	6.
3.				TIME	3.50
					3.50
HYDROGRAPH AT					
+	StI-2	.00	1	FLOW	5.
3.				TIME	3.50
					3.50
6 COMBINED AT					
+	CP1	.03	1	FLOW	69.
				TIME	31.
					3.50

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

ADJACENT SECTION IN KESTREL CREEK

Worksheet for Kestrel Creek Ave - STI-2 - 100 yr

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.069 ft/ft
Discharge	6.10 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.08
0+02	0.10
0+19	0.43
0+35	0.10
0+35	0.08
0+36	0.00
0+37	0.50
0+37	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+02, 0.08)	0.013
(0+02, 0.08)	(0+35, 0.08)	0.015
(0+35, 0.08)	(0+37, 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

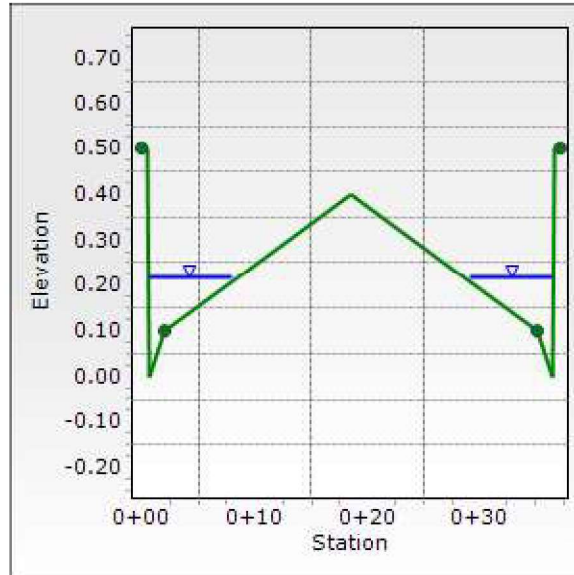
Results	
Normal Depth	0.2 ft
Elevation Range	0.00 to 0.50 ft
Flow Area	1.2 ft ²
Wetted Perimeter	15.2 ft
Hydraulic Radius	0.1 ft
Top Width	14.74 ft
Normal Depth	0.2 ft
Critical Depth	0.3 ft

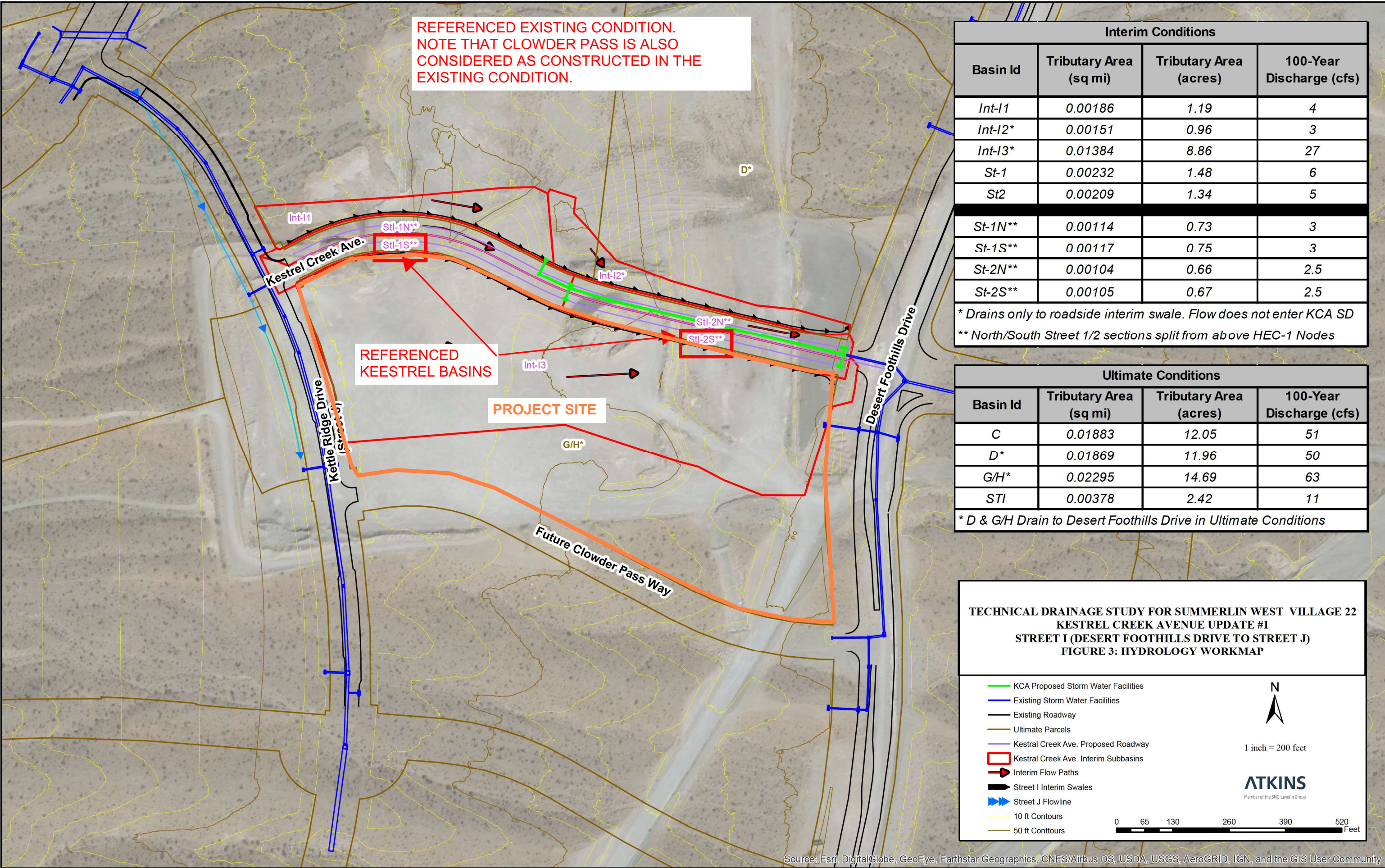
Worksheet for Kestrel Creek Ave - STI-2 - 100 yr

