DS #: 05251

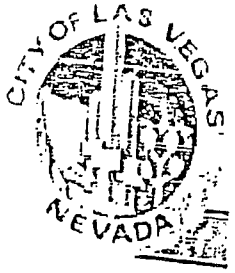
APN: 137.23.201.001

PROJECT: Summerlin West V22 - Flight Range Avenue (From Kettle Bend to Desert Foothills)

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**				**DATE:** **March 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 – Flight Range Avenue (from Kettle Bend to Desert Foothills)**			**COPIES TO:** VTN Nevada
Cross Streets:	Desert Foothills Blvd. & Flight Range Ave.			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5251A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-201-001			CCRFCD
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	2/18/2020	3/12/2020	See Comments Below	$400.00	3747250: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS:

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

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

1. The subject project is based on the premise that *Kettle Bend Road* and the associated storm drain facilities are in place for flood protection. The subject drainage study will not be finally approved prior to the posting of the construction bonds of *Summerlin West Village 22 - Kettle Bend Road (Sunset Run Drive to Kestrel Creek Road)*.
2. The project proposed to construct temporary drainage facilities including drainage berms/ditches along the north and south sides of the proposed improvements. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.

3. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

4. **Sheet MUTSD** and all pertinent plans: Provide drop inlets on each side of *Flight Range Avenue* at approximately Station 17+50. A proposed inlet on the south side at Station 15+65.13 may be replaced by the one at Station 17+50.

5. In all pertinent lateral plan & profile sheets, label the depth of the proposed drop inlets. All storm drain inlets that are more than 10'-deep require a special structural detail and calculations. Submit structural design and calculations to *City Building & Safety Department* for review and approval prior to the final approval of the drainage study.

6. All offsite interim flood control facilities such as but not limited to berms/ditches and temporary sump are privately owned and to be privately maintained by the *Howard Hughes Company*. Provide a note as such on the grading plans.

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

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

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



Sample Letter to certify CD.pdf

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

END OF REMARKS
ays

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

TRANSACTION REPORT

MAR/13/2020/FRI 06:15 AM

FAX(TX)

#	DATE	START T.	RECEIVER	COM.TIME	PAGE	TYPE/NOTE	FILE
001	MAR/13	06:14AM	7023622597	0:00:57	2	MEMORY OK ECM	5707

CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**				**DATE:** **March 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 – Flight Range Avenue (from Kettle Bend to Desert Foothills)**			**COPIES TO:** VTN Nevada
Cross Streets:	Desert Foothills Blvd. & Flight Range Ave.			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5251A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-201-001			CCRFCD
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	2/18/2020	3/12/2020	See Comments Below	$400.00	3747250: $400
			TOTAL FEES (LDDRS):	**$400.00**	----

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   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.

Technical Drainage Study for

Summerlin West Village 22
Flight Range Avenue
Kettle Bend to Desert Foothills

Las Vegas, Nevada

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin West V22 Flight Range Avenue- Kettle Bend to Desert Foothills Date: 02/18/2020

Location of Development: a) Descriptive (Cross Streets) North/South: Kettle Bend Road

East/West: Flight Range Road

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

c) APN : 137-23-201-001

Name of Owner: The Howard Hughes Company, LLC

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

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

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

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

Firm: VTN Nevada

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

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 1.36 Acres Being Developed/Disturbed: +/-1.36 Acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☒ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ **Yes**** ☐ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Roadway
5. Approximate upstream land area which drains to the subject site: +/- 22 acres
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: SWPA MPU(DS 4926), Summerlin V22-Kettle Bend Road(DS 5204);Summerlin V21-Summerlin Parkway Extension(DS 5159);MDS Summerlin V22(DS 5005)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing 8'x8' RCB located east of the project site in Kettle Bend Road.
8. Briefly describe your proposed schedule for the subject project: As soon as possible

PROFESSIONAL ENGINEER - STATE OF NEVADA
JOANNA Y. AYSON
EXP: 12/31/20
CIVIL
No. 26638
2/18/20

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

Updated 05/01/2008

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT
(Revised 5/18/11)

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

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

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

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

II. GRADING PLAN INFORMATION		
Yes	No	
X		Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
N/A		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
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.
N/A		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.)
N/A		This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
N/A		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

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

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

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

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

PROVIDING QUALITY PROFESSIONAL
SERVICE SINCE 1960

February 12, 2020

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

Subject: **Technical Drainage Study for Summerlin West Village 22 Flight Range Avenue**

Mr. Sung:

This letter certifies that all items on the **Technical Drainage Study for Summerlin West Village 22 Flight Range Avenue** electronic submittal matches the paper version bound into the study.

Respectfully submitted,

Joanna Ayson, P.E.

TECHNICAL DRAINAGE STUDY

FOR

SUMMERLIN WEST VILLAGE 22

FLIGHT RANGE AVENUE

W.O. # 7861-MISC-16

Prepared for:
THE HOWARD HUGHES COMPANY, LLC

Submitted To:
CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS

PROVIDING QUALITY PROFESSIONAL
SERVICE SINCE 1960

February 12, 2020
W.O. #7861-MISC-16

City of Las Vegas
Land Development Services
Department of Building Safety

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

SUBJECT: TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22 FLIGHT RANGE AVENUE – KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

Mr. Sung,

Transmitted herewith for your review is one (1) copy of the *Technical Drainage Study for Summerlin West Village 22 Flight Range Avenue – Kettle Bend Road to Desert Foothills Drive.* The site is a ± 1.5-acre development located within a portion of Section 23, Township 20 South, Range 59 East, M.D.M., Clark County, Nevada.

If there are any questions concerning this study or if additional information is needed, please do not hesitate to contact this office.

Respectfully Submitted,

VTN Nevada

Joanna Ayson, P.E.

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I. INTRODUCTION

A. STUDY OVERVIEW AND PURPOSE

The Howard Hughes Company is proposing to construct Flight Range Avenue between Kettle Bend Road and Desert Foothills Drive. The proposed project will include approximately +/- 830-linear feet of roadway improvements and flood protection infrastructure. This *Technical Drainage Study for Summerlin Village 22 Flight Range Avenue – Kettle Bend Road to Desert Foothills Drive* serves to analyze the drainage conditions for the proposed improvements and to determine adequate flood protection for the project. The methodology presented in this study is in accordance with the criteria set forth in the Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (HCDDM) (Hereinafter referred to as the Manual).

B. LOCATION

The site is located within a portion of Section 23, Township 20 South, Range 59 East, M.D.M, Clark County, Nevada. The project lies within Village 22 of the Summerlin West Planning Area (SWPA). Specifically, the site is located north of Sunset Run Drive and west of the I-215 Western Beltway. (Refer to *Figure 1: Vicinity Map*).

C. DESCRIPTION

The site slopes from the west to the east at approximately 6% and is presently bound by undeveloped land to the north, south, east, and west. (Refer to *Figure 2: Site Description Map*)

D. FLOODPLAIN INFORMATION

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community Panel Number 32003C2150E, Clark County, Nevada, and Incorporated Areas, dated September 27, 2002, the site is located within a Zone "X". A Zone "X" is described as an area determined to be outside the 0.2% annual chance floodplain. (Refer to *Figure 3: Flood Insurance Rate Map*)

E. MASTER PLANNING INFORMATION

The proposed site is delineated on the referenced Figures F-22 and W-4 from the 2018 Clark County Regional Flood Control District (CCRFCD) Las Vegas Valley Flood Control Master Plan Update (MPU) (Refer to *Figures 4A and 4B, MPU Facilities Map and MPU Hydrologic Map*). The referenced MPU facility map indicates that the project is adjacent to CCRFCD Facility APBE 0154. Facility APBE 0154 is described as an 8'x6' RCB.

Hydrologic patterns and drainage facilities within the SWPA were re-studied according to a revised land plan in the *Update #2 to the Drainage Study for Summerlin West Planning Area Master Plan Update* which was submitted to CLV on October 28, 2019 (hereinafter referred to as the Master Study). The Master Study reconfigured the overall CCRFCD conceptual storm drain layout within the SWPA, and the information presented in the latest Master

Study supersedes the information in the 2018 CCRFCD MPU. Facility 0154 was revised to an 8'x8' RCB in the latest Master Study. Drainage patterns in this project are consistent with the Master Study and therefore the improvements proposed in this project will not adversely impact existing or proposed CCRFCD facilities.

F. REFERENCED HYDROLOGY STUDIES

The following drainage studies and their corresponding addendums and updates have been referenced for the purposes of this report:

- *Drainage Study for Summerlin West Planning Area Master Plan Update* (referred to as the Overall Master Study), approved by the City of Las Vegas (CLV) March 13, 2019 (DS4926), Update #2 submitted on October 28, 2019 and currently under review.
- *Technical Drainage Study for Summerlin Parkway Extension (*referred to as the Summerlin Parkway Study), originally submitted to CLV on July 18, 2019 (DS5159), and currently under review.
- *Update #2 Master Conceptual Drainage Study for Village 22* (referred to as the Village 22 Master Study), conditionally approved by CLV on December 12, 2019 (DS5005)
- *Technical Drainage Study for Kettle Bend Road (Sunset Run Drive to Kestrel Creek Road)* (referred to as the Kettle Bend Study), originally submitted to CLV on October 15, 2019 and currently under review (DS5204).

The referenced drainage studies have been reviewed by the engineer and have been determined to be acceptable for use in this drainage study.

II. HYDROLOGIC ANALYSIS

A. METHOD OF ANALYSIS

The hydrologic modeling for this study was prepared using the SCS Unit Hydrograph Methodology in conjunction with the HEC-1 computer program from the U.S. Army Corps of Engineers (USACOE) as outlined in the Clark County Regional Flood Control District *Hydrologic Criteria and Drainage Design Manual* (hereinafter referred to as the *Manual*). The computation and analyses have been included in the Appendix of this study.

B. RAINFALL CRITERIA

The project site is outside in the McCarran Airport Rainfall Area as shown by Figure 513 of the Manual. The calculated rainfall depth for the project is 3.40-inches and has been referenced from the Village 22 Master Study. The referenced precipitation coverage map for the project is provided in Appendix D. The provided map depicts rainfall depths adjusted per the 2006 MPU Atlas 2.

C. RUNOFF COMPUTATION

The SCS Soil Survey of Las Vegas, Nevada, was used to identify soil types and their corresponding hydrologic soil groups. The land uses or land covers for onsite and offsite basins include Desert Shrub in Poor Condition and Impervious Paved Roads/Streets. For the given soil type and land use, CN values were determined from using the appropriate

columns of Table 602 of the Manual. Soil information and CN calculations for existing condition basins have been included in Appendix B.

The lag times quantify how long before basins are contributing to flow at the outlet and is a representative scale of an individual basin that were determined using Standard Form 4. Velocities used in Standard Form 4 have been calculated using the equation $V = CS^{1/2}$ from the *Manual*. The coefficient C = 14.8 represents wide channel flow with D = 0.25 and n = 0.04 for undeveloped conditions. The coefficient C = 29.4 represents wide channel flow with D = 0.7 and n = 0.04 for undeveloped conditions. The coefficient C = 20.2 represents street flow with n = 0.016 and a depth in the gutter of 0.3 feet for developed conditions. The coefficient C = 30.6 represents curb height street flow for developed conditions.

Travel Time velocities have been calculated based on the equation $V = CS^{1/2}$ from section 602.1 of the *Manual*. For basins analyzed in this study, the first 500 feet of the Travel Time Length uses the V_1 set of C coefficients from the *Manual* and the remaining Travel Time Length uses the larger V_2 set of coefficients. The Standard Form 4 computes the Travel Time separately for the V_1 and V_2 portions of the basin and adds them together to give the total Travel Time for the basin. Based on the hydrologic properties and land usages of the basins within this study, we feel that the 500-foot break point provides a conservative but representative assumption to where enough flow can be generated within the basin to warrant the use of the higher velocity coefficients. In summary,

Existing Conditions	**Developed Conditions**
$V_1 = 14.8*(S/100)^{1/2}$	**$V_1 = 20.2*(S/100)^{1/2}$**
$V_2 = 29.4*(S/100)^{1/2}$	**$V_2 = 30.6*(S/100)^{1/2}$**

D. PEAK FLOWS

The following table summarizes the peak flow generated by each offsite and onsite basin for the listed conditions. A discussion of each drainage condition may be found in the following section of this report.

TABLE 1
INTERIM CONDITION
HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100
OFF1	0.93	2
OFF2	3.13	5
STE3*	1.36	6
*Referenced from V22 MCDS by VTN (DS# 5005)		

TABLE 2 ULTIMATE CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	**AREA (ac)**	**Q100**
STE2*		8
BB*	6.29	23
CBB	-	31
T*	4.02	13
CT	-	44
CC*	5.34	19
CCC	-	63
DD*	4.76	17
CDD	-	77
STE3*	1.36	6
CSTE3	-	80
*Referenced from V22 MCDS by VTN (DS# 5005)		

III. ONSITE & OFFSITE BASIN ANALYSIS

A. EXISTING CONDITION ANALYSIS

Presently, the existing site slopes from east to west and storm flow is conveyed as sheet flow easterly to the 215 Western Beltway Channel. It is assumed that the downstream Kettle Bend Road improvements will be constructed prior to or concurrently with this project. An existing upstream channel along the former Desert Foothills Drive alignment directs flow generated upstream of the project northerly away from the project. The Summerlin Parkway Extension study analyzed the existing channels to the west and verified flow will be contained within the channels. The Overall and Village 22 Master Studies defined the flow patterns within the Summerlin West Planning Area and verified the permitted discharge flow rates for the project, and therefore a site-specific existing condition hydrologic analysis is not required.

B. INTERIM CONDITION ANALYSIS

(Refer to *Figure 6: Interim Condition Basin Map* in Appendix A.*)*

Interim Condition assumes that the proposed Flight Range Avenue improvements and the referenced Kettle Bend Road improvements are fully constructed. The areas immediately to the north, south, and west of the site are assumed to be undeveloped.

1. OFFSITE DRAINAGE BASIN DESCRIPTION

An existing channel along the former Desert Foothills Drive alignment conveys flows northerly away from the project. Therefore, flow generated to the west does not enter the project in interim condition. Flow generated by the offsite areas to the north and south are conveyed easterly as sheet flow parallel to Flight Edge Avenue. Roadside swales are proposed adjacent to Flight Edge Avenue on both the north and south sides to provide a more defined flow path. Two offsite basins have been delineated to determine the flow impacting the roadside swales, OFF1 and OFF2. Flow in the proposed roadside swales will eventually enter existing swales constructed with Kettle Bend Road which direct the offsite flow to storm drain stubs in Kettle Bend Road.

2. ONSITE DRAINAGE BASIN DESCRIPTION

The interim condition onsite basin STE3 has been referenced from the Village 22 Master Study and represents the site in its fully developed state. Flow generated by the project in interim condition will be intercepted by drop inlets and will flow easterly to Kettle Bend Road.

C. ULTIMATE CONDITION ANALYSIS

(Refer to *Figure 7: Ultimate Condition Drainage Map)*

Ultimate condition assumes that the proposed improvements and offsite areas are fully developed. Referenced drainage basins correspond to the future Summerlin West parcels and roadways. Hydrologic calculations have been included in Appendix B. Pertinent reference material is included in Appendix D.

1. OFFSITE DRAINAGE BASIN DESCRIPTION

Ultimate condition offsite drainage basins have been referenced from the Village 22 Master Study. Offsite basins and concentration points tributary to the project in ultimate condition are depicted on Figure 7. Since the approval of the latest Village 22 Master Study, Atkins and VTN have begun coordination on the design of Desert Foothills Drive between Sunset Run and Flight Range Avenue. The invert elevation of the approved Sunset Run and Desert Foothills Drive intersection proved to be a design constraint that would best be resolved by allowing the storm drain in Flight Range Avenue between Desert Foothills and Kettle Ridge to continue east towards Kettle Bend Road rather than turning south in Desert Foothills. The Overall Master Study hydrology addressed the revised flow patterns and confirmed the revised flow patterns do not adversely impact downstream facilities on a regional level. Therefore, this study shows the referenced ultimate condition Concentration Point CDD (77 cfs) routed through the proposed project towards Kettle Bend Road rather than south in Desert Foothills. The referenced basins and concentration points are depicted on Figure 7 included in Appendix A.

2. ONSITE DRAINAGE BASIN DESCRIPTION

The ultimate condition onsite basin is consistent with the interim condition. Basin STE3 has been referenced from the Village 22 Master Study and represents the project in its fully developed state. Flow generated onsite will be discharged east to Kettle Bend Road.

IV. EXISTING & INTERIM CHANNELS

(Refer to *Figure 6: Interim Condition Drainage Map)*

Temporary offsite channels are proposed to protect the roadway and to direct flows to storm drain laterals in Kettle Bend Road. Facility names for the offsite ditches/berms in the calculations correspond to the tributary basin and facility location. A summary of the offsite swales are summarized in Table 3 below. Normal depth calculations have been included in Appendix C. Refer to Figure 6 for the locations of the channels.

TABLE 3
INTERIM CONDITION SWALE SUMMARY TABLE

Swale	Q100 (cfs)	Slope	Normal Depth (ft)	Freeboard Req'd (ft)	Total Depth (ft)	Velocity (ft/s)	Side Slopes
SW1	2	4.00%	0.41	1.07	1.48	3.98	3:1/3:1
SW2	5	4.00%	0.58	1.10	1.68	5.01	3:1/3:1

In general, the proposed offsite grading will consist of unlined V ditches. The proposed offsite channels will have a minimum of 1-foot of freeboard above the calculated water surface elevation.

V. STREET FLOW

A street hydraulic analysis has been provided to determine the normal depth and velocity of the anticipated storm flows within the proposed streets. Please note that all parcels within Summerlin West are required to drain to storm drain stubs provided with the main storm lines in the adjacent Summerlin built streets. No parcel flows will be discharged into Summerlin streets as surface flow. In addition, it is assumed that no surface flows will enter the proposed streets in any condition.

The results of the street flow analysis are summarized in Table 4. Refer to Figure 7 for the locations of the cross sections used in the analysis. Street hydraulic calculations are included in Appendix C.

TABLE 4
ULTIMATE CONDITION STREET FLOW ANALYSIS SUMMARY

Street Section	Q100 (cfs)	Slope	Velocity (ft/s)	Depth (ft)	V x D	Tributary Basin
ST1 MIN	6	2.15%	3.08	0.32	0.99	STE3*
ST1 MAX	6	7.12%	4.98	0.28	1.39	STE3*
*Referenced from SWPA MPU by VTN (DS# 4926)						

The product V x D has been calculated for each section to show that the flow within the drive aisles meets the Manual requirement. The manual requires the V x D to be less than 6 in the 10-year storm event and less than 8 in the 100-year storm event. The results show that the V x D requirements for both the 10-year and 100-year events have been met. Additionally, all flow depths are contained below top of curb as required by Summerlin criteria.