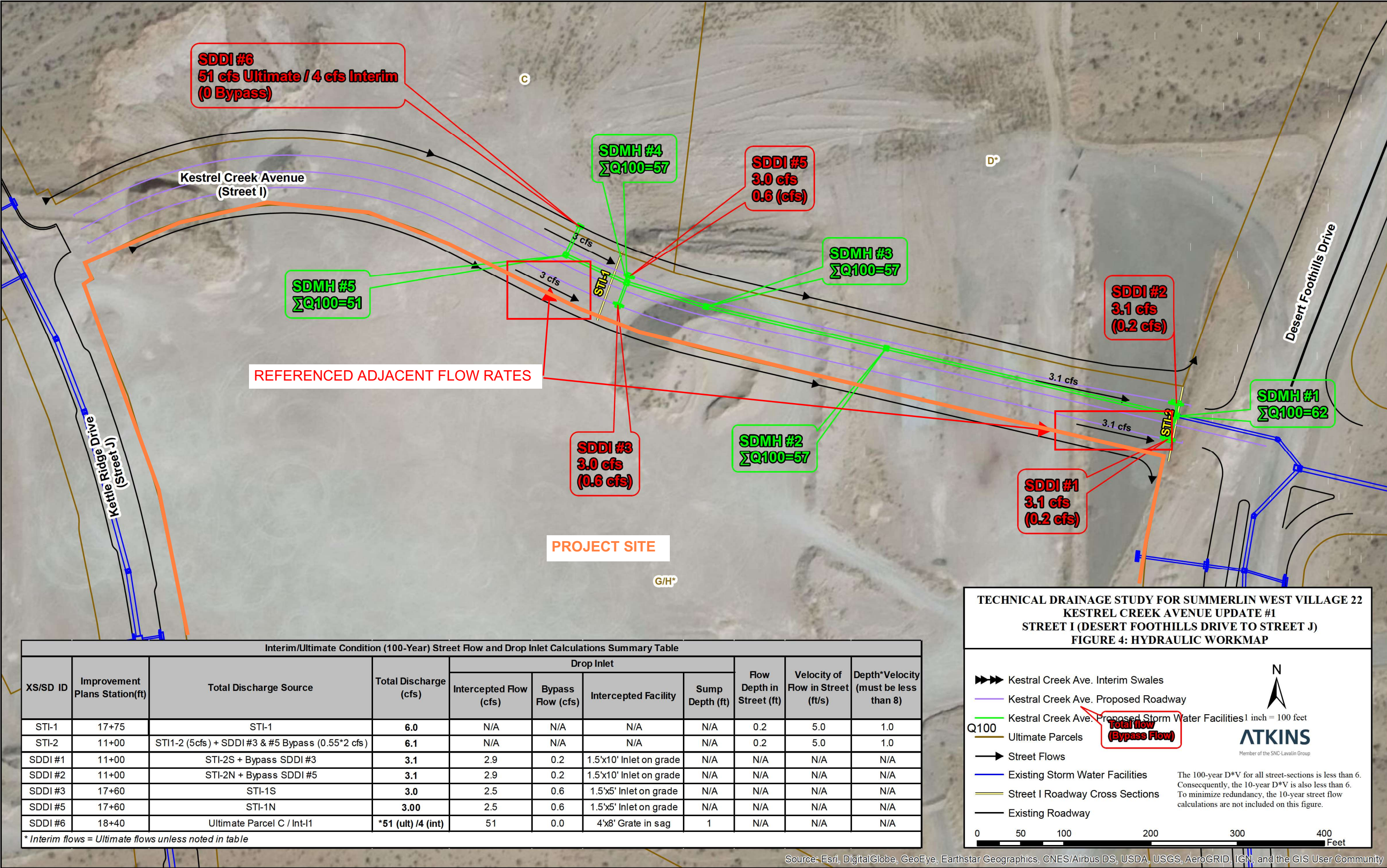
Results	
Critical Slope	0.006 ft/ft
Velocity	4.99 ft/s
Velocity Head	0.39 ft
Specific Energy	0.61 ft
Froude Number	3.059
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.2 ft
Critical Depth	0.3 ft
Channel Slope	0.069 ft/ft
Critical Slope	0.006 ft/ft

Cross Section for Kestrel Creek Ave - STI-2 - 100 yr

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.069 ft/ft
Normal Depth	0.2 ft
Discharge	6.10 cfs







APPENDIX D



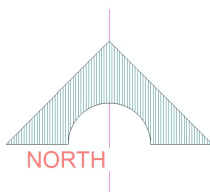


Legend

 **Project Site**

GRAPHIC SCALE

0 1000 2000 3000 4000 ft



764-A174-001

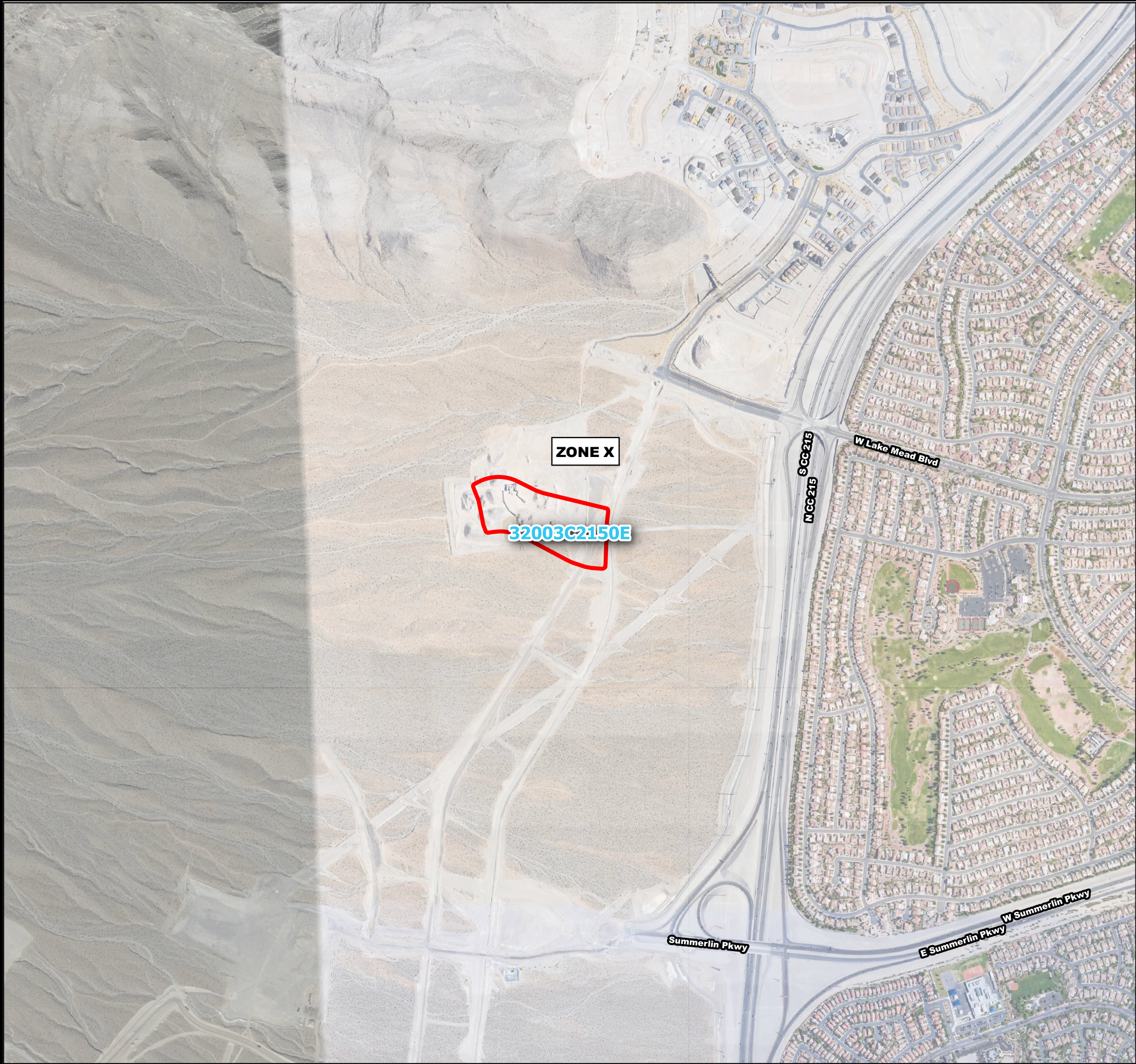
PULTE HOMES
SUMMERLIN VILLAGE 22 PARCEL GH MASS GRADING

FIGURE 1 LOCATION MAP

GCV
ENGINEERS SURVEYORS