VI. STORM DRAIN FACILITES

This project consists of a 36-inch RCP mainline which extends from Kettle Bend to Desert Foothills. In ultimate condition, 77 cfs will enter the storm drain from upstream and onsite street flow will enter the storm drain by drop inlets. The design flow used for the mainline is 80 cfs (CSTE3). In interim condition, only drop inlet flow will enter the storm drain therefore ultimate condition presents the worst-case flows. The mainline has been modeled in Standard Form 6. Hydraulic calculations have been included in Appendix C.

VII. CONCLUSIONS

This *Technical Drainage Study for Summerlin West Village 22 Flight Range Avenue – Kettle Bend Road to Desert Foothills Drive* has been developed in accordance with Criteria established in the Manual. The proposed development does not adversely impact any proposed or existing Clark County Regional Flood Control District Master Plan Update facilities.

The site has been designed to control storm water runoff for the 6-hour, 100-year floods as calculated in this study and the Master Study. There are no adverse effects on upstream or downstream properties due to the proposed drainage system or infrastructure improvements.

REFERENCES

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

2. *CCRFCD Las Vegas Valley Flood Control Master Plan Update*, 2008 and 2013.

3. *Flood Insurance Rate Map*, Community Panel Number 32003C2545F, Clark County, Nevada and Incorporated Areas, effective date November 16, 2011, and is a digital duplication of the FIRM Map derived from the Clark County GIS database.

4. *Soil Survey of Las Vegas, Nevada, Part of Clark County*, by the United States Department of Agriculture, Soil Conservation Service.

5. *Drainage Study for Summerlin West Planning Area Master Plan Update*, approved by the City of Las Vegas (CLV) March 13, 2019 (DS4926), Update #2 submitted on October 28, 2019.

6. *Technical Drainage Study for Summerlin Parkway Extension*, submitted to CLV on July 18, 2019 (DS5159).

7. *Update #2 Master Conceptual Drainage Study for Village 22* (referred to as the Village 22 Master Study), conditionally approved by CLV on December 12, 2019 (DS5005).

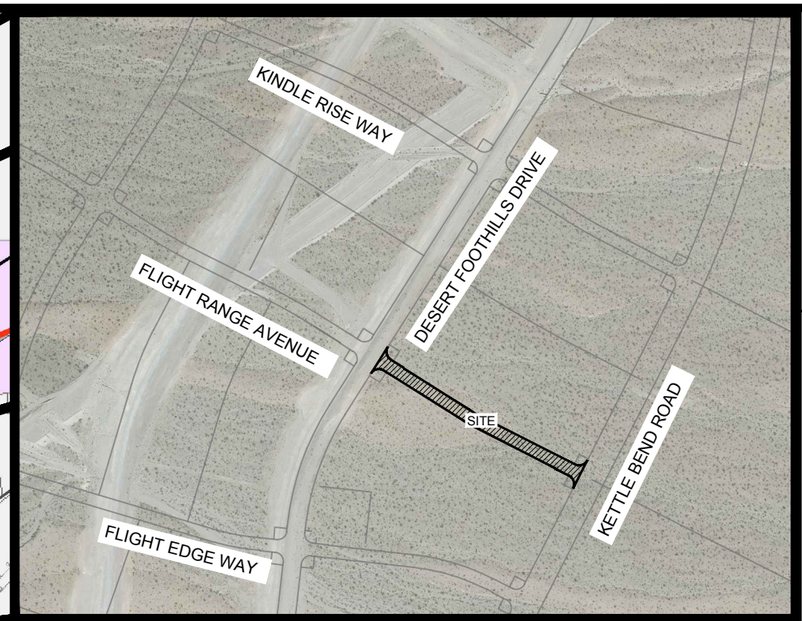
8. *Technical Drainage Study for Kettle Bend Road (Sunset Run Drive to Krestel Creek Road)*, submitted to CLV on October 15, 2019 (DS5204).

APPENDIX

APPENDIX A
FIGURES

FIGURE 1: VICINITY MAP
SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE
(KETTLE BEND TO DESERT FOOTHILLS)

W.O.#:	7861- MISC- 16
DATE:	11/21/2019
BY:	RBR
SCALE:	N/A
SHEET	1 OF 1



Lone Mountain

North Las Vegas

LAS VEGAS

Winchester

Spring Valley

Paradise Valley

Red Rock Canyon
nal Recreational Lands

McCARRAN INTERNATIONAL AIRPORT

NLV AIRPORT

UNLV

SR 157 KYLE CANYON

GRAND TETON

CENTENNIAL

ANN

LONE MOUNTAIN

CRAIG

ALEXANDER

CHEYENNE

CAREY

LAKE MEAD BLVD

VEGAS

WASHINGTON

OWENS

BONANZA

STEWART

CHARLESTON

SAHARA

VEGAS VALLEY

DESERT INN

SPRING MOUNTAIN

TWAIN

SANDS

FLAMINGO

TROPICANA

RUSSELL

SUNSET

WARM SPRINGS

WINDMILL

SUMMERLIN PKWY

DEL WEBB

SMOKE RANCH

BOULDER HWY

LAKE MEAD BLVD

SR 159

SR 14

SR 41

95

215

15

CC 215

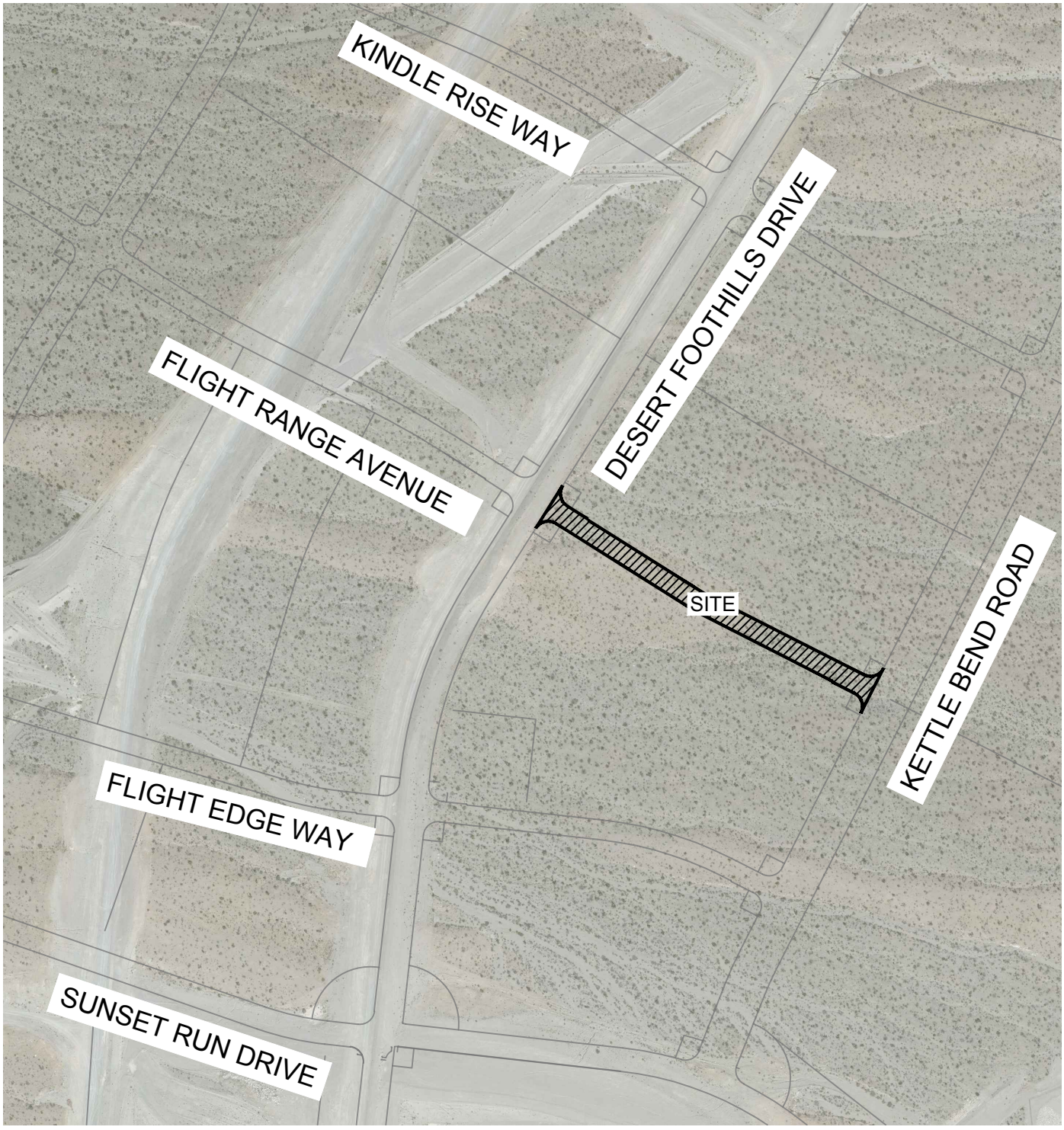
I 215

US 95

U.P.R.R.

H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Drainage\A Figures\Figure 1 & 2.dwg;rachelr; Nov 21, 2019 - 10:48am

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148



GRAPHIC SCALE

300 0 150 300 600

1" = 300'

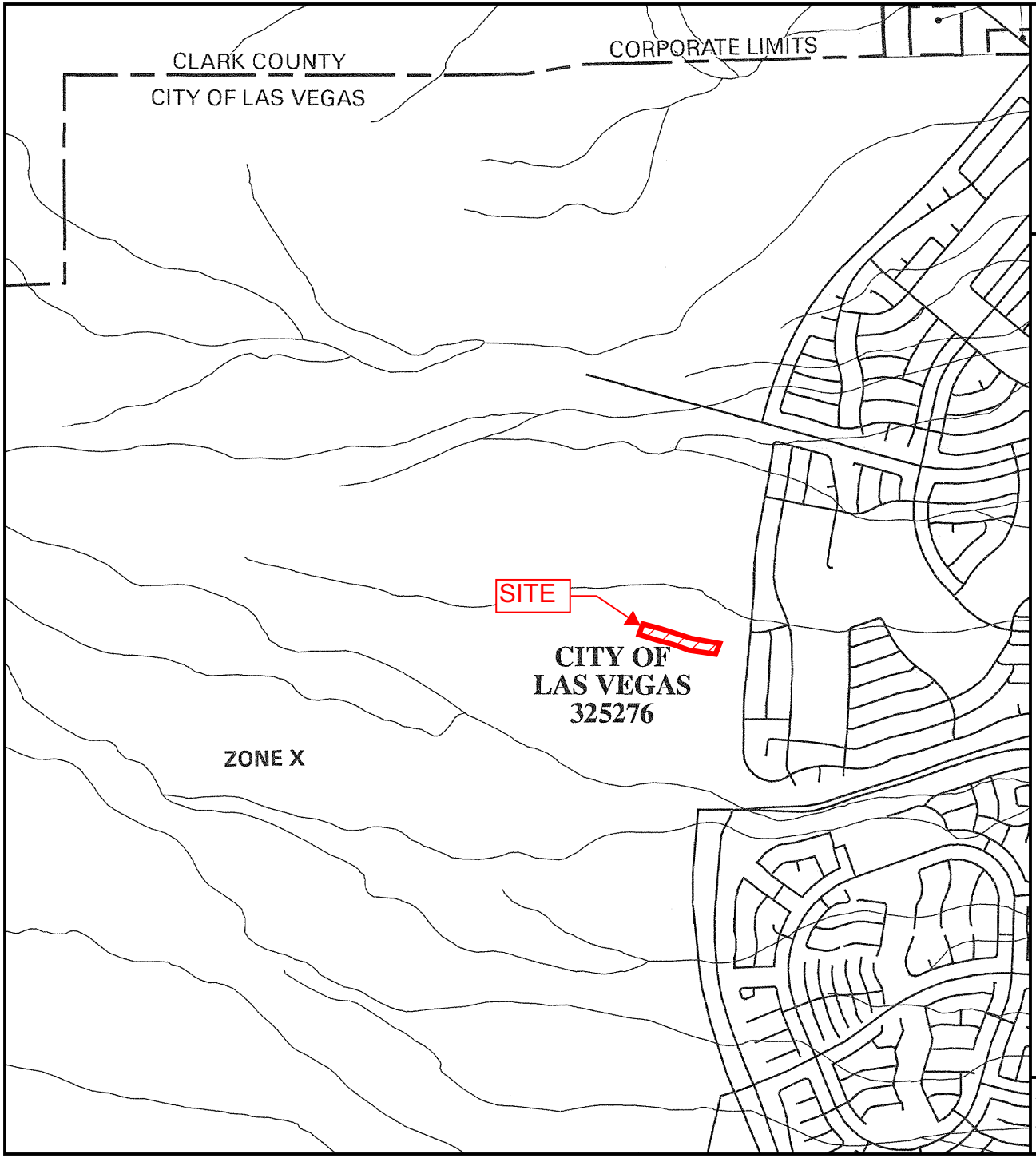
NORTH

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE
(KETTLE BEND TO DESERT FOOTHILLS)

SITE DESCRIPTION MAP
FIGURE 2

SCALE	HORZ.	1"= 300'
	VERT.	N/A
W.O. NO.		7861- MISC- 16
DRAWN BY:		RBR
DATE:		11/21/2019
SHEET	1	OF 1



MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

PANEL 2150 E

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY,
NEVADA AND
INCORPORATED AREAS

PANEL 2150 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS, CITY OF	325276	2150	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	2150	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C2150 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

FIGURE 3

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD		ANGEL PARK - ALTA DRIVE BRANCH						
0203	E	2: 7' X 5.5' RCB	1104	2200	CSWAA-1	GOW3A	6.95	5.28
0225	E	2: 7' X 5.5' RCB OUTLET	360	2137	SUM5DB	GOW3A	6.73	3.40
APBE		ANGEL PARK - BELTWAY BRANCH						
0022	E	CONC CHNL 20'W 7'D 2:1 SS	1556	3366	CCSWFH15	GOW3A	3.39	1.81
0051	E	CONC CHNL 20'W 7'D 2:1 SS	1583	3366	CCSWFH15	GOW3A	3.39	2.77
0081	E	8' X 8' RCBC @ FAR HILLS	777	1048	CSWFH-15	GOW3A	0.59	2.32
0094	E	CONC CHNL 10'W 5'D 2:1 SS	1465	1048	CSWFH-15	GOW3A	0.59	1.88
0122	E	CONC CHNL 10'W 4'D 2:1 SS	1685	1048	CSWFH-15	GOW3A	0.59	0.80
0154	P0	8' X 6' RCB	5012	781	CSWFH-12	GOW3A	0.41	1.30
0249	P0	6' X 5' RCB	2858	606	CSWFH-11	GOW3A	0.31	3.00
APCH		ANGEL PARK - CARRIAGE HILL BRANCH						
0000	E	8' X 6' RCB	152	399	CSWFH-14	GOW3A	0.21	0.87
0003	P0	72" RCP	1685	399	CSWFH-14	GOW3A	0.21	2.00
0031	P0	60" RCP	2008	206	SWFH-13	GOW3A	0.10	1.38
APD2		ANGEL PARK - DESERT FOOTHILLS 2 BRANCH						
0002	E	7' X 6' RCB	883	674	SWAA-2	GOW3A	0.68	1.08
APDF		ANGEL PARK - DESERT FOOTHILLS BRANCH						
0000	P0	10' X 6' RCB	1788	1428	CSWFH-9	GOW3B	0.80	3.55
0026	P0	8' X 6' RCB	1813	968	CSWFH-8	GOW3A	1.80	2.00
0073	P0	6' X 4' RCB	1922	486	CSWFH-4	GOW3A	1.52	4.40
0123	P0	42" RCP	1076	141	GPDB	GOW3A	1.29	6.00
0125	P0	130 AC-FT GRAND PARK DETENTION BASIN		1543	CSWFH-3	GOW3A	1.29	
0127	P0	6' X 6' RCB	2977	853	SWFH-1	GOW3A	0.69	3.80
0128	P0	5' X 4' RCB	2197	509	SWFH-2	GOW3A	0.37	5.70
APFH		ANGEL PARK - FAR HILLS BRANCH						
0000	E	2: 8' X 8' RCB	1070	2494	CCSWFH14	GOW3B	1.51	3.50
0019	E	2: 8' X 8' RCB	250	2149	CCSWFH-9	GOW3B	1.30	4.19
0024	E	16' X 8' RCAP	1951	2149	CCSWFH-9	GOW3B	1.30	5.10
0061	E	8' X 6' RCB	1435	839	CSWFH-7	GOW3A	0.50	2.00
0089	E	8' X 6' RCB	2946	839	CSWFH-7	GOW3A	0.50	2.00
0144	P0	5' X 4' RCB	2497	456	SWFH-6	GOW3A	0.28	5.50
APM5		DETENTION BASIN #5						
0000	E	384 AC-FT DETENTION BASIN #5		6856	SUM5IN	GOW3A	6.73	
0008	P0	CONC CHNL 50'W 4.5'D 2:1 SS	2102	3634	CCDB54-7	GOW3A	4.13	5.20
0009	P0	CONC CHNL 50'W 4'D 2:1 SS	4180	3495	CDB55-7	GOW3A	2.60	5.80
0047	E	DIVERSION BERM WITH GABION BANK PROTECTION	1000	3634	CCDB54-7	GOW3A	4.13	1.30
0056	P0	CONC CHNL 80'W 4'D 2:1 SS	264	3634	CCDB54-7	GOW3A	4.13	1.30
0057	P0	CONC CHNL 50'W 3'D 2:1 SS	9922	1664	CDB54-4	GOW3A	0.81	6.80
0059	P0	CONC CHNL 100'W 3'D 2:1 SS	9075	2606	CDB54-7	GOW3A	3.31	7.00
0212	P0	CONC CHNL 30'W 3'D 2:1 SS	6695	1092	DB55-1	GOW3A	0.64	7.50
0213	P0	CONC CHNL 50'W 3'D 2:1 SS	6522	1729	CDB55-5	GOW3A	1.30	7.30
APSP		ANGEL PARK - SUMMERLIN PARKWAY						
0183	E	CONC CHNL 10'W 6'D 2:1 SS	1680	884	C11B-1	GOW3A	0.84	1.70
GOB3		GOWAN LONE MOUNTAIN SYST. 3 BELTWAY						
0000	E	66" RCP	1370	341	SV22-1	GOW3A	0.18	4.50
GOBE		GOWAN LONE MOUNTAIN SYST. BELTWAY						
0000	E	20' X 10' RCBC @ ACCESS RD	30	1044	CSV22	GOW3A	0.67	5.67
0001	E	CONC CHNL 20'W 5'D 2:1 SS	1100	1044	CSV22	GOW3A	0.67	6.50
0021	E	CONC CHNL 11'W 6.8'D 0:1 SS	2143	1044	CSV22	GOW3A	0.67	6.50
0058	E	CONC CHNL 15'W 7.5'D 0:1 SS	487	1044	CSV22	GOW3A	0.67	3.93
0065	E	CONC CHNL 17'W 7.5'D 0:1 SS	844	1044	CSV22	GOW3A	0.67	0.76
0088	E	2: 10' X 9' RCBC @ LAKE MEAD	400	782	SV22-2	GOW3A	0.49	0.50
0096	E	CONC CHNL 20'W 9'D 2:1 SS	627	782	SV22-2	GOW3A	0.49	0.50
0108	E	CONC CHNL 20'W 6'D 2:1 SS	1021	782	SV22-2	GOW3A	0.49	0.50
0127	E	CONC CHNL 20'W 6'D 2:1 SS	638	782	SV22-2	GOW3A	0.49	0.50
0139	E	CONC CHNL 10'W 5.5'D 2:1 SS	1500	782	SV22-2	GOW3A	0.49	1.02
GOL3		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3						
0010	E	CONC CHNL 20'W 10'D 0:1 SS	3037	3277	CRCLMT1R	GOW3A	7.31	2.78
0068	E	TRANSITION STRUCTURE	100	3277	CRCLMT1R	GOW3A	7.31	3.50
0070	E	20' X 6' RCBC @ CLIFF SHADOWS	350	1271	CRCSV22	GOW3A	4.99	2.44
0077	E	CONC CHNL 20'W 6'D 0:1 SS	1229	1271	CRCSV22	GOW3A	4.99	6.11