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

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LEGEND

 Project Site

FEMA FLOOD ZONE

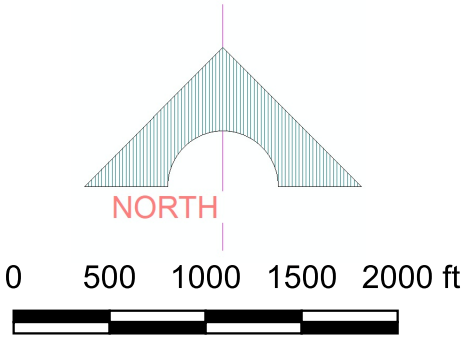
 Zone Shaded X

 Zone A

 Zone AE

 Zone AO

THE PROJECT SITE LIES WITHIN ZONE X.
ZONE X IS CLASSIFIED AS BEING OUTSIDE THE 0.2%
ANNUAL CHANCE FLOODPLAIN.



DATE: NOV 2020

SUMMERLIN VILLAGE 22 PARCEL GH MASS GRADING

FEMA FIRM MAP

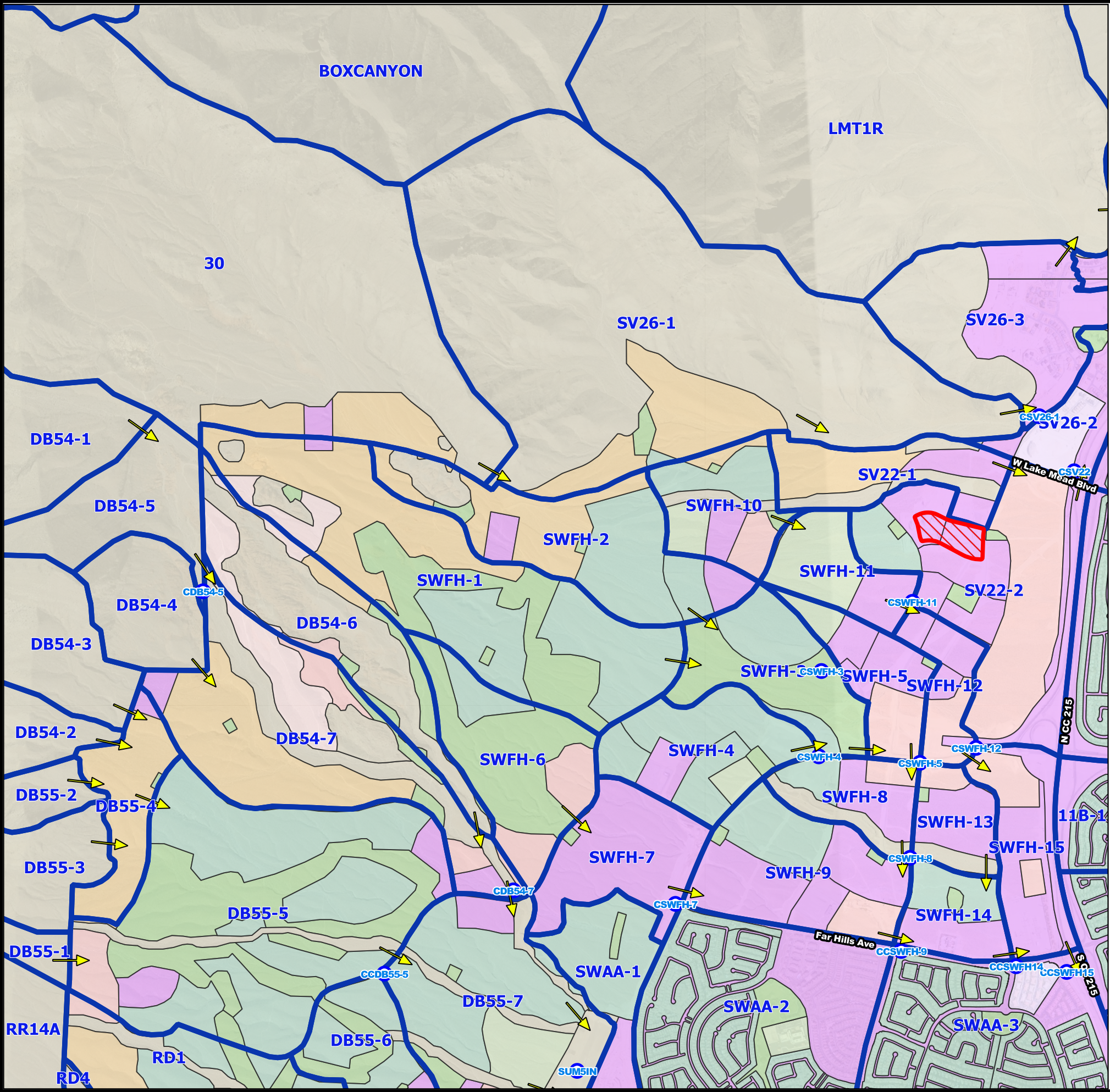
DRAFTER:

DESIGNER: NB

PROJECT NO:764-A174-001

PULTE HOMES

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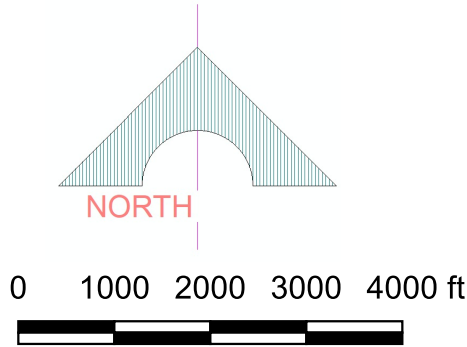


LEGEND

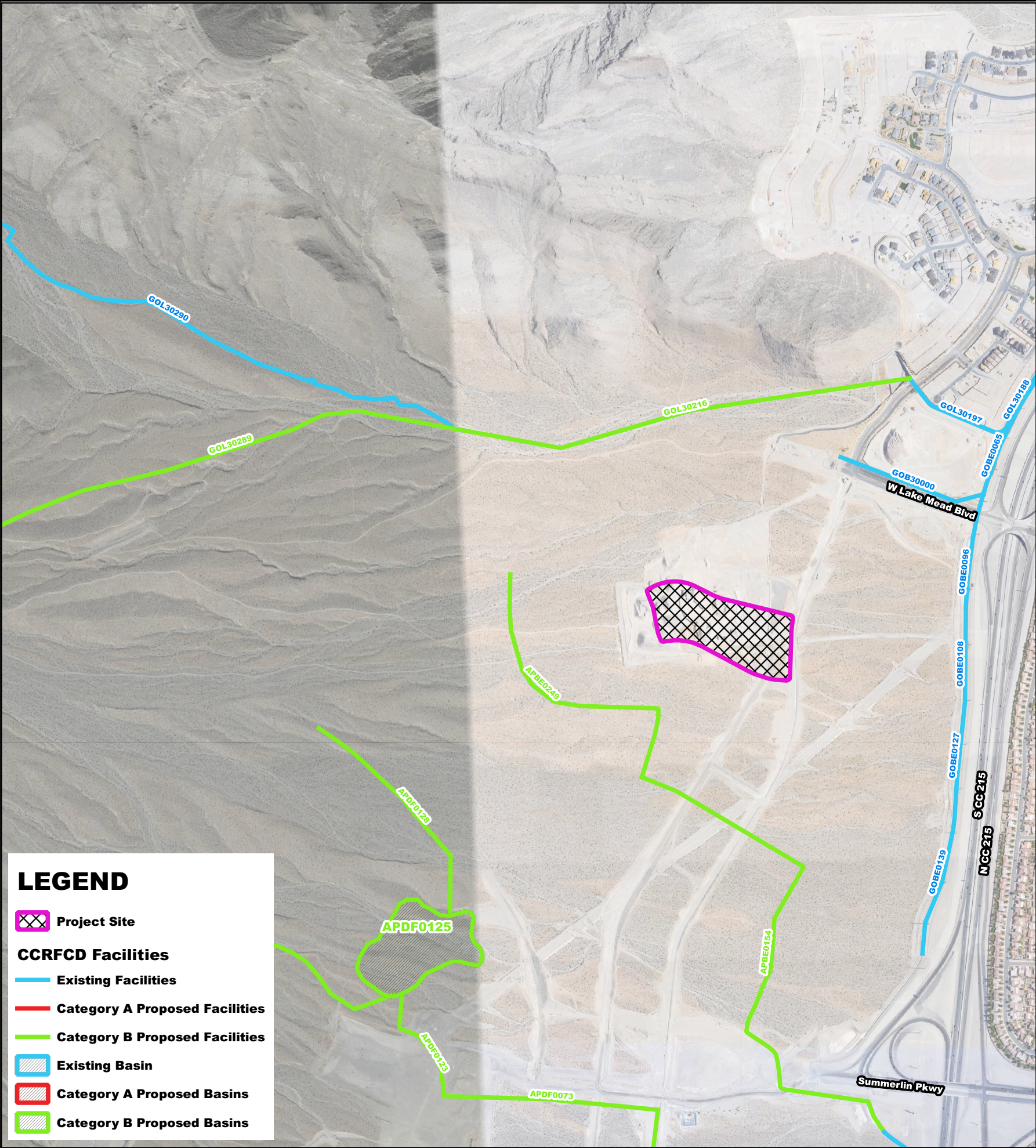
Project Site

Planned Land Use

- Undeveloped Land, Opendesert
- Parks, Golf Courses
- Rural, 0.5-1 units per acre (uses 1 unit/acre)
- Low-Density Residential, 1-2 units per acre (uses 2 units/acre)
- Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)
- High-Density Residential, 4-8 units per acre (uses 6 units/acre)
- Public Facility and Residential, 8-12 units/acre
- Very High-Density Residential, 12 units/acre or more
- Commercial, Retail, Casino, High Rise Condominiums
- Light Industrial
- Heavy Industrial
- Schools
- Lakes

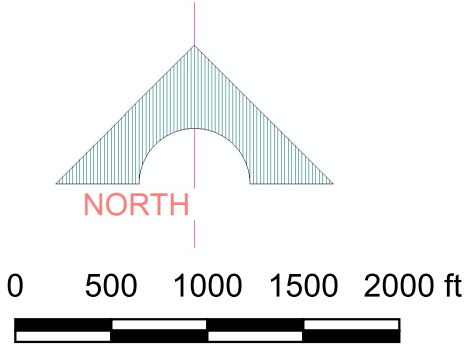


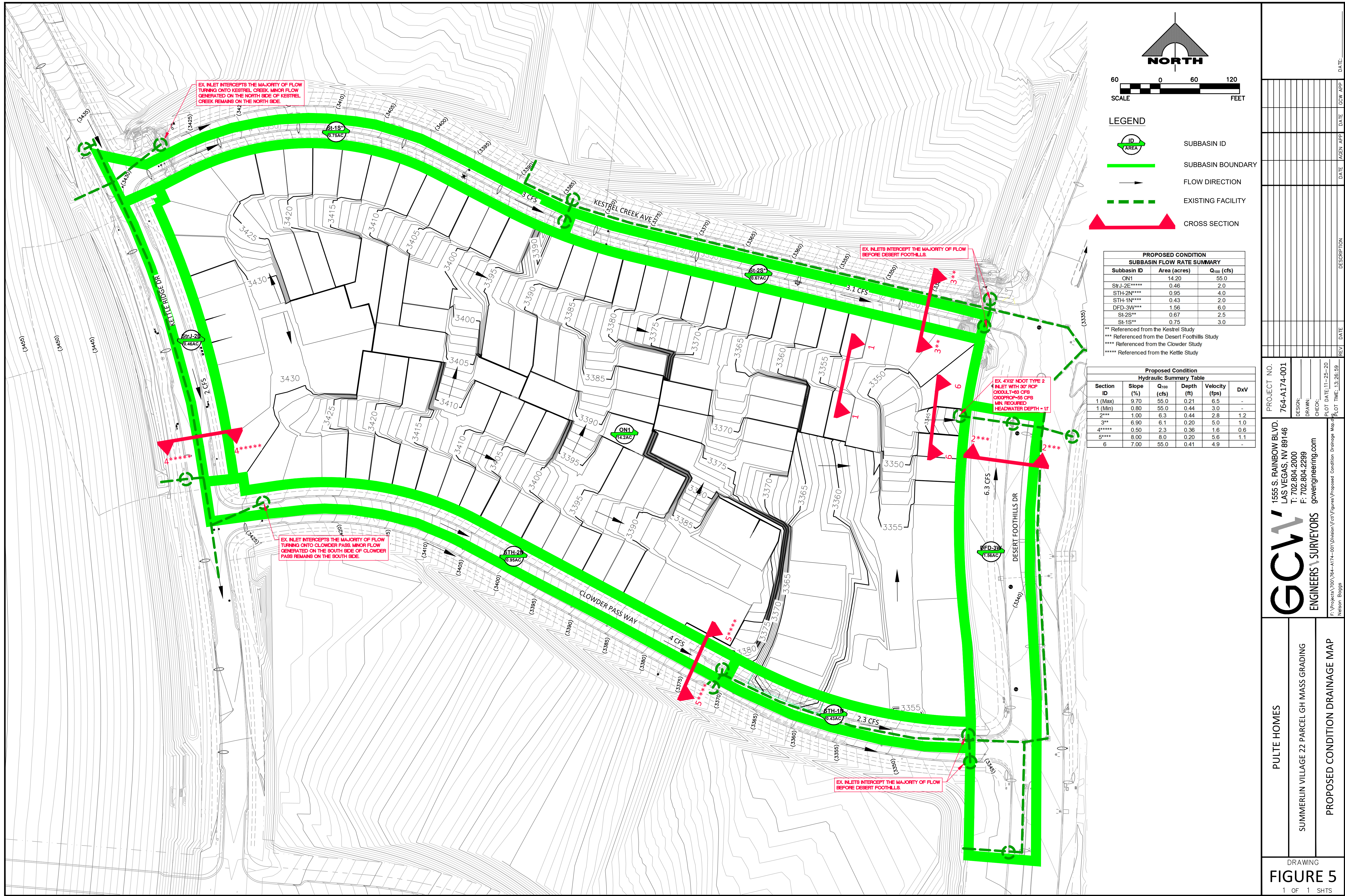