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOL3		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3						
0100	E	CONC CHNL 20'W 10'D 0:1 SS	200	1271	CRCSV22	GOW3A	4.99	5.67
0115	E	96" RCP OUTLET	670	666	DET26	GOW3A	4.31	0.29
0128	E	305 AC-FT VILLAGE 26 DETENTION BASIN		3615	VIL26IN	GOW3A	4.31	
0137	E	CONC CHNL 20'W 7.5'D 0:1 SS	2720	3615	VIL26IN	GOW3A	4.31	6.50
0188	E	CONC CHNL 20'W 8'D 0:1 SS	563	3615	VIL26IN	GOW3A	4.31	3.91
0197	E	14' X 14' RCB	890	3615	VIL26IN	GOW3A	4.31	0.88
0214	E	Dual 10' X 14' RCB	124	3615	VIL26IN	GOW3A	4.31	0.57
0216	P0	CONC CHNL 50'W 4'D 2:1 SS	4060	3524	CSV26-1	GOW3A	4.02	6.08
0289	P0	CONC CHNL 50'W 3.5'D 2:1 SS	6215	2281	30	GOW3A	2.44	7.95
0290	E	NATURAL WASH 363'W	4850	1410	SV26-1	GOW3A	1.59	22.50
0370	E	NATURAL WASH 450'W	7000	2281	30	GOW3A	2.44	8.50
GOL4		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4						
0000	E	14' X 8' RCB	554	2243	CLMT1R	GOW3A	2.33	2.50
0010	E	2: 9' X 8' RCB	820	2243	CLMT1R	GOW3A	2.33	4.74
0025	E	SOIL CEMENT CHNL 60'W 8'D 3-4:1 SS	320	2243	CLMT1R	GOW3A	2.33	2.00
0026	E	SOIL CEMENT CHNL 42'W 6'D 3-4:1 SS	700	2243	CLMT1R	GOW3A	2.33	1.00

*The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.
**As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.
^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e. HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2018 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F-22

LEGEND

ID (Facility Identifier) AABB
Parent Stream Name
Stream Name
Mile 0000
Distance Above Confluence with Parent Stream (Miles)
Miles in Hundredths

Existing Facility..... E
Proposed or Modified Facility..... P
Contingency Level
Category A..... P
Category B..... P0

Bottom Width..... W
Depth..... D
Side Slope, H:V..... SS

Construction Features

Cast in Place Concrete Pipe..... CIPCP
Corrugated Metal Arch Pipe Culvert..... CMAP
Corrugated Metal Pipe Culvert..... CMPC
High Density Polyethylene..... HDPE
Horizontal Elliptical Reinforced Concrete Pipe..... HERCP
Reinforced Concrete Arch Pipe..... RCAP
Reinforced Concrete Arch Culvert..... RCAC
Reinforced Concrete Box..... RCB
Reinforced Concrete Box Culvert..... RCBC
Reinforced Concrete Pipe..... RCP
Reinforced Concrete Pipe Culvert..... RCPC
Storm Sewer Pipe..... SSP

ATKINS
Member of the SNC-Lavalin Group
Louis Berger

REGIONAL FLOOD CONTROL DISTRICT

2018
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-22
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Detention Basin
- Culvert or Bridge Crossing
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

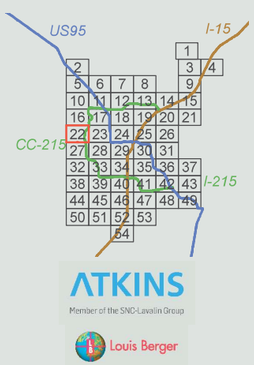
Category A	Category B
Channel	Channel
Stormdrain	Stormdrain
Crossing	Crossing

N

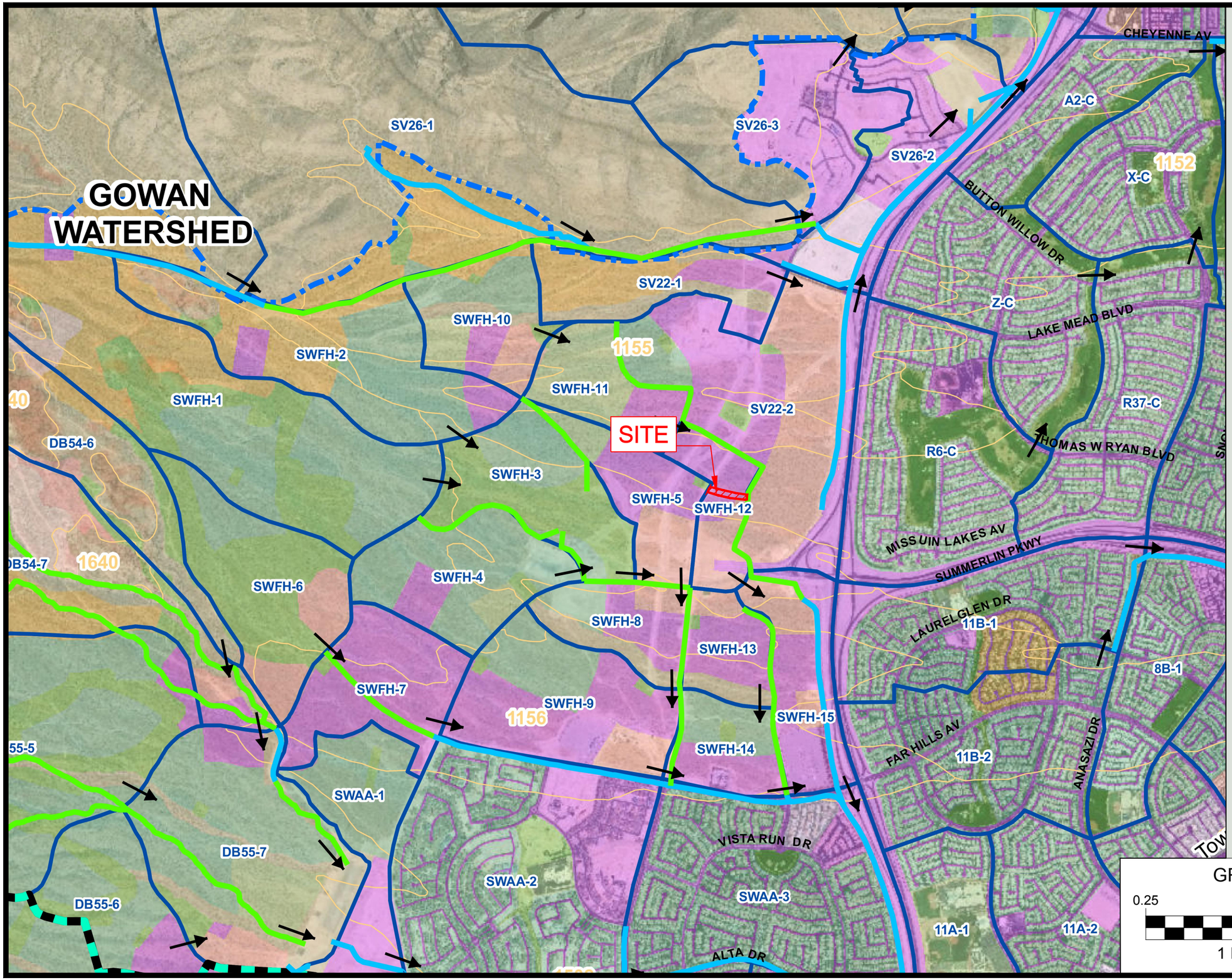
0 500 1,000 2,000 3,000
Feet

Scale: 1 inch = 2,000 feet

AerialSource:Esri World Imagery 2017



ATKINS
Member of the SNC-Lavalin Group
Louis Berger



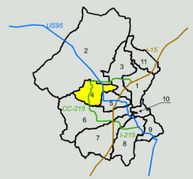
REGIONAL FLOOD CONTROL DISTRICT

2018 Las Vegas Valley Master Plan Update

Figure W-4
Gowan Watershed

Legend

- Flow Arrows
- NodeID flow(cfs) Concentration Points
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Ultimate Development Boundary
- Watershed
- BasinID Subbasins
- MUSYM Soils
- 1: Undeveloped Land, Open desert
- 2: Parks, Golf Courses
- 3: Rural, 0.5-1 units per acre (uses 1 unit/acre)
- 4: Low-Density Residential, 1-2 units per acre (uses 2 units/acre)
- 5: Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)
- 6: High-Density Residential, 4-8 units per acre (uses 6 units/acre)
- 7: Public Facility and Residential, 8-12 units/acre
- 8: Very High-Density Residential, 12 units/acre or more
- 9: Commercial, Retail, Casino, High Rise Condominiums
- 10: Light Industrial
- 11: Heavy Industrial
- 12: Schools
- 13: Lakes



GRAPHIC SCALE

0.25 0 0.125 0.25 0.5

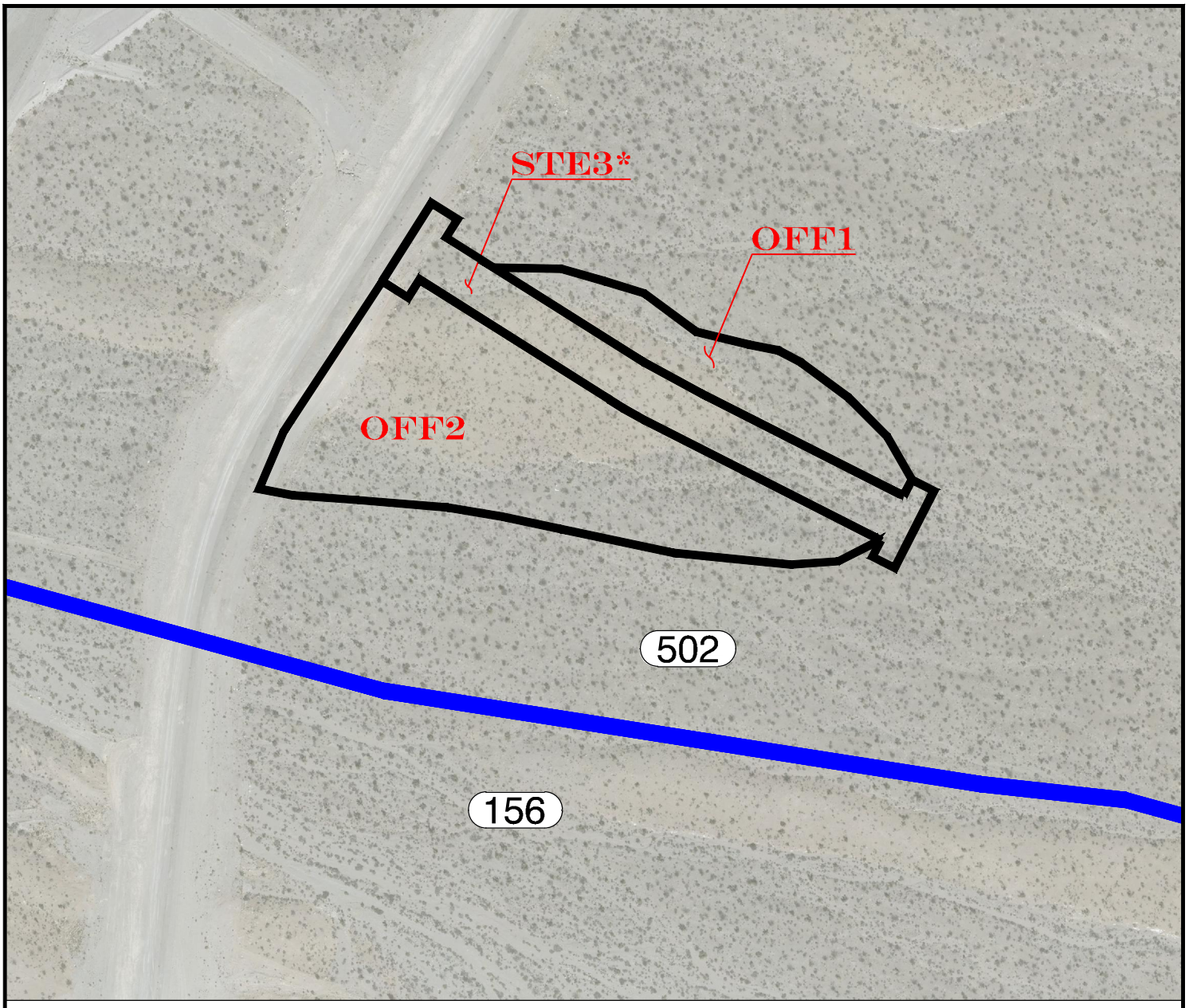
1 Inch = 0.25 Miles

W.O.#: 7861-MISC- 16
DATE: 11/21/2019
BY: RBR
SCALE: 1 Inch= 0.25 Miles
SHEET 1 OF 1

FIGURE 4B-FLIGHT RANGE AVENUE (KETTLE BEND TO DESERT FOOTHILLS) TRUNCATED W-4 GOWAN WATERSHED CCRFCD 2018 MPU

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Drainage\A Figures\MPU Map\Truncated W- Map.dwg,rachelr, Nov 21, 2019 - 10:55am



LEGEND

SITE BOUNDARY

300 SOIL NUMBER

SOIL BOUNDARY

NOTE:
1. This data was taken from the following website:
http://soildatamart.nrcs.usda.gov
2. This data is in state plane coordinates

GRAPHIC SCALE

200 0 100 200 400

1" = 200'

NORTH

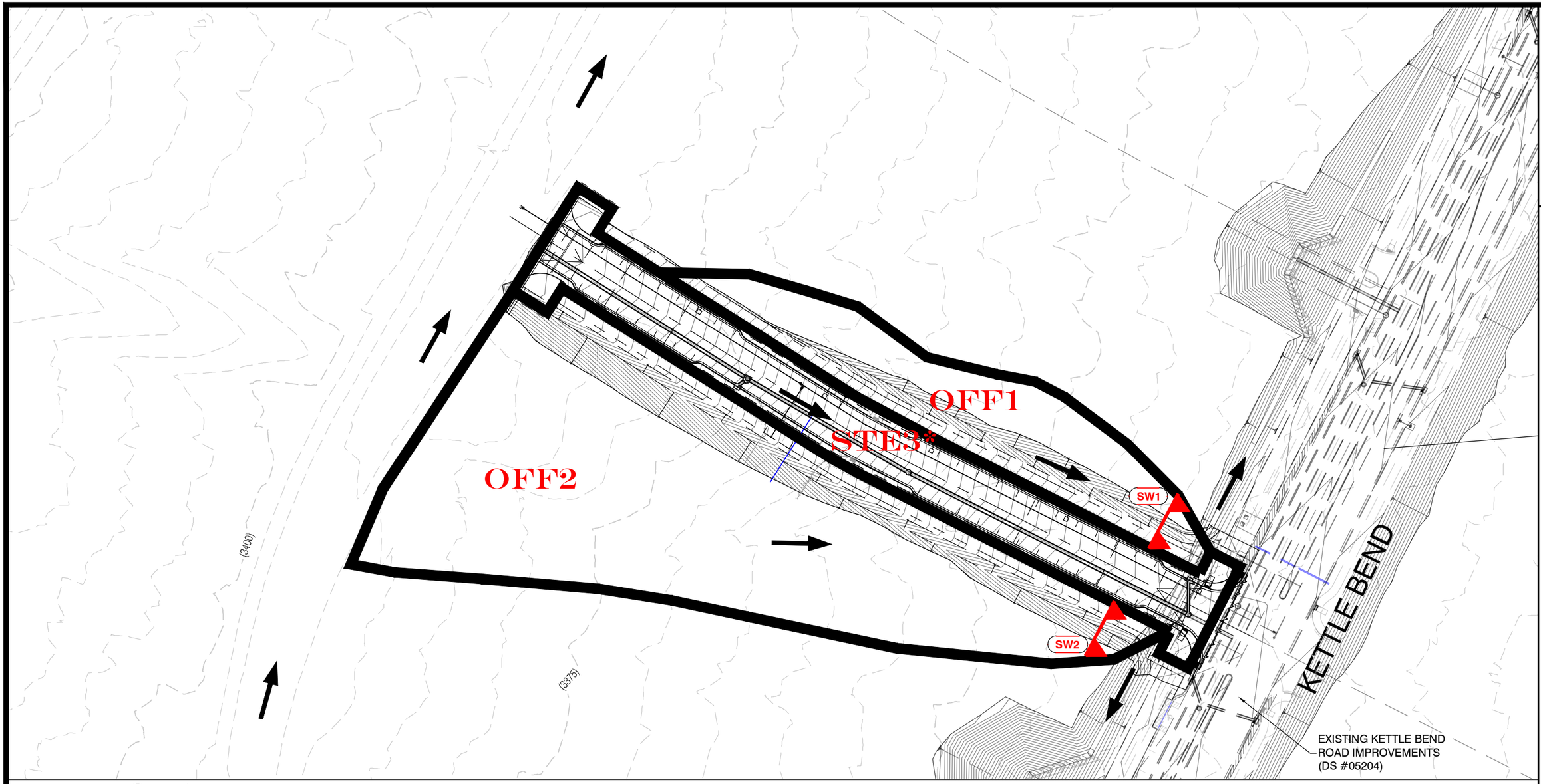
H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Drainage\A Figures\Figure 5 -Soil Map.dwg

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

FIGURE 5- INTERIM CONDITION SOIL MAP

FLIGHT RANGE AVE (KETTLE BEND TO DESERT FOOTHILLS)

SCALE	HORZ. N/A
	VERT. 1"=200'
W.O. NO.	7861-MISC-16
DRAWN BY:	JYA
DATE:	01/2020
SHEET	1 OF 1



LEGEND

- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW

NORTH

GRAPHIC SCALE

100 0 50 100 200

1" = 100'

INTERIM CONDITION SWALE SUMMARY TABLE

Swale	Q100 (cfs)	Slope	Normal Depth (ft)	Freeboard Req'd (ft)	Total Depth (ft)	Velocity (ft/s)	Side Slopes
SW1	2	4.00%	0.41	1.07	1.48	3.98	3:1/3:1
SW2	5	4.00%	0.58	1.10	1.68	5.01	3:1/3:1

INTERIM CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100
OFF1	0.93	2
OFF2	3.13	5
STE3*	1.36	6

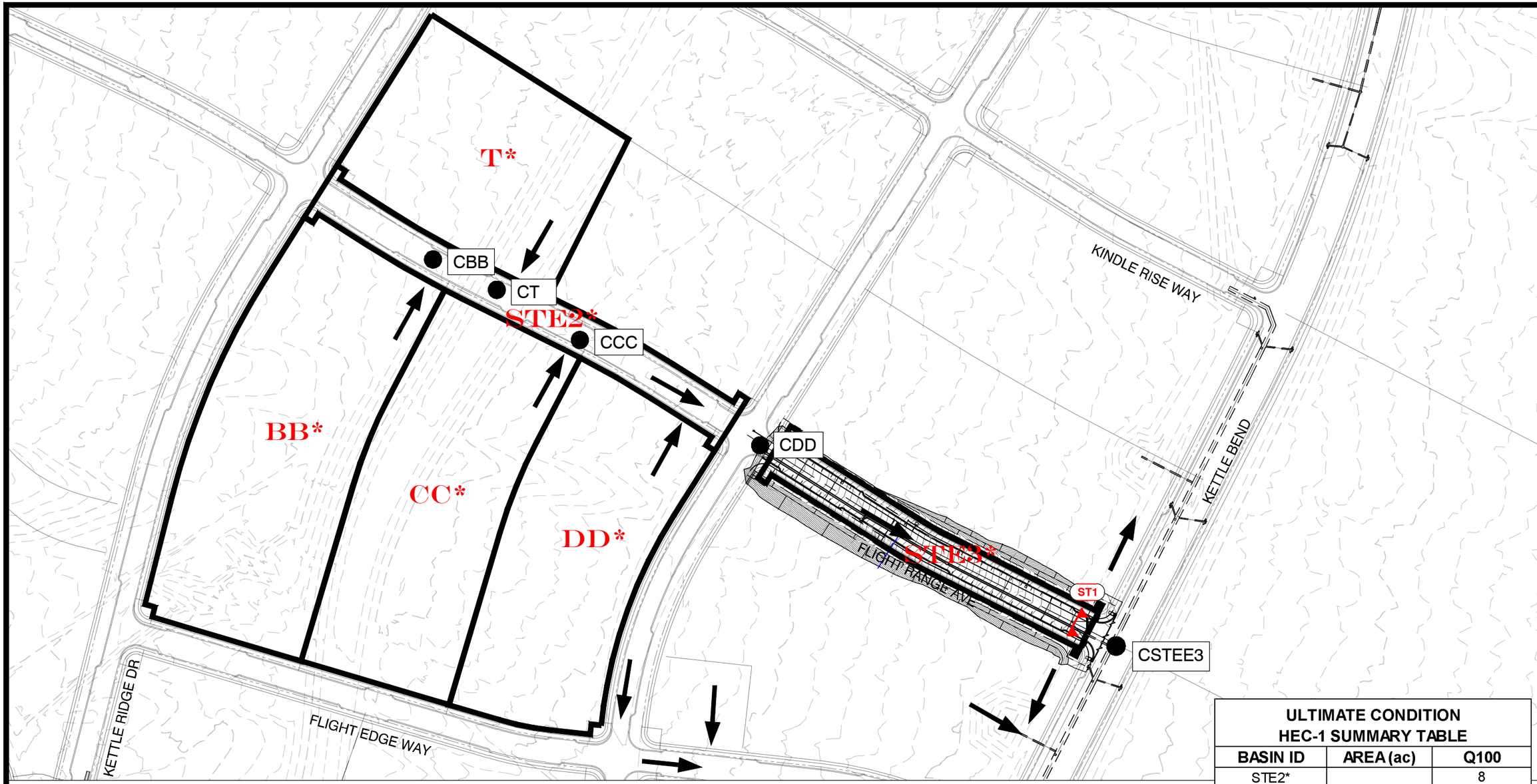
*Referenced from V22 MCDS by VTN (DS# 5005)

FIGURE 6- INTERIM CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVE (KETTLE BEND TO DESERT FOOTHILLS)

W.O.#: 7861- MISC- 16
DATE: 01/2020
BY: RBR
SCALE: 1"= 100'
SHEET 1 OF 1

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Drainage\A Figures\Figure 6- Interim Condition Map.dwg;rachelr; Feb 12, 2020 - 1:57pm



LEGEND

- BASIN BOUNDARY
- ST7 — BASIN DESIGNATION
- FLOW ARROW
- FLOW CONCENTRATION POINT

NORTH

GRAPHIC SCALE

200 0 100 200 400

1" = 200'

ULTIMATE CONDITION STREET FLOW ANALYSIS SUMMARY

Street Section	Q100 (cfs)	Slope	Velocity (ft/s)	Depth (ft)	V x D	Tributary Basin
ST1 MIN	6	2.15%	3.08	0.32	0.99	STE3*
ST1 MAX	6	7.12%	4.98	0.28	1.39	STE3*

*Referenced from SWPA MPU by VTN (DS# 4926)

ULTIMATE CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100
STE2*		8
BB*	6.29	23
CBB	-	31
T*	4.02	13
CT	-	44
CC*	5.34	19
CCC	-	63
DD*	4.76	17
CDD	-	77
STE3*	1.36	6
CSTEE3	-	80

*Referenced from V22 MCDS by VTN (DS# 5005)

FIGURE 7 - ULTIMATE CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE WAY (KETTLE BEND TO DESERT FOOTHILLS)

W.O.#:	7861 - MISC- 16
DATE:	2/12/2020
BY:	RBR
SCALE:	1"= 200'
SHEET	1 OF 1

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Drainage\A Figures\Figure 7 - Ultimate Condition Map.dwg,rachelr, Feb 12, 2020 - 1:59pm

APPENDIX B
HYDROLOGIC CALCULATIONS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Las Vegas Valley Area, Nevada, Part of Clark County



November 26, 2019

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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502—Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes..... 14

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,530 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 14, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 6, 2016—Sep 1, 2017

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

MAP LEGEND

MAP INFORMATION

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
156	Vace-Wechech association	40.5	53.4%
502	Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes	35.4	46.6%
Totals for Area of Interest		**75.9**	**100.0%**

Map Unit Descriptions

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

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

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

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

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Las Vegas Valley Area, Nevada, Part of Clark County

156—Vace-Wechech association

Map Unit Setting

National map unit symbol: 1tf5w
Elevation: 2,720 to 4,030 feet
Mean annual precipitation: 5 to 7 inches
Mean annual air temperature: 57 to 69 degrees F
Frost-free period: 180 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Vace and similar soils: 45 percent
Wechech and similar soils: 25 percent
Wechech, steep, and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vace

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Calcareous loess and mixed alluvium

Typical profile

H1 - 0 to 2 inches: gravelly fine sandy loam
H2 - 2 to 8 inches: loam
H3 - 8 to 60 inches: cemented material

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 4 to 14 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Arid Active Alluvial Fans (R030XB005NV)
Other vegetative classification: Limy 5-7 p.z. (030XB005NV_3)
Hydric soil rating: No

Description of Wechech

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from limestone and dolomite

Typical profile

H1 - 0 to 2 inches: very gravelly sandy loam
- 2 to 7 inches: very gravelly sandy loam
H2 - 7 to 13 inches: very gravelly sandy loam
H3 - 13 to 60 inches: cemented material

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 8 to 14 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Arid Active Alluvial Fans (R030XB005NV)
Hydric soil rating: No

Description of Wechech, Steep

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from limestone and dolomite

Typical profile

H1 - 0 to 2 inches: very gravelly sandy loam
- 2 to 7 inches: very gravelly sandy loam
H2 - 7 to 13 inches: very gravelly sandy loam
H3 - 13 to 60 inches: cemented material

Properties and qualities

Slope: 8 to 30 percent
Depth to restrictive feature: 8 to 14 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: LIMY HILL 5-7 P.Z. (R030XB001NV)
Hydric soil rating: No

Minor Components

Weiser

Percent of map unit: 8 percent
Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: GRAVELLY FAN 5-7 P.Z. (R030XB075NV)
Other vegetative classification: Gravelly Fan 5-7 p.z. (030XB075NV_1)
Hydric soil rating: No

Irongold

Percent of map unit: 4 percent
Landform: Fan remnants
Landform position (two-dimensional): Shoulder
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: SHALLOW GRAVELLY LOAM 5-7 P.Z. cool thermic fan portions corr (R030XB029NV)
Other vegetative classification: Shallow Gravelly Loam 5-7 p.z. (030XB029NV_2)
Hydric soil rating: No

Commski

Percent of map unit: 2 percent
Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: CALCAREOUS LOAM 5-7 P.Z. (R030XA066NV)
Other vegetative classification: Calcareous Loam 5-7 p.z. (030XA066NV_1)
Hydric soil rating: No

Threelakes

Percent of map unit: 1 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: VALLEY WASH (R030XB028NV)
Hydric soil rating: No

502—Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hrcf
Elevation: 1,700 to 4,800 feet
Mean annual precipitation: 4 to 12 inches
Mean annual air temperature: 57 to 70 degrees F
Frost-free period: 180 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Canutio and similar soils: 55 percent
Cave and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canutio

Setting

Landform: Inset fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 9 inches: gravelly fine sandy loam
H2 - 9 to 60 inches: stratified extremely gravelly loamy coarse sand to gravelly loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: A

Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

Description of Cave

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 16 inches: gravelly fine sandy loam
H2 - 16 to 30 inches: indurated
H3 - 30 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 4 to 20 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 12.0
Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

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

Minor Components

Arizo

Percent of map unit: 5 percent
Landform: Channels
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: VALLEY WASH (R030XB028NV)
Hydric soil rating: No

CURVE NUMBERS FOR SOILS

Soil #502 Canutio- Cave gravelly fine sandy loams, 2 to 8 percent slopes				
Soil	Percent	Group	Existing$_1$	Impervious$_2$
Canutio	55%	A	63	98
Cave	40%	D	88	98
Arizo	5%	A	63	98
Total	**100%**		**73**	**98**

Notes:

1- Referenced from Table 602 (4 of 4) Desert Shrub Poor Condition
2- Referenced from Table 602 (1 of 4), Impervious Paved Streets and Roads

Curve Number Calculations for Basins

Basin	Type	%	Existing$_1$	Impervious$_2$	CN Value
UNDEVELOPED BASINS					
OFF1	502	100%	100%		**73.0**
OFF2	502	100%	100%		**73.0**

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Flight Range
W.O. # 7861-MISC-16 **CALCULATED BY:**

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

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

Non-urban		Urbanized	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
UNDEVELOPED BASINS								
OFF1	550	3375	3336	0.071	14.8	3.9	29.4	7.8
OFF2	770	3390	3336	0.070	14.8	3.9	29.4	7.8

STANDARD FORM 4

DEVELOPMENT: Flight Range

CONDITION: Interim

W.O. # 7861-MISC-16 **CALCULATED BY:**

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

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

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

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

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
UNDEVELOPED BASINS																	
OFF1	73.0	0.574	0.93	0.0015	20	6.0	2.33	550	7.1	3.9	7.8	2.22	570	13.17	4.55	0.046	Tlag= 0.1 Min NON-URB
OFF2	73.0	0.574	3.13	0.0049	20	6.0	2.33	770	7.0	3.9	7.8	2.70	790	14.39	5.04	0.050	Tlag= 0.1 Min NON-URB

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1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   15JAN20  TIME  13:42:19  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
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                                                X     X  X        X     X         XX
                                                X     X  X        X               X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X               X
                                                X     X  X        X     X         X
                                                X     X  XXXXXXX   XXXXX         XXX


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

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

1                                                HEC-1 INPUT                                                    PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID    INTERIM CONDITION HYDROLOGIC MODEL
              2         ID    INPUT FILE DATE = JANUARY 15, 2020
              3         ID    DESIGN STORM = 100-YEAR 6-HR STORM
              4         ID    STORM DISTRIBUTION = SDN #3
              5         ID    MODELED BY VTN (JYA)
              6         ID
              7         ID    ********************************************************
              8         ID    * FLIGHT RANGE AVE (KETTLE BEND TO DESERT FOOTHILLS     *
              9         ID    ********************************************************
             10         ID
             11         ID
             12         ID
             13         ID
             14         ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
             15         ID
             16         ID  100-YEAR,  6-HOUR STORM,  SDN3
             17         ID
             18         IT       5       0       0     100
             19         IO       5       0       0
             20         IN       5       0       0
             21         JR    PREC    1.00
                        *

             22         KK    OFF1
             23         BA  0.0015
             24         PB    3.40
             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    73.0
             34         UD   0.100
                        *

             35         KK    OFF2
             36         BA  0.0049
             37         LS       0    73.0
             38         UD   0.100
                        *
             39         ZZ
1
                  SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

```
    22        OFF1
                .
                .
    35          .        OFF2

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                    ************************************
 *                                      *                                   *                                  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                   *    U.S. ARMY CORPS OF ENGINEERS  *
 *              JUN   1998              *                                   *    HYDROLOGIC ENGINEERING CENTER *
 *            VERSION 4.1               *                                   *         609 SECOND STREET        *
 *                                      *                                   *       DAVIS, CALIFORNIA 95616    *
 *  RUN DATE   15JAN20  TIME  13:42:19  *                                   *           (916) 756-1104         *
 *                                      *                                   *                                  *
 ****************************************                                    ************************************



                          INTERIM CONDITION HYDROLOGIC MODEL
                          INPUT FILE DATE = JANUARY 15, 2020
                          DESIGN STORM = 100-YEAR 6-HR STORM
                          STORM DISTRIBUTION = SDN #3
                          MODELED BY VTN (JYA)

                          ******************************************************
                          * FLIGHT RANGE AVE (KETTLE BEND TO DESERT FOOTHILLS     *
                          ******************************************************



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

                        100-YEAR,  6-HOUR STORM,  SDN3


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

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

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE    8.25 HOURS

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

      JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00
1

                PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                  FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                        1.00

 HYDROGRAPH AT
+                  OFF1       .00     1   FLOW           2.
                                           TIME         3.58

 HYDROGRAPH AT
+                  OFF2       .00     1   FLOW           5.
                                           TIME         3.58
```

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

```
1*************************************                                  *************************************
 *                                   *                                  *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                              *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998           *                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.1            *                                  *          609 SECOND STREET          *
 *                                   *                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   15JAN20  TIME  13:34:01   *                              *           (916) 756-1104           *
 *                                   *                                  *                                   *
 *************************************                                  *************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID    ULTIMATE CONDITION HYDROLOGIC MODEL
              2         ID    INPUT FILE DATE = JANUARY 15, 2020
              3         ID    DESIGN STORM = 100-YEAR 6-HR STORM
              4         ID    STORM DISTRIBUTION = SDN #3
              5         ID    MODELED BY VTN (JYA)
              6         ID
              7         ID    ******************************************************
              8         ID    * FLIGHT RANGE AVE (KETTLE BEND TO DESERT FOOTHILLS     *
              9         ID    ******************************************************
             10         ID
             11         ID
             12         ID
             13         ID
             14         ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
             15         ID
             16         ID  100-YEAR,  6-HOUR STORM,  SDN3
             17         ID
             18         IT       5       0       0     100
             19         IO       5       0       0
             20         IN       5       0       0
             21         JR    PREC    1.00
                        *

             22         KK   STE2*
             23         BA  0.0028
             24         PB    3.40
             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   0.050
                        *

             35         KK     BB*
             36         BA  0.0098
             37         PB    3.42
             38         LS       0    91.1
             39         UD   0.074
                        *

             40         KK     CBB
             41         HC       2
                        *
1                                                HEC-1 INPUT                                                PAGE  2

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

```
             42           KK      T*
             43           BA  0.0063
             44           PB    3.42
             45           LS       0    86.3
             46           UD   0.069
                          *

             47           KK      CT
             48           HC       2
                          *

             49           KK     CC*
             50           BA  0.0083
             51           PB    3.42
             52           LS       0    90.7
             53           UD   0.079
                          *

             54           KK     CCC
             55           HC       2
                          *

             56           KK    RCCC
             57           KM   ROUTE CCC TO CDD
             58           RD     570   0.005   0.015       0    CIRC       3
                          *

             59           KK     DD*
             60           BA  0.0074
             61           PB    3.40
             62           LS       0    90.5
             63           UD   0.075
                          *

             64           KK     CDD
             65           HC       2
                          *

             66           KK    RCDD
             67           KM   ROUTE CCDD TO CDES5
             68           RD     390   0.005   0.015       0    CIRC     3.5
                          *

             69           KK   STE3*
             70           BA  0.0021
             71           PB    3.40
             72           LS       0    98.0
             73           UD   0.050
                          *
1                                                HEC-1 INPUT                                                PAGE  3

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


             74           KK   CSTE3
             75           KM   COMBINE STE3 AND CDD
             76           HC       2
                          *
                          *
             77           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    22       STE2*
                .
                .
    35          .         BB*
                .           .
                .           .
    40        CBB............
                .
                .
    42          .          T*
                .           .
                .           .
    47         CT............
                .
                .
    49          .         CC*
                .           .
                .           .
    54        CCC............
                V
                V
    56       RCCC
```