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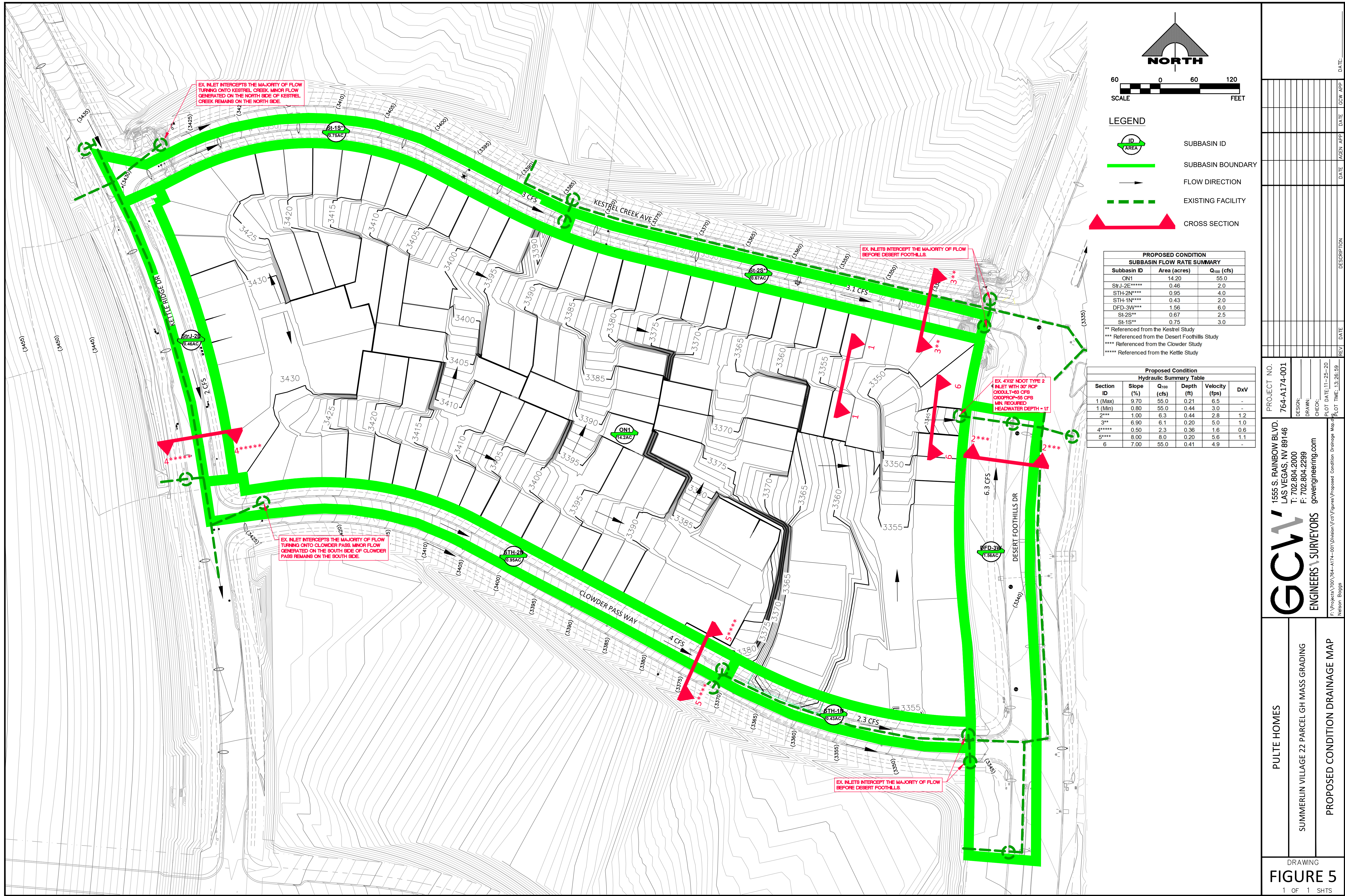