```
                .
                .
    59          .         DD*
                .           .
                .           .
    64        CDD............
                V
                V
    66        RCDD
                .
                .
    69          .       STE3*
                .           .
                .           .
    74      CSTE3............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   15JAN20  TIME  13:34:01  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************



                          ULTIMATE CONDITION HYDROLOGIC MODEL
                          INPUT FILE DATE = JANUARY 15, 2020
                          DESIGN STORM = 100-YEAR 6-HR STORM
                          STORM DISTRIBUTION = SDN #3
                          MODELED BY VTN (JYA)

                          ******************************************************
                          * FLIGHT RANGE AVE (KETTLE BEND TO DESERT FOOTHILLS     *
                          ******************************************************



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

                        100-YEAR,  6-HOUR STORM,  SDN3


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

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

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE    8.25 HOURS

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

      JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00
1

                PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                             TIME TO PEAK IN HOURS


                                                                RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                        1.00
```

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

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

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

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

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

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

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

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

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

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

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

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

  2 COMBINED AT
+                  CSTE3       .04     1   FLOW          80.
                                           TIME         3.50
1
                                       SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                           (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                 INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                     PEAK

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

          FOR PLAN = 1  RATIO=  .00
              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



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

APPENDIX C
HYDRAULIC CALCULATIONS

NORMAL DEPTH CALCULATIONS

Worksheet for SW1 (OFF1)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	4.00	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	2.00	ft^3/s

Results

Normal Depth	0.41	ft
Flow Area	0.50	ft^2
Wetted Perimeter	2.59	ft
Hydraulic Radius	0.19	ft
Top Width	2.45	ft
Critical Depth	0.49	ft
Critical Slope	0.01564	ft/ft
Velocity	3.98	ft/s
Velocity Head	0.25	ft
Specific Energy	0.66	ft
Froude Number	1.55	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.41	ft
Critical Depth	0.49	ft
Channel Slope	4.00	%
Critical Slope	0.01564	ft/ft

Cross Section for SW1 (OFF1)

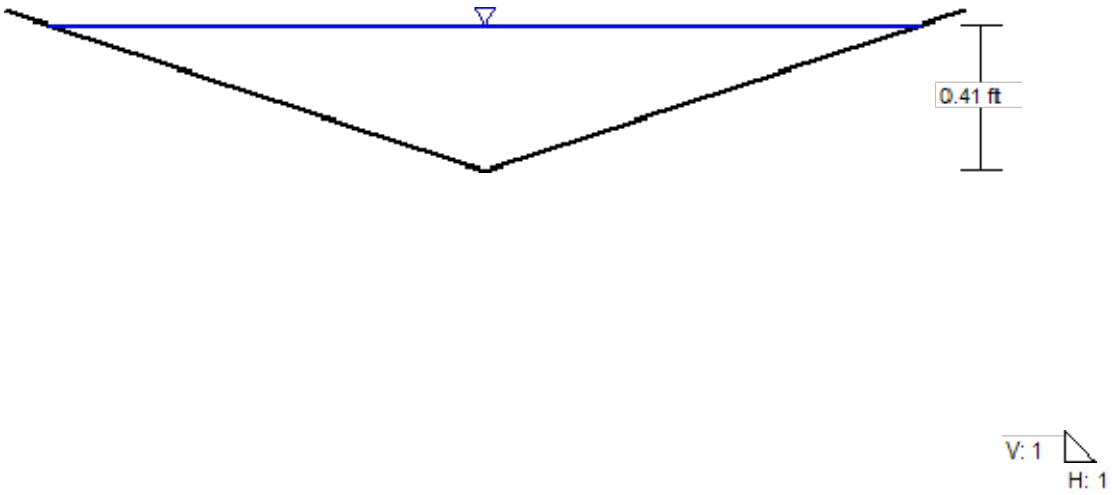
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	4.00	%
Normal Depth	0.41	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	2.00	ft³/s

Cross Section Image



Worksheet for SW2 (OFF2)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	4.00	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Results

Normal Depth	0.58	ft
Flow Area	1.00	ft²
Wetted Perimeter	3.65	ft
Hydraulic Radius	0.27	ft
Top Width	3.46	ft
Critical Depth	0.70	ft
Critical Slope	0.01384	ft/ft
Velocity	5.01	ft/s
Velocity Head	0.39	ft
Specific Energy	0.97	ft
Froude Number	1.64	
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	0.58	ft
Critical Depth	0.70	ft
Channel Slope	4.00	%
Critical Slope	0.01384	ft/ft

Cross Section for SW2 (OFF2)

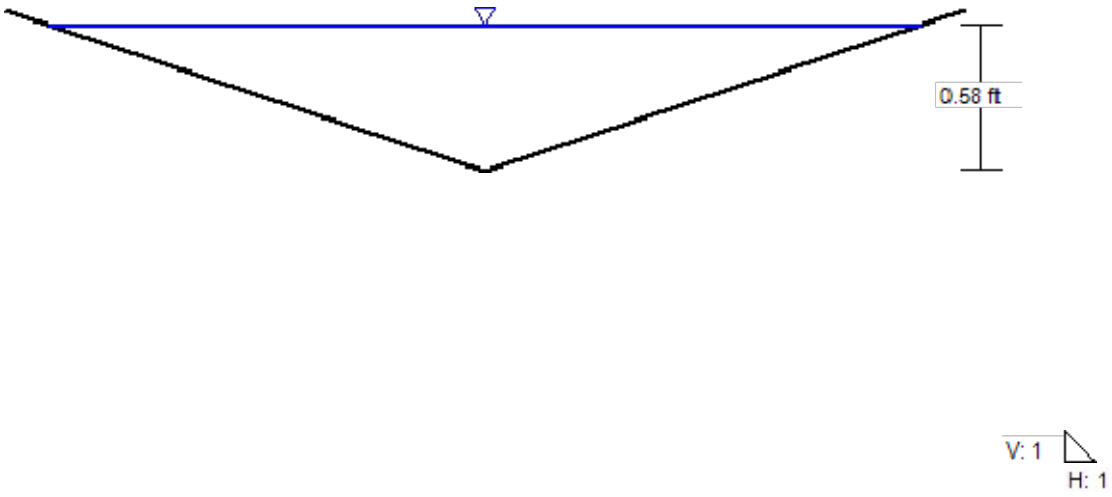
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	4.00	%
Normal Depth	0.58	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Cross Section Image



Worksheet for ST1 MAX

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.12	%
Discharge	6.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+22.50	0.58
0+43.00	0.17
0+43.00	0.13
0+44.50	0.00
0+44.50	0.50
0+45.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+43.00, 0.13)	0.016
(0+43.00, 0.13)	(0+45.00, 0.50)	0.013

Options

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

Worksheet for ST1 MAX

Results

Normal Depth		0.28	ft
Elevation Range	0.00 to 0.58 ft		
Flow Area		1.20	ft²
Wetted Perimeter		14.32	ft
Hydraulic Radius		0.08	ft
Top Width		13.67	ft
Normal Depth		0.28	ft
Critical Depth		0.37	ft
Critical Slope		0.00711	ft/ft
Velocity		4.98	ft/s
Velocity Head		0.39	ft
Specific Energy		0.66	ft
Froude Number		2.96	
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	0.28	ft
Critical Depth	0.37	ft
Channel Slope	7.12	%
Critical Slope	0.00711	ft/ft

Cross Section for ST1 MAX

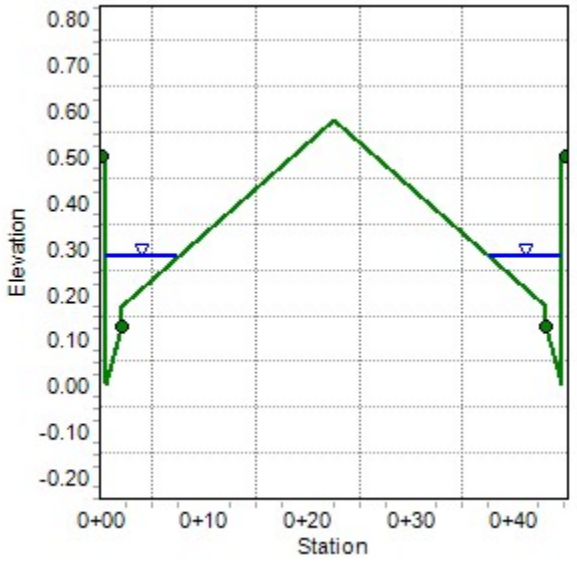
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.12	%
Normal Depth	0.28	ft
Discharge	6.00	ft³/s

Cross Section Image



Worksheet for ST1 MIN

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.15	%
Discharge	6.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+22.50	0.58
0+43.00	0.17
0+43.00	0.13
0+44.50	0.00
0+44.50	0.50
0+45.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+43.00, 0.13)	0.016
(0+43.00, 0.13)	(0+45.00, 0.50)	0.013

Options

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

Worksheet for ST1 MIN

Results

Normal Depth		0.32	ft
Elevation Range	0.00 to 0.58 ft		
Flow Area		1.95	ft²
Wetted Perimeter		19.06	ft
Hydraulic Radius		0.10	ft
Top Width		18.32	ft
Normal Depth		0.32	ft
Critical Depth		0.37	ft
Critical Slope		0.00726	ft/ft
Velocity		3.08	ft/s
Velocity Head		0.15	ft
Specific Energy		0.47	ft
Froude Number		1.66	
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	0.32	ft
Critical Depth	0.37	ft
Channel Slope	2.15	%
Critical Slope	0.00726	ft/ft

Cross Section for ST1 MIN

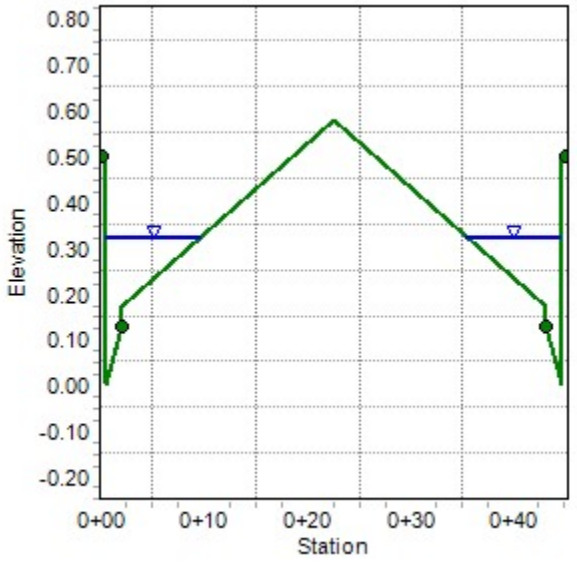
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.15	%
Normal Depth	0.32	ft
Discharge	6.00	ft³/s

Cross Section Image



FREEBOARD CALCULATIONS

FREEBOARD CALCULATIONS

DEVELOPMENT Flight Range Ave (Kettle Bend to Desert Foothills)
W.O. # 7861-MISC-16 **CALCULATED BY** JYA

EQUATIONS*

$$Fb_{sup} = 1 + 0.025 * V * D^{1/3}$$

$$Fb_{sub} = \frac{1}{2} + \frac{V^2}{2g}$$

Where :Fb=Freeboard, sup=Super-critical, sub=Sub-critical, V = Velocity, D = Depth and g = 32.2

NOTES: Equations are referenced from pages 769 and 773 of the CCRFCD HC&DDM
Minimum Freeboard is 1 ft.

Section / Description	Super/Sub critical flow	Channel Velocity (fps)	Flow Depth (ft)		Freeboard Required (ft)	Channel Depth (ft)
SW1	SUPER	3.98	0.41		1.07	1.48
SW2	SUPER	5.01	0.58		1.10	1.68

FREEBOARD CALCULATIONS

DEVELOPMENT Flight Range Ave (Kettle Bend to Desert Foothills)
W.O. # 7861-MISC-16 **CALCULATED BY** JYA

EQUATIONS*

$$Fb_{sup} = 1 + 0.025 * V * D^{1/3}$$

$$Fb_{sub} = \frac{1}{2} + \frac{V^2}{2g}$$

Where :Fb=Freeboard, sup=Super-critical, sub=Sub-critical, V = Velocity, D = Depth and g = 32.2

NOTES: Equations are referenced from pages 769 and 773 of the CCRFCD HC&DDM
Minimum Freeboard is 1 ft.

Section / Description	Super/Sub critical flow	Channel Velocity (fps)	Flow Depth (ft)		Freeboard Required (ft)	Channel Depth (ft)

DROP INLET
INTERCEPTION CALCULATIONS

Drop Inlet Interception

Project: Flight Range Ave
Work Order no.: 7861-MISC-16
Calculated By: JYA
Date: Jan-20

Inlet ID: SDDI #1
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: 1/2 STE3
Inlet Description: 5" Modified Type C

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	3.0
Longitudinal Slope (ft/ft)	S_o	0.0712
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	4.98
Street Flow Depth (ft)	D	0.28
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	2.5
Length of Curb Opening (ft)	L_c	5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	1.25
Effective Curb Opening Lenth (ft)	L_{ce}	2.5

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	0.97
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	4.61
E - grate Flow Ratio	Q_w/Q_s	1.27
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	1.68
Q_s - Side Flow (cfs)	$Q-Q_w$	1.32
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	5.67
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.01
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**3.0**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.16
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.00
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	0.00
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.0**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**3.0**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kindle Rise Way (Kettle Bend to Desert Foothills)
Work Order no.: 7861-MISC-15
Calculated By: RBR
Date: Dec-19

Inlet ID: SDDI #2
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: 1/2STE3
Inlet Description: 5" Modified Type C

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	3.0
Longitudinal Slope (ft/ft)	S_o	0.0215
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	3.08
Street Flow Depth (ft)	D	0.32
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	2.5
Length of Curb Opening (ft)	L_c	5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	1.25
Effective Curb Opening Lenth (ft)	L_{ce}	2.5

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	4.61
E - grate Flow Ratio	Q_w/Q_s	0.79
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	1.32
Q_s - Side Flow (cfs)	Q-Q_w	1.68
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	7.67
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.03
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**2.4**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.11
Q_{sx} - Remaining Flow After Grate Interception (cfs)	Q-Q_{gi}	0.62
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	7.05
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.3**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**2.7**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.3**

STANDARD FORM 6

STANDARD FORM 6

DEVELOPMENT: SW V22 Flight Range
CALCULATED BY: JYA **WO#** 7861-MISC-16
STORM DRAIN SEGMENT: Mainline
DESCRIPTION: 100-Year Ultimate Condition

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth-Dc (ft)	Pipe Diameter-D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3320.44	3313.83	6.61	2.74	3.0	2.87128	3320.44	1.99	3322.43

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

Phi Index

n Value	Phi
0.013	0.004925

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

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	EX PIPE	10+00.00	10+49.75	3	3313.83	3318.80	49.8	7.07	0.00492	80.0	10.00	11.32	1.99	0.01436	0.01436	0.71						0.71	3323.14	3321.15	Yes	3323.79	3323.79	3321.80
2	SDMH $4	10+49.75	10+49.75	3	3318.80	3318.80	0.0	7.07	0.00492	80.0	N/A	11.32	1.99	0.01436	0.01436	0.00		0.04				0.04	3323.83	3321.84	Yes	3323.79	3323.83	3321.84
3	PIPE	10+49.75	13+60.95	3	3318.80	3341.38	311.2	7.07	0.00492	80.0	7.26	11.32	1.99	0.01436	0.01436	4.47						4.47	3328.30	3326.31	Yes	3346.37	3346.37	3344.38
4	SDMH #3	13+60.95	13+60.95	3	3341.38	3341.38	0.0	7.07	0.00492	80.0	N/A	11.32	1.99	0.01436	0.01436	0.00		0.04				0.04	3346.41	3344.42	Yes	3346.37	3346.41	3344.42
5	PIPE	13+60.95	15+45.75	3	3341.38	3358.01	184.8	7.07	0.00492	80.0	9.00	11.32	1.99	0.01436	0.01436	2.65						2.65	3349.06	3347.08	Yes	3363.00	3363.00	3361.01
6	SDMH #1	15+45.75	15+45.75	3	3358.01	3358.01	0.0	7.07	0.00492	80.0	N/A	11.32	1.99	0.01436	0.01436	0.00		0.04				0.04	3363.04	3361.05	Yes	3362.85	3363.04	3361.05
7	PIPE	15+45.75	17+87.65	3	3358.01	3366.24	241.9	7.07	0.00492	77.0	3.40	10.89	1.84	0.01330	0.01383	3.35						3.35	3366.39	3364.54	Yes	3371.08	3371.08	3369.24
8	STUB	17+87.65	17+87.65	3	3366.24	3366.24	0.0	7.07	0.00492	77.0	N/A	10.89	1.84	0.01330	0.01330	0.00						0.00	3371.08	3369.24				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2	0	0.020	1.989	0.040												
3																
4	0	0.020	1.989	0.040												
5																
6	0	0.020	1.989	0.040												
7																
8																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
EX PIPE			
SDMH $4	3337.8	15.960	Yes
PIPE			
SDMH #3	3355.5	11.078	Yes
PIPE			
SDMH #1	3368.6	7.549	Yes
PIPE			
STUB	3382	12.764	Yes

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

STANDARD FORM 6

DEVELOPMENT: SW V22 Flight Range
CALCULATED BY: JYA **WO#** 7861-MISC-16
STORM DRAIN SEGMENT: SDDI#1 Station 15+60.95
DESCRIPTION: 100-Year Ultimate Condition

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3361.05	3358.01	3.04	1.95	2.0	1.975216	3361.05	0.01	3361.06

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

Phi Index

n Value	Phi
0.013	0.004925

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

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+10.90	2	3358.01	3360.19	10.9	3.14	0.00492	3.0	20.00	0.95	0.01	0.00018	0.00018	0.00						0.00	3361.07	3361.05	Yes	3362.20	3362.20	3362.19
2	INLET	10+10.90	10+10.90	2	3360.19	3360.19	0.0	3.14	0.00492	3.0	N/A	0.95	0.01	0.00018	0.00018	0.00				0.01		0.01	3362.21	3362.20				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.01416	0.007

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
INLET	3369	6.803	Yes

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

STANDARD FORM 6

DEVELOPMENT: SW V22 Flight Range
CALCULATED BY: JYA **WO#** 7861-MISC-16
STORM DRAIN SEGMENT: SDDI#2 Station 10+65.75
DESCRIPTION: 100-Year Ultimate Condition

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3321.84	3318.80	3.04	1.95	2.0	1.975216	3321.84	0.01	3321.85

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

Phi Index

n Value	Phi
0.013	0.004925

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

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+32.90	2	3318.80	3329.76	32.9	3.14	0.00492	3.0	33.33	0.95	0.01	0.00018	0.00018	0.01						0.01	3321.86	3321.85	Yes	3331.77	3331.77	3331.76
2	INLET	10+32.90	10+32.90	2	3329.76	3329.76	0.0	3.14	0.00492	3.0	N/A	0.95	0.01	0.00018	0.00018	0.00				0.01		0.01	3331.78	3331.77				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.01416	0.007

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
INLET	3338.2	6.433	Yes

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

APPENDIX D
REFERENCE MATERIAL

UPDATE #2 TO THE
DRAINAGE STUDY FOR
SUMMERLIN WEST PLANNING AREA

(DS4926)

CITY OF LAS VEGAS
INTER-OFFICE MEMORANDUM

DATE: Revised

January 21, 2020

TO:
Land Development Services
Department of Building & Safety

FROM:
Albert Sung, P.E.
Flood Control Project Engineer
Department of Public Works

SUBJECT: Drainage Study for:
Summerlin West Planning Area Master Plan - Update #2

COPIES TO:
VTN Nevada
The Howard Hughes Corporation
Bart Anderson, P.E., DevCo
CCRFCD
CCPW

Cross Streets:	West of I-215 between Lake Mead Boulevard and Charleston Boulevard	
File Number:	F:\Depot\DSMemos\DS4926L-Rev.doc	
Parcel Number:	137-22-000-017 & more	
Zoning Action:	N/A	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES X	NO

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	10/9/2017 & 10/25/2017	11/8/2017	Not Approved	$400.00	490518: $400
2nd Submittal	12/6/2017	12/20/2017 & 1/10/2018	Not Approved	$400.00	492005: $400
3rd Submittal	2/27/2018	3/24/2018	Not Approved	$400.00	493739: $400
4th Submittal & Supplement	4/23/2018 & 5/22/2018	5/22/2018	See Comments Below	$400.00	495223: $400
CCPW & CCRFCD	7/30/2018	7/30/2018	Concurrence Recv'd	N/C	N/C
5th Submittal	1/3/2019 (Paid on 1/7/2019)	1/30/2019	Not Approved	$100.00	502286: $100
6th Submittal	2/19/2019	3/13/2019	Conditional Approval	$400.00	503267: $400
CCPW & CCRFCD	4/15/2019	4/17/2019	Concurrence Recv'd	N/C	N/C
7th Submittal	10/28/2019	12/2/2019	Not Approved	$100.00	3625174: $100
8th Submittal – Mass Grading	11/19/2019 & 11/27/2019	11/25/2019	Conditionally Approved	$100.00	3645141: $100
9th Submittal & Supplement	12/17/2019 & 1/21/2020	1/21/2019	Conditional Approval	$400.00	3679639: $400
Revised Memo	1/23/2020	1/23/2020	See Comments Below	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:

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

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. **This update is acceptable in concept**; however, *City of Las Vegas* will not formally accept the study until the *Clark County Regional Flood Control District (CCRFCD)* has issued a letter of concurrence. The engineer should contact the CCRFCD to confirm that they have begun their review.
2. 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.

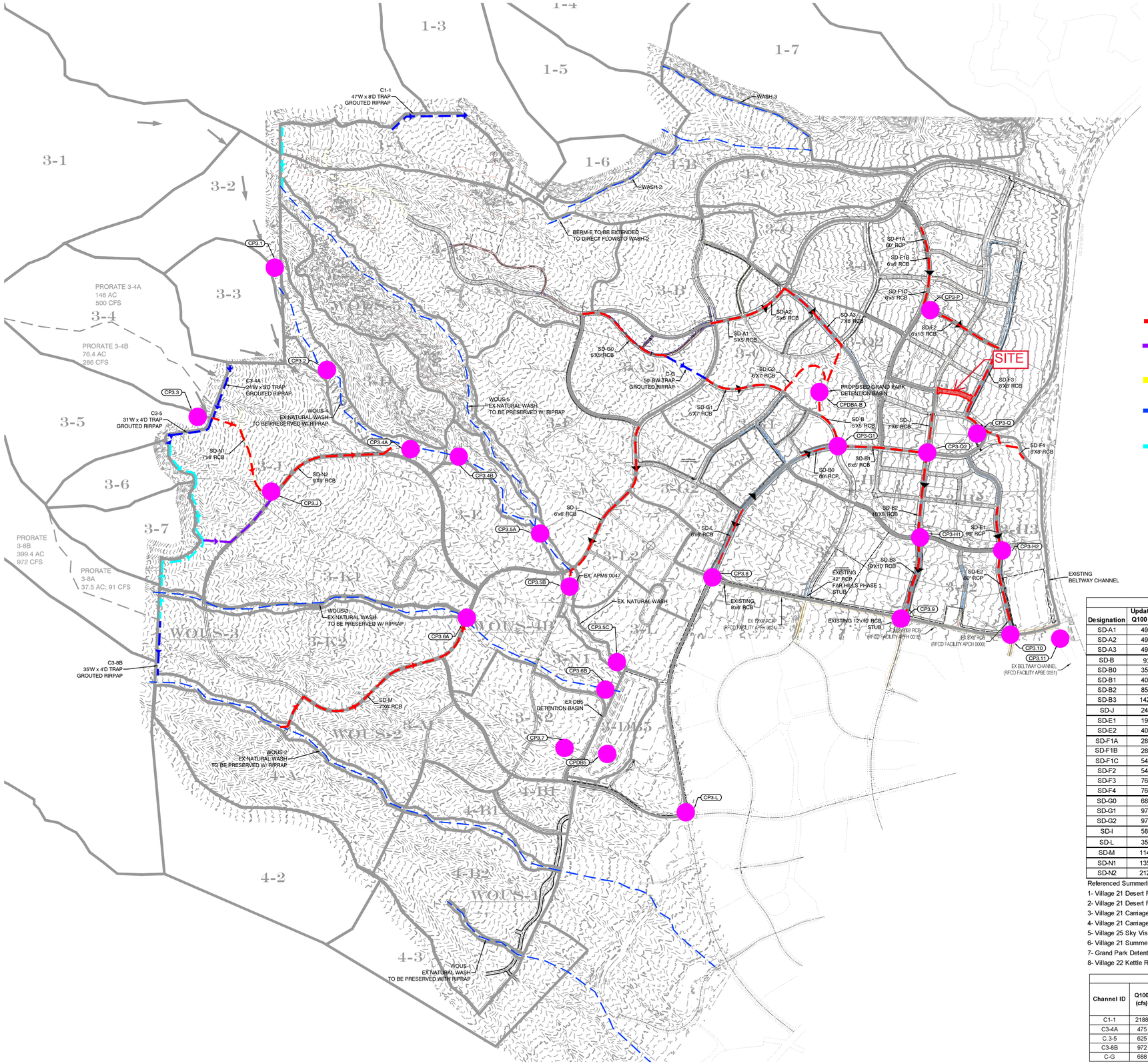
The following comments are repeated until they are complete:

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.

END OF REMARKS
WSP/AYS/PBJ

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



LEGEND

- REGIONAL STORM DRAIN FACILITY
- ANTICIPATED LOCAL STORM DRAIN
- EXISTING FACILITY ALIGNMENT
- REGIONAL OPEN CHANNEL / WASH FACILITIY
- ANTICIPATED LOCAL CHANNEL
- CONCENTRATION POINT
- BASIN BOUNDARY
- 3-A ONSITE BASIN
- 3-1 OFFSITE BASIN

REGIONAL FLOOD CONTROL FACILITY SUMMARY TABLE

Designation	Update #2 Q100 (cfs)	Previous Q100 (cfs)	Basin/CP	Size	Type	Velocity	Remarks
SD-A1	490	628	3-B	5'x5'	RCB	33.03	
SD-A2	490	628	3-B	5'x6'	RCB	33.70	
SD-A3	490	1255	3-B	7'x6'	RCB	31.48	
SD-B	91	184	GPDB	5'X5'	RCB	N/A	Reference 7
SD-B0	353	407	3-G1	60"	RCP	28.50	Reference 7
SD-B1	408	529	CP3-G1	6'x5'	RCB	25.58	
SD-B2	857	958	CP3-H1	10'x8'	RCB	N/A	Reference 2
SD-B3	1422	1496	CP3-H1, 3-I1	10'x10'	RCB	N/A	Reference 1
SD-J	245	204	3-Q2	7'x6'	RCB	13.11	Reference 6
SD-E1	198	197	3-H2	60"	RCP	N/A	Reference 4
SD-E2	409	408	3-H2, 3-I2	60"	RCP	N/A	Reference 3
SD-F1A	285	596	3-O, 1/3 3-P1	60"	RCP	N/A	Reference 8
SD-F1B	285	596	3-O, 1/3 3-P1	6'x6'	RCB	N/A	Reference 8
SD-F1C	548	596	CP3-P	6'x5'	RCB	N/A	Reference 8
SD-F2	548	596	CP3-P	6'x10'	RCB	28.23	
SD-F3	763	779	CP3-Q	8'x8'	RCB	17.34	
SD-F4	763	779	CP3-Q	8'x8'	RCB	19.64	
SD-G0	688	N/A	3-A1	5'x5'	RCB	32.74	
SD-G1	975	332	CP3.A	5'x7'	RCB	34.92	
SD-G2	975	332	CP3.A	6'x7'	RCB	33.44	
SD-I	583	476	3-F	6'X6'	RCB	18.13	
SD-L	359	416	3-G2	6'x6'	RCB	12.15	Reference 5
SD-M	1145	N/A	3-8	7'x6'	RCB	34.02	
SD-N1	1358	N/A	CP3.3	7'x6'	RCB	34.96	
SD-N2	2128	N/A	CP3.J	9'x9'	RCB	34.07	

Referenced Summerlin West Technical Drainage Studies:
1- Village 21 Desert Foothills Drive (Far Hills to Street A)
2- Village 21 Desert Foothills Drive (Redpoint to Summerlin Pkwy)
3- Village 21 Carriage Hill Drive (Far Hills to Street A)
4- Village 21 Carriage Hill Drive (Redpoint to Summerlin Pkwy)
5- Village 25 Sky Vista Drive Improvments- Phase 1 (DS5120A) by GCW
6- Village 21 Summerlin Parkway Extension
7- Grand Park Detention Basin
8- Village 22 Kettle Ridge Drive

REGIONAL CHANNEL SUMMARY

Channel ID	Q100 (cfs)	EG Slope	Modified Slope	# of 3' Drops for New Slope	Normal Depth	Min Freeboard	Channel Dimensions					
							Depth (ft)	Velocity (ft/s)	Side Slopes	Bottom Width (ft)	Top Width (ft)	Riprap
C1-1	2188	5.1%	1.5%	25	5.7	1.65	8.0	14.55	2:1/2:1	15	47	Grouted
C3-4A	475	2.8%	-	-	3.08	1.46	4.5	12.69	2:1/2:1	6	24	Grouted
C.3-5	625	9.1%	4.5%	17	2.16	1.48	4.0	14.94	2:1/2:1	15	31	Grouted
C3-8B	972	4.7%	3.1%	12	3.07	1.54	5.0	15.00	2:1/2:1	15	35	Grouted
C-G	688	7.7%	-	-	0.99	1.33	2.5	13.12	3:1/3:1	50	65	Grouted

REVISION | BY | DATE | REV

CLV

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

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

2019 UPDATE #2 TO SUMMERLIN WEST PLANNING AREA

A.6.5 REGIONAL FLOOD CONTROL FACILITIES MAP

DRAWN BY:
DESIGNED BY:
CHECKED BY:
PROJECT NO: 7809
SCALE: HORIZ. VERT.

SHEET A.6.5 OF SHEETS
DRAWING NO.

H:\7809\Drainage\10_UP2 ADD1\A Figures\A.6.5_Regional Flood Control Facility Map\A.6.5_Regional Flood Control Facility Map UP2.dwg,1/16/2020 2:34 PM,JAyson

MASTER CONCEPTUAL DRAINAGE STUDY FOR UPDATE #2 SUMMERLIN WEST VILLAGE 22

(CLV DS5005)

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: May 29, 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: **Master Conceptual Drainage Study for – Update #1 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\DS5005F.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006, 137-23-101-002			CCRFCD
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 #
1st Submittal	6/12/2018	6/28/2018 & 7/13/2018	Not Approved	$400.00	49696: $400
2nd Submittal	7/31/2018	8/22/2018	Not Approved	$400.00	497790: $400
3rd 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
CCRFCD	1/10/2019	1/10/2019	Concurrence Recv'd	N/C	N/C
4th Submittal	2/12/2019	3/6/2019	Not Approved	$100.00	503164: $100
5th Submittal	3/21/2019	4/4/2019	Conditional Approval	$400.00	3057847: $400
CCPW & CCRFCD	4/25/2019 & 5/23/2019	5/29/2019	Concurrence Received	N/C	N/C
			TOTAL FEES (LDDRS):	**$1,700.00**	**----**

REMARKS:

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 *Master Drainage Study Update* for *Summerlin West Planning Area* proposes a modification to internal flow patterns that alters the flow patterns to the *Beltway Channel* system downstream of the *Summerlin Parkway* interchange. The modification proposes a storm drain system within *Summerlin Village 22* area (Storm Drain F) that will collect flows from the Gowan channel tributary area and route them into the *Beltway Channel* (MPU Facility APBE 0122). This resulted in increased flows in the *Beltway Channel* segment between *Summerlin Parkway* and *Far Hills Boulevard*, ie, mitigation measures are required for the impacted *Beltway Channel* segment.

A technical drainage study for the analysis, design and construction plans for the Beltway Channel modifications must be submitted and approved by the City prior to the individual onsite parcel developments.

2. 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

```
1*************************************                                  *************************************
 *                                   *                                  *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                              *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998           *                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.1            *                                  *          609 SECOND STREET          *
 *                                   *                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   20NOV19  TIME  14:58:22   *                              *          (916) 756-1104           *
 *                                   *                                  *                                   *
 *************************************                                  *************************************

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


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

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

1                                                  HEC-1 INPUT                                                  PAGE  1

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

  98          KK     RCG
```

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

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

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

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


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

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

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

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

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

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

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

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

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


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

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

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

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

```
             154          LS       0    98.0
             155          UD   0.070
                          *

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

```
                *

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

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

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

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


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

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

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

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

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

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

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

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

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

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


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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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


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

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

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

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

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

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

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

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

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

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


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

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

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

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

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

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

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

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

456          KK    STE2
457          BA  0.0028
458          PB    3.40
459          LS       0    98.0
460          UD   0.050
             *
```



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

461          KK      BB
462          BA  0.0098
463          PB    3.42
464          LS       0    91.1
465          UD   0.074
             *

466          KK     CBB
467          HC       2
             *

468          KK       T
469          BA  0.0063
470          PB    3.42
471          LS       0    86.3
472          UD   0.069
             *

473          KK      CT
474          HC       2
             *

475          KK      CC
476          BA  0.0083
477          PB    3.42
478          LS       0    90.7
479          UD   0.079
             *

480          KK     CCC
481          HC       2
             *

482          KK    RCCC
483          KM   ROUTE CCC TO CDD
484          RD     570   0.005   0.015       0    CIRC       3
             *

485          KK      DD
486          BA  0.0074
487          PB    3.40
488          LS       0    90.5
489          UD   0.075
             *

490          KK     CDD
491          HC       2
             *
```



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

```
  492          KK    RCDD
  493          KM   ROUTE CCDD TO CDES5
  494          RD     390   0.005   0.015       0    CIRC     3.5
               *

  495          KK    STE3
  496          BA  0.0021
  497          PB    3.40
  498          LS       0    98.0
  499          UD   0.050
               *

  500          KK     CP8
  501          KM   COMBINE STE3, CDD, AND CCARR3
  502          HC       3
               *

  503          KK    RCP8
  504          KM   ROUTE CP8 TO CEE
  505          RD     240   0.005   0.015       0    DEEP       8       0
               *

  506          KK      EE
  507          BA  0.0106
  508          PB    3.39
  509          LS       0    90.2
  510          UD   0.068
               *

  511          KK     CEE
  512          KM   COMBINES CP8 AND EE
  513          HC       2
               *

  514          KK    RCP8
  515          KM   ROUTE CEE TO CP9
  516          RD     220   0.005   0.015       0    DEEP       8       0
               *

  517          KK    NP-3
  518          BA  0.0011
  519          PB    3.39
  520          LS       0    80.5
  521          UD   0.080
               *

  522          KK   STEE3
  523          BA  0.0019
  524          PB    3.39
  525          LS       0    98.0
  526          UD   0.050
               *
```



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

  527          KK  CSTEE3
  528          KM   COMBINES NP-3 AND CSTEE3
  529          HC       2
               *

  530          KK     CP9
  531          KM   COMBINES CSTEE3 AND CEE
  532          HC       2
               *

  533          KK    RCP9
  534          KM   ROUTE CP9 TO DUMMY2
  535          RD     281   0.005   0.015       0    DEEP       8       0
               *

  536          KK      HH
  537          BA  0.0076
  538          PB    3.39
  539          LS       0    94.2
  540          UD   0.058
               *

  541          KK   CARR4
  542          BA  0.0036
  543          PB    3.37
  544          LS       0    98.0
  545          UD   0.059
               *

  546          KK  DUMMY2
  547          KM   REGIONAL FACILITY - BELTWAY CHANNEL SOUTH
  548          HC       3
```

```
                *

 549            KK 25-HS1B
 550            BA  0.0182
 551            PB    3.44
 552            LS       0    92.2
 553            UD   0.050
                *

 554            KK    STN2
 555            BA  0.0068
 556            PB    3.44
 557            LS       0    98.0
 558            UD   0.065
                *

 559            KK   CSTN2
 560            KM   COMBINE 25-HS1B AND STN2
 561            HC       2
                *
1                                       HEC-1 INPUT                                          PAGE 17

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


 562            KK  RCSTN2
 563            KM   ROUTE CSTN2 TO CSTE1
 564            RD    1000   0.067   0.015       0    CIRC       3
                *

 565            KK     Y-Z
 566            BA  0.0176
 567            PB    3.42
 568            LS       0    92.2
 569            UD   0.075
                *

 570            KK    STE1
 571            BA  0.0027
 572            PB    3.42
 573            LS       0    98.0
 574            UD   0.050
                *

 575            KK   CSTE1
 576            KM   COMBINE CSTN2, Y-Z AND STE1
 577            HC       3
                *

 578            KK  RCSTE1
 579            KM   ROUTE CSTE1 TO CSTJ3
 580            RD     980   0.005   0.015       0    DEEP       5       0
                *

 581            KK   COS-3
 582            BA  0.0027
 583            PB    3.42
 584            LS       0    83.2
 585            UD   0.105
                *

 586            KK    STJ3
 587            BA  0.0050
 588            PB    3.42
 589            LS       0    98.0
 590            UD   0.059
                *

 591            KK   CSTJ3
 592            KM   COMBINE CSTE1, COS-3 AND STJ3
 593            HC       3
                *

 594            KK      AA
 595            BA  0.0158
 596            PB    3.44
 597            LS       0    88.4
 598            UD   0.088
                *
1                                       HEC-1 INPUT                                          PAGE 18

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


 599            KK  DUMMY3
 600            KM   COMBINE CSTJ3 AND AA
 601            HC       2
                *

 602            KK    DES5
 603            BA  0.0025
```