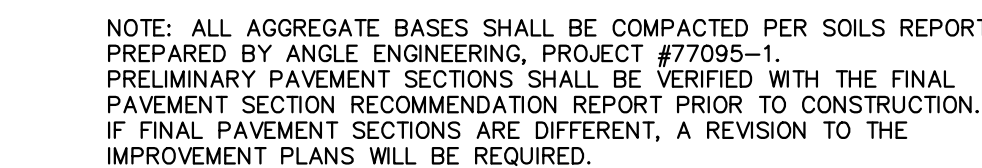
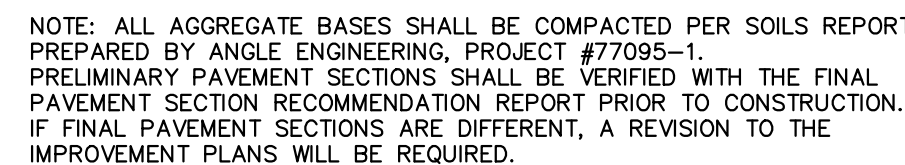
MPU ID	DESCRIPTION	TRIB A	DESIGN Q	STATUS
APDF0128	5' X 4' RCB	0.37	509	PRO
APDF0127	6' X 6' RCB	0.69	853	PRO
GOB30000	66" RCP	0.18	341	COM
APBE0249	6' X 5' RCB	0.31	606	PRO
GOBE0096	CONC CHNL 20'W 9'D 2:1 SS	0.49	782	COM
GOBE0127	CONC CHNL 20'W 6'D 2:1 SS	0.49	782	COM
GOBE0088	2: 10' X 9' RCBC @ LAKE MEAD	0.49	782	COM
APBE0154	8' X 6' RCB	0.41	781	PRO
APDF0073	6' X 4' RCB	1.52	486	PRO
GOBE0058	CONC CHNL 15'W 7.5'D 0:1 SS	0.67	1044	COM
GOBE0065	CONC CHNL 17'W 7.5'D 0:1 SS	0.67	1044	COM
APDF0026	8' X 6' RCB	1.8	968	PRO
GOL30290	NATURAL WASH 363'W	1.59	1410	COM
GOBE0108	CONC CHNL 20'W 6'D 2:1 SS	0.49	782	COM
GOL30197	14' X 14' RCB	4.31	3615	COM
APDF0123	42" RCP	1.29	141	PRO
GOL30289	CONC CHNL 50'W 3.5'D 2:1 SS	2.44	2281	PRO
GOL30188	CONC CHNL 20'W 8'D 0:1 SS	4.31	3615	COM
APBE0122	CONC CHNL 10'W 4'D 2:1 SS	0.59	1048	COM
GOBE0139	CONC CHNL 10'W 5.5'D 2:1 SS	0.49	782	COM
GOL30214	Dual 10' X 14' RCB	4.31	3615	COM
GOL30216	CONC CHNL 50'W 4'D 2:1 SS	4.02	3524	PRO

MPU ID	DESCRIPTION	TRIB A	DESIGN Q	STATUS
APDF0125	130 AC-FT GRAND PARK DETENTION BASIN	1.29	1543	PRO







[illegible]

PROJECT NO.	
764-A174-001	
DESIGN:	NPD
DRAWN:	NPD
CHECK:	WTP
PLOT DATE:	11-25-20
PLOT TIME:	14:33:58

GCV
ENGINEERS \ SURVEYORS

1555 S. RAINBOW BLVD.
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PRODUCTS: VOO 174-A-174-501 (VVO) CABLES 174-A-174-445Z CABLES 01MS

NICHOLAS BIERSSA

PULTE HOMES	DRAWING MG3 3 OF 5 SHTS
SUMMERLIN VILLAGE 22 PARCEL GH	
STREET SECTIONS	