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

            607           KK   STEE2
            608           BA  0.0028
            609           PB    3.41
            610           LS       0    98.0
            611           UD   0.050
                          *

            612           KK    DES6
            613           BA  0.0020
            614           PB    3.40
            615           LS       0    98.0
            616           UD   0.050
                          *

            617           KK   CDES6
            618           KM   COMBINE DES5, STEE2, AND DES6
            619           HC       3
                          *

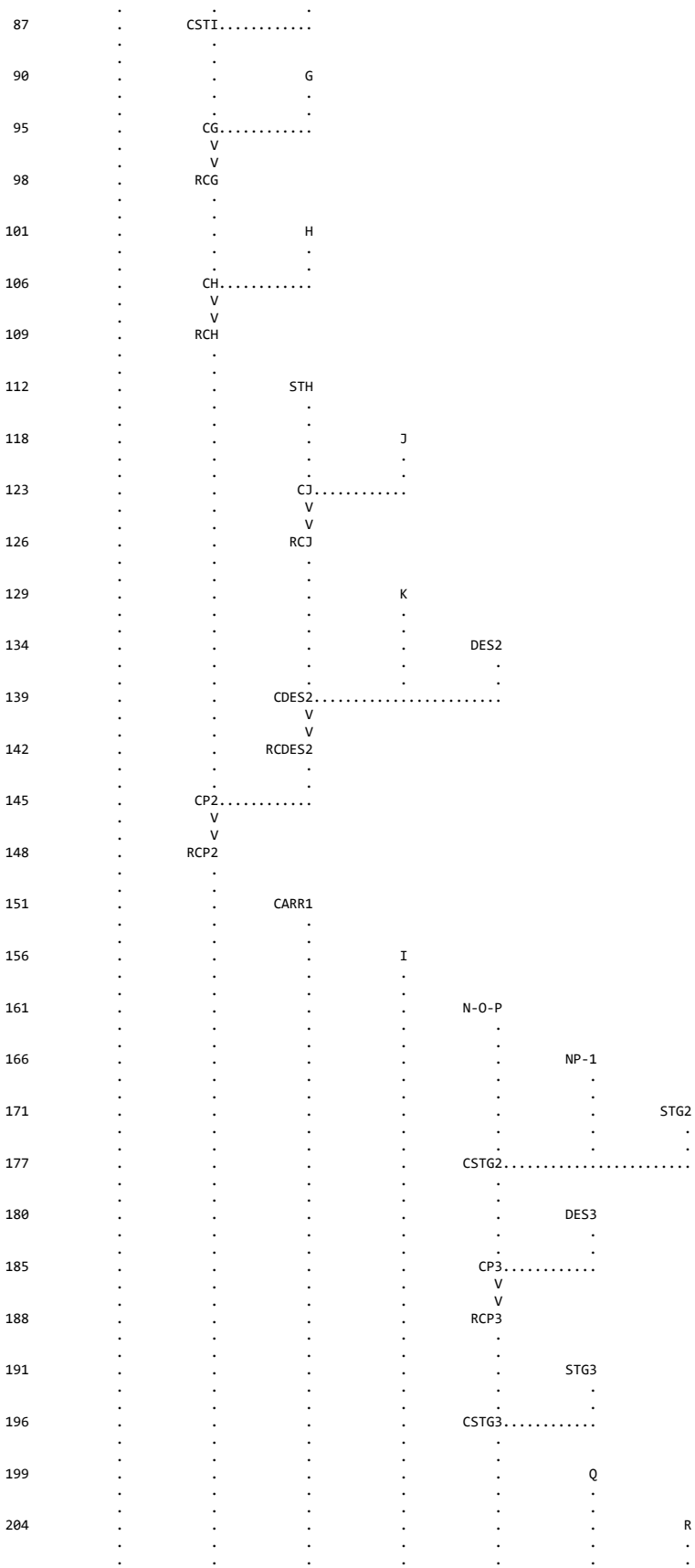
            620           KK      GG
            621           BA  0.0078
            622           PB    3.41
            623           LS       0    94.2
            624           UD   0.055
                          *

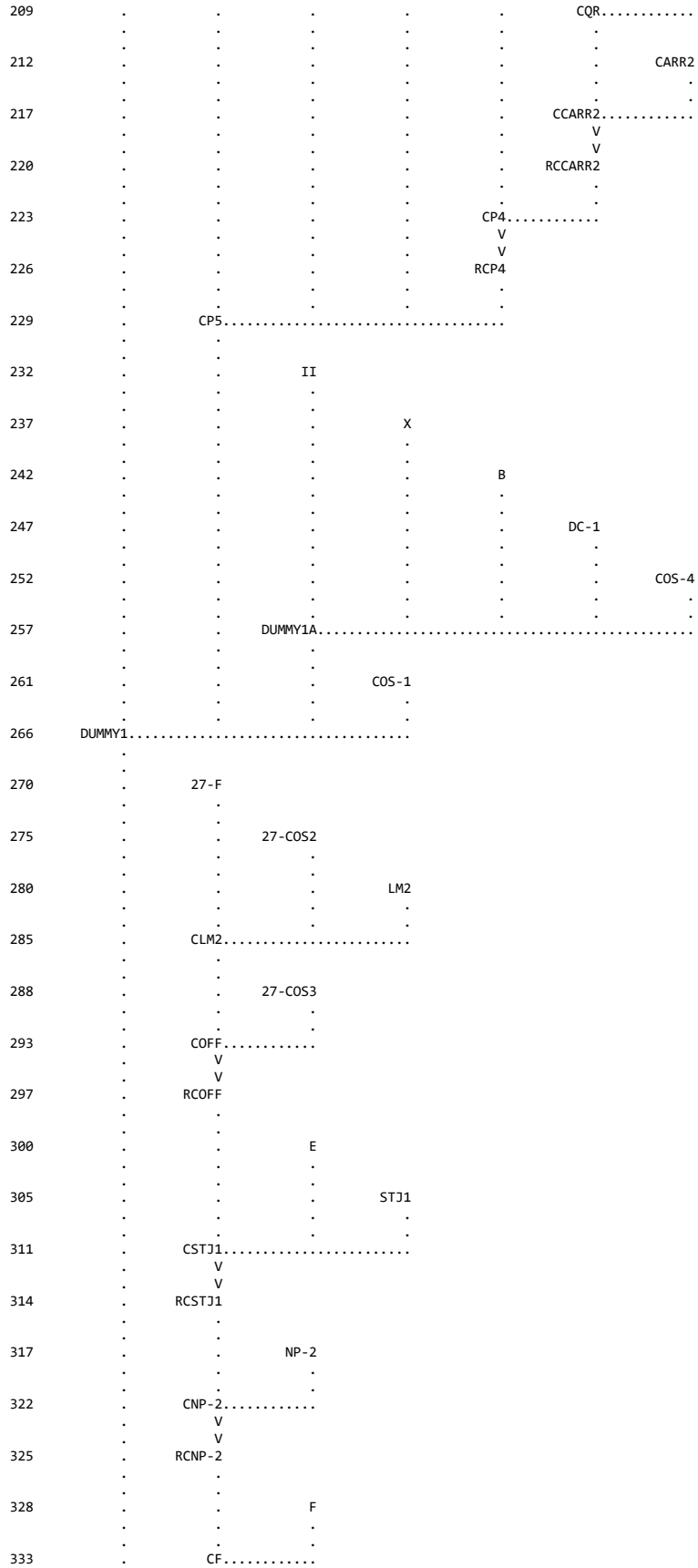
            625           KK      FF
            626           BA  0.0055
            627           PB    3.41
            628           LS       0    94.2
            629           UD   0.050
                          *

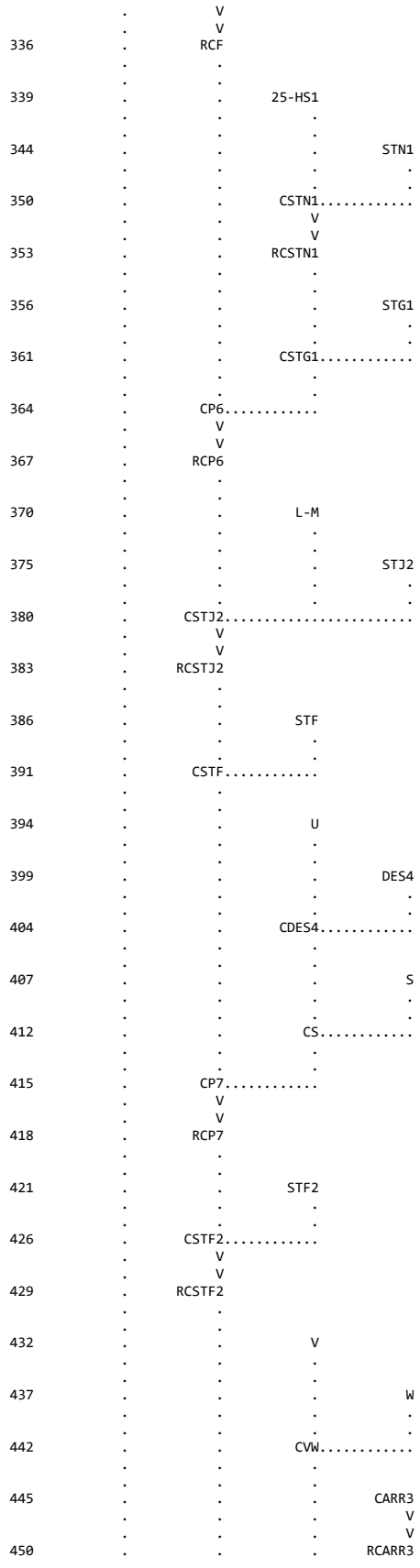
            630           KK  DUMMY4
            631           KM   COMBINE DUMMY3, FF, AND CGG
            632           HC       3
                          *
            633           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

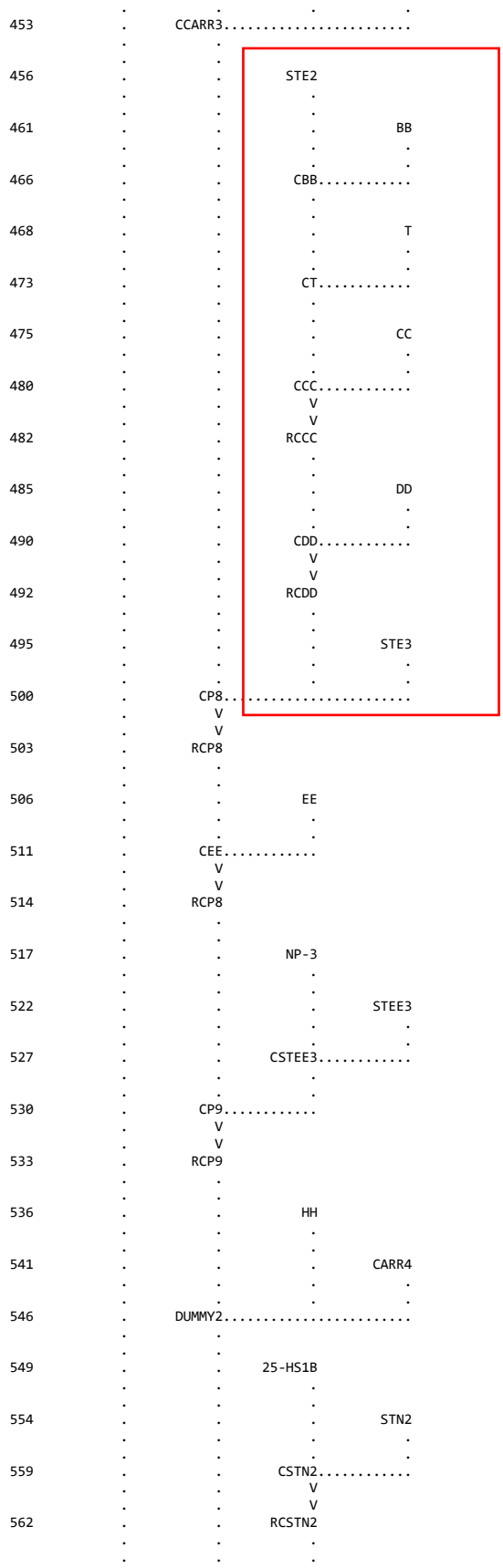
   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

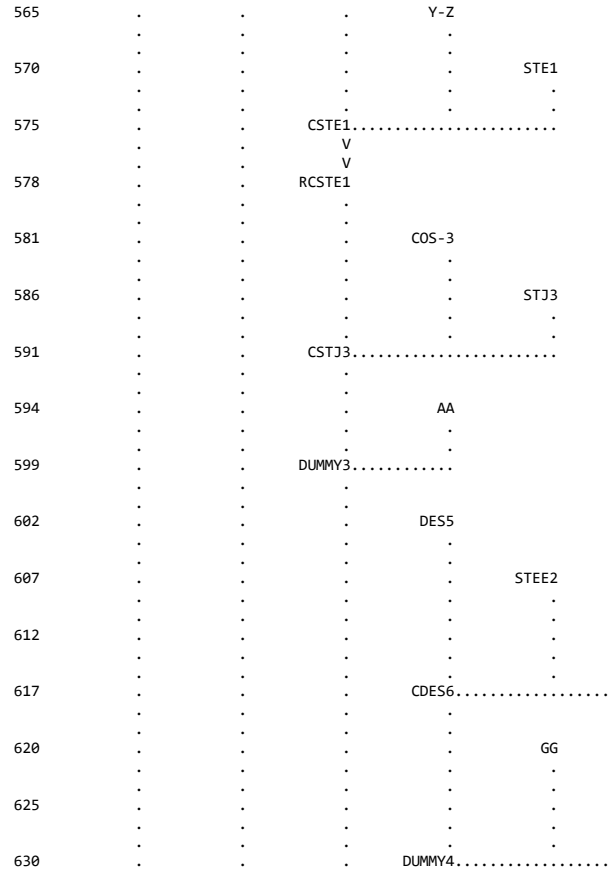
    22          LM
                .
                .
    35          .           D
                .           .
                .           .
    40          .           .       DES1
                .           .           .
                .           .           .
    45          .       CDES1............
                .           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
                .           .           .
```


CSTI
G
CG
RCG
H
CH
RCH
STH
J
CJ
RCJ
K
DES2
CDES2
RCDES2
CP2
RCP2
CARR1
I
N-O-P
NP-1
STG2
CSTG2
DES3
CP3
RCP3
STG3
CSTG3
Q
R


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


V
V
336 RCF
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 STE2
461 BB
466 CBB
468 T
473 CT
475 CC
480 CCC
482 RCCC
485 DD
490 CDD
492 RCDD
495 STE3
500 CP8
503 RCP8
506 EE
511 CEE
514 RCP8
517 NP-3
522 STEE3
527 CSTEE3
530 CP9
533 RCP9
536 HH
541 CARR4
546 DUMMY2
549 25-HS1B
554 STN2
559 CSTN2
562 RCSTN2



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *               JUN   1998             *
 *            VERSION 4.1               *
 *                                      *
 *  RUN DATE   20NOV19  TIME  14:58:22  *
 *                                      *
 ****************************************
```

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

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

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

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

100-YEAR, 6-HOUR STORM, SDN3

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

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME         0000  STARTING TIME
                          NQ          100  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
```

```
                    NDTIME        0815  ENDING TIME
                    ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE    8.25 HOURS

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

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00
1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN                        RATIO 1
                                                                    1.00

 HYDROGRAPH AT
+                    LM       .02     1   FLOW                     36.
                                          TIME                    3.50

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

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

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

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

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

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

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

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

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

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

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

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

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

   2 COMBINED AT
+                  CSTI       .02     1   FLOW                     62.
                                          TIME                    3.50
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 HYDROGRAPH AT
+                      G       .01     1   FLOW          30.
                                           TIME         3.50

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

  5 COMBINED AT
+                 DUMMY1A      .20     1   FLOW        454.
                                           TIME         3.50

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

 ROUTED TO
+               RCSTN1       .08     1   FLOW        220.
                                          TIME        3.50

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

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

  2 COMBINED AT
+                  CP6       .21     1   FLOW        532.
                                          TIME        3.50
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 ROUTED TO
+                    RCP6       .21     1   FLOW         518.
                                            TIME         3.50

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

  2 COMBINED AT
+                     CVW       .02     1   FLOW          36.
                                            TIME         3.50

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

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

  3 COMBINED AT
+                  CCARR3       .29     1   FLOW         667.
                                            TIME         3.50
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 HYDROGRAPH AT
+                   STE2       .00     1   FLOW          8.
                                           TIME         3.50

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

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

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

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

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

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

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

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

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

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

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

  3 COMBINED AT
+                    CP8       .33     1   FLOW        747.
                                           TIME         3.50

 ROUTED TO
+                   RCP8       .33     1   FLOW        737.
                                           TIME         3.50

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

  2 COMBINED AT
+                    CEE       .34     1   FLOW        762.
                                           TIME         3.50

 ROUTED TO
+                   RCP8       .34     1   FLOW        753.
                                           TIME         3.50

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

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

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

  2 COMBINED AT
+                    CP9       .34     1   FLOW        760.
                                           TIME         3.50

 ROUTED TO
+                   RCP9       .34     1   FLOW        750.
                                           TIME         3.50

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

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

  3 COMBINED AT
+                DUMMY2       .35     1   FLOW         780.
                                           TIME         3.50

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

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

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

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

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

 HYDROGRAPH AT
+                  STE1       .00     1   FLOW           8.
                                           TIME         3.50

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

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

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

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

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

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

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

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

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

 HYDROGRAPH AT
+                  DES6       .00     1   FLOW           6.
                                           TIME         3.50

  3 COMBINED AT
+                 CDES6       .01     1   FLOW          21.
                                           TIME         3.50

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

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

  3 COMBINED AT
+                DUMMY4       .02     1   FLOW          57.
                                           TIME         3.50
1
                                        SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
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(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

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

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          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
              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
              RCP8  MANE          .27    739.29    210.12      2.75      5.00    737.44    210.00        2.75


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4769E+02 EXCESS= .0000E+00 OUTFLOW= .4768E+02 BASIN STORAGE= .7519E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP8  MANE          .25    754.94    210.08      2.73      5.00    753.29    210.00        2.73


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4904E+02 EXCESS= .0000E+00 OUTFLOW= .4903E+02 BASIN STORAGE= .6560E-04 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
              RCP9  MANE          .32    751.65    210.26      2.73      5.00    750.40    210.00        2.73


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4946E+02 EXCESS= .0000E+00 OUTFLOW= .4945E+02 BASIN STORAGE= .8520E-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

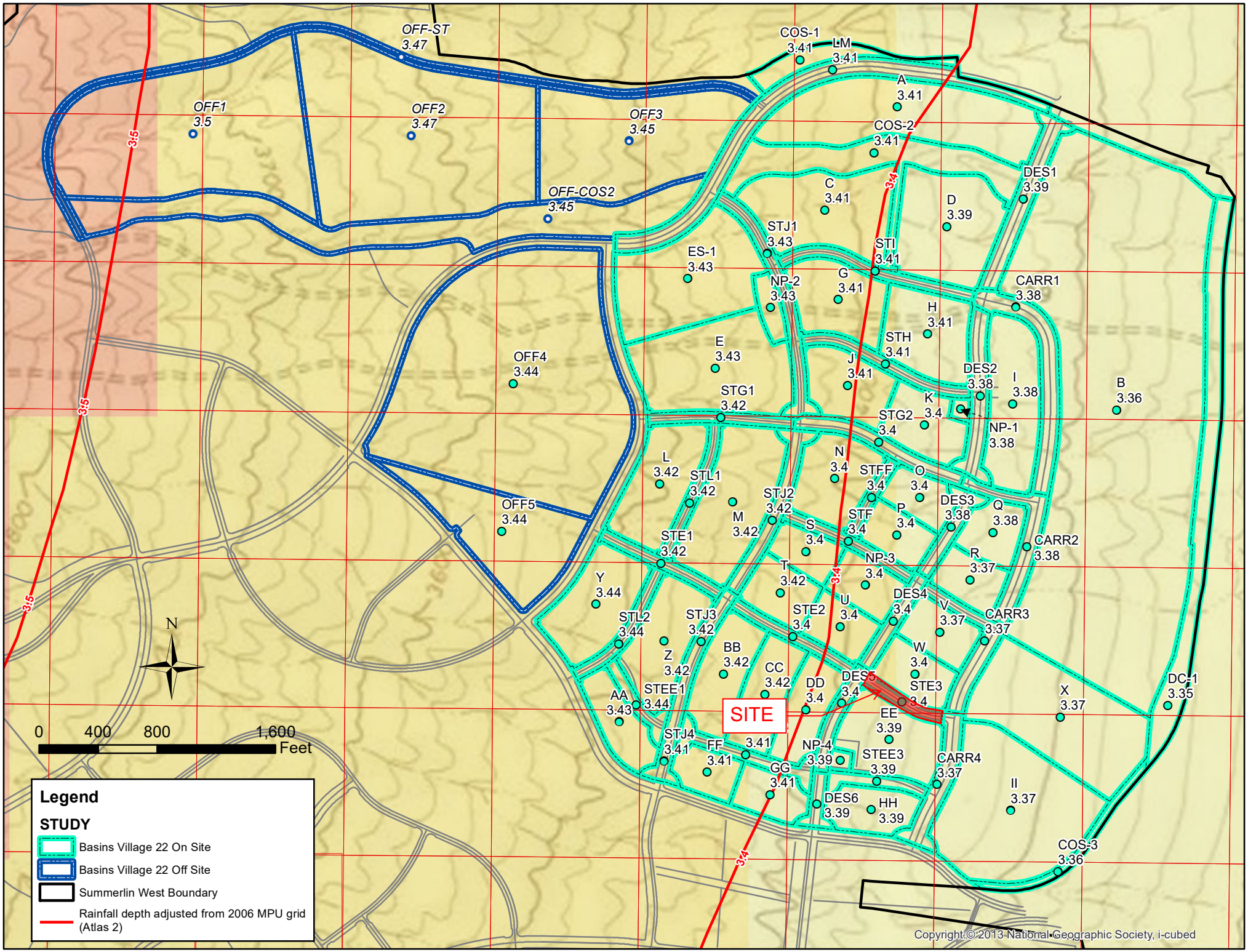

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3685E+01 EXCESS= .0000E+00 OUTFLOW= .3685E+01 BASIN STORAGE= .6612E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCSTE1  MANE         1.78    110.49    211.63      2.72      5.00    107.44    210.00        2.72

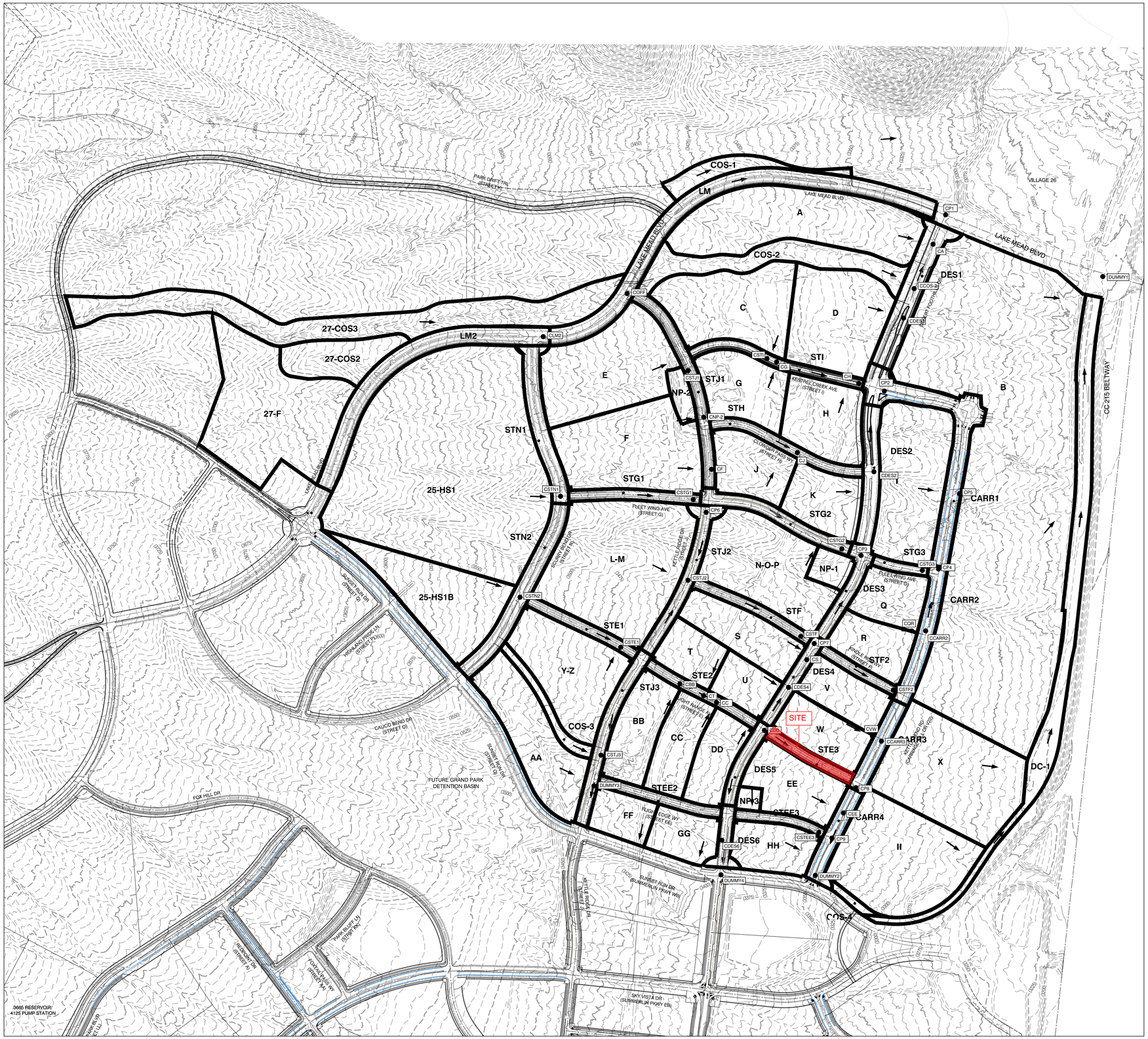

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6575E+01 EXCESS= .0000E+00 OUTFLOW= .6571E+01 BASIN STORAGE= .3348E-03 PERCENT ERROR=    .1



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



H:\7861\Village 22 Master\GIS\Rainfall\mxd\Village22-2006MPU-Precipitation.mxd Date: 11/5/2018



GRAPHIC SCALE

350 0 175 350 700

1" = 350'

LEGEND

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

ULTIMATE CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)	BASIN ID	AREA (ac)	Q100 (CFS)
LM	10.04	36	25-HS1	49.49	211
D	11.96	50	STN1	3.61	13
DES1	4.46	20	CSTN1	-	244
CDES1	-	70	STG1	1.85	8
COS-2	7.51	22	CSTG1	-	229
CCOS-2	-	89	CP6	-	532
A	17.39	68	L-M	21.14	81
CA	-	156	STJ2	3.10	13
CP1	-	191	CSTJ2	-	612
STI	2.42	11	STF	1.84	8
C	12.05	51	CSTF	-	610
CSTI	-	62	U	3.49	11
G	7.05	30	DES4	1.77	8
CG	-	92	CDES4	-	19
H	7.64	33	S	3.01	10
CH	-	124	CS	-	29
STH	2.29	10	CP7	-	639
J	5.93	24	STF2	1.21	5
CJ	-	34	CSTF2	-	637
K	5.28	22	V	5.01	17
DES2	3.09	13	W	5.28	19
CDES2	-	68	CVW	-	36
CP2	-	189	CARR3	2.14	8
CARR1	6.95	29	CCARR3	-	667
I	13.44	38	STE2		8
N-O-P	14.52	49	BB	6.29	23
NP-1	1.73	6	CBB	-	31
STG2	2.86	13	T	4.02	13
CSTG2	-	68	CT	-	44
DES3	2.00	9	CC	5.34	19
CP3	-	77	CCC	-	63
STG3	0.72	3	DD	4.76	17
CSTG3	-	79	CDD	-	77
Q	4.58	17	STE3	1.36	6
R	4.97	20	CP8	-	747
CQR	-	37	EE	6.80	25
CARR2	3.58	15	CEE	-	762
CCARR2	-	52	NP3	0.70	2
CP4	-	131	STEE3	1.23	5
CP5	-	379	CSTEE3	-	7
II	16.03	61	CP9	-	760
X	17.45	60	HH	4.85	20
B	80.77	304	CARR4		10
DC-1	12.59	36	25-HS1B		48
COS-4	0.57	2	STN2		19
COS-1	2.87	6	CSTN2	-	67
V27-F	19.13	83	Y-Z	11.28	42
V27-COS2	5.25	20	STE1	1.75	8
LM2	7.23	28	CSTE1	-	115
CLM2	-	132	COS-3	1.70	4
27-COS3	17.46	53	STJ3	3.22	14
COFF	-	185	CSTJ3	-	126
E	13.91	58	AA	10.13	33
STJ1	3.52	15	DES5	1.57	7
CSTJ1	-	255	STEE2	1.79	8
NP-2	1.34	5	DES6	1.31	6
CNP-2	-	255	CDES6	-	21
F	14.22	59	GG	4.98	21
CF	-	309	FF	3.49	15

REVISION | BY | DATE | REV

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

2727 SOUTH RAINBOW BOULEVARD
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

FIGURE 6
ULTIMATE CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 22

DRAWN BY: JVA — OCT 2019
DESIGNED BY:
CHECKED BY:
PROJECT NO: 7861
SCALE: 1" = 350' HORIZ, N/A VERT.

SHEET
OF SHEETS
DRAWING NO.

H:\7861\Village 22 Master Drainage?_LIP2 ADD1\A Figures\Figure 6 - Village 22 Drainage Basin Map.dwg

DRAINAGE STUDY FOR
SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

(CLV DS5159)

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: November 2, 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: **Summerlin West V21 – Summerlin Parkway Extention**			**COPIES TO:** VTN Nevada, Inc.
Cross Streets:	Summerlin Parkway & I-215 Western Beltway			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5159B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-410-001			CCRFCD
Zoning Action:	N/A			CCPW
FEMA Flood Zone	YES	NO **X**		
Proposed Storm Drain	YES **X**	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	7/18/2019	8/12/2019	Not Approved	$400.00	3494541: $400
2nd Submittal	10/3/2019	11/2/2019	See Comments Below	$400.00	3597440: $400
			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:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

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

3. In the last addendum, ***Additional Note #2*** stated that the 5'x5' regional facility is relocated from *Flight Edge Way* to *Sunset Run Drive*. There are a couple errors here: i) Per the approved *Master Drainage Study for Summerlin West Village 22*, the original location of the regional facility was in *Flight Range Avenue*, not *Flight Edge Way*; ii) The regional facility upstream of *Desert Foothills Drive* (SD-J) was revised from 5'x5' to 7'x6'. Revise the narrative in ***Additional Note #2*** in the next submittal.

4. An update to the approved *Master Drainage Study for Summerlin West Village 22* must be submitted addressing the location change of SD-J. The subject drainage study will not be approved prior to the approval of the *Update to the Master Drainage Study for Village 22.*

5. The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Kettle Ridge Drive* and *Desert Foothills Drive.* Prior to final plan approval the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City of Las Vegas Flood Control* for approval. Once the drainage study is conditionally approved, the engineer should contact the *City's Land Development Section* (229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update / letter will be required to justify that the offsite berms / channels are no longer necessary and can be removed.

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

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

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

9. The street and the associated storm drain facilities will eventually be transferred to the *City of Las Vegas*, the engineer/developer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final acceptance of the subject improvement plans.

10. **Second Request**: *Show and identify the "existing" regional facility in Desert Foothill Drive south of the intersection with Summerlin Parkway in all pertinent plans and exhibits in the next submittal.*

    The revised plans (UT11 and UT20) still did not provide the *City of Las Vegas* recorded drawing number as required. Revise as such in the next submittal.

11. **Second Request: *Sheet GR1***: *At the intersection of Kettle Ridge Drive and Sunset Run Drive, no drop inlet is proposed. Address in the next submittal, how the drainage can be conveyed across the street intersection.*

    At a minimum, on Sheets GR1, UT1 and UT19, show two drop inlets as "FUTURE" at the west side of the intersection of *Kettle Ridge* and *Sunset Run.*

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

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

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

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

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



Sample Letter to certify CD.pdf

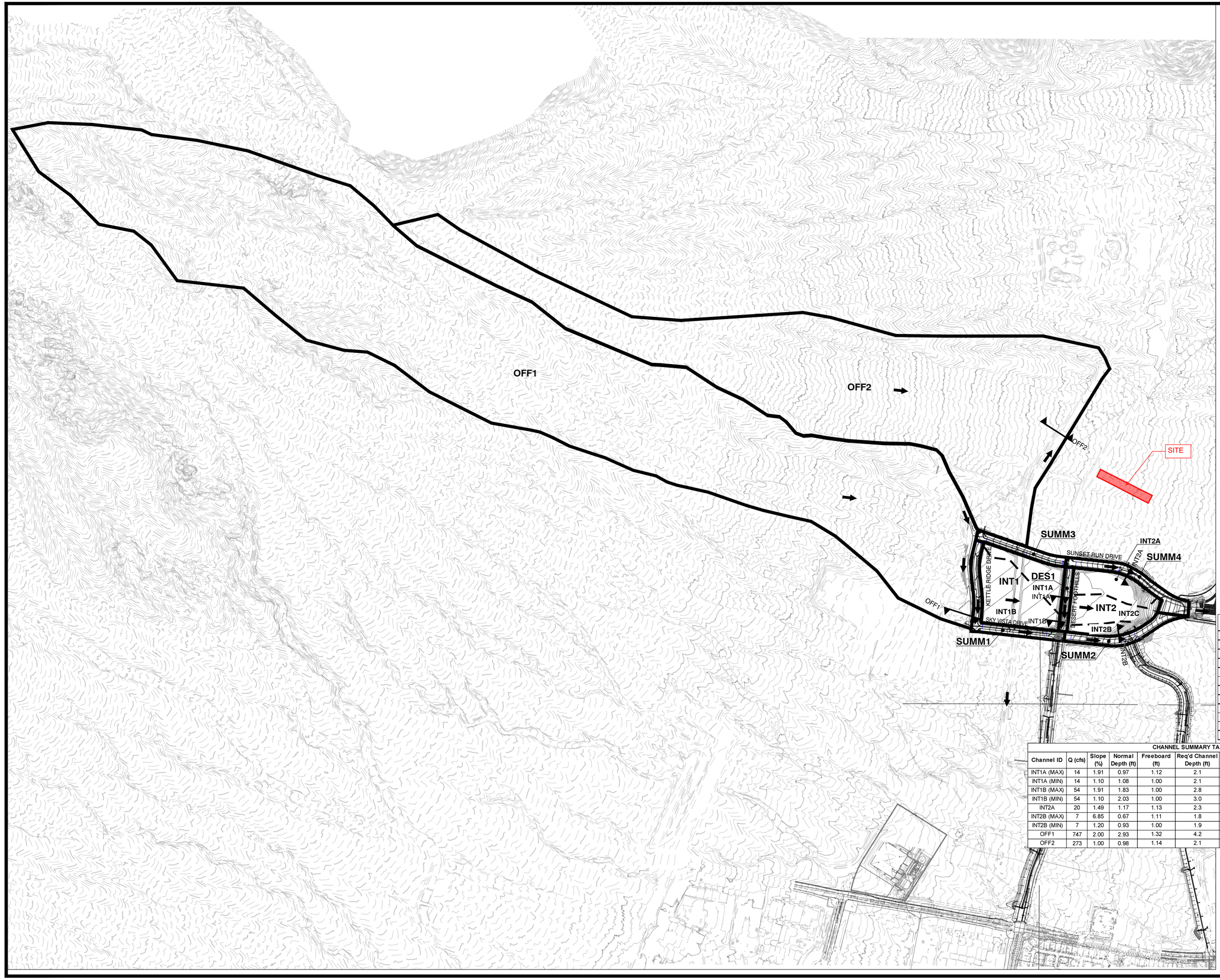
NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained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

END OF REMARKS

ays

T/R/S: T20S/R59E/23

AREA K-23



GRAPHIC SCALE

500 0 250 500 1000

1" = 500'

Interim Condition
HEC-1 Summary Table

Basin ID	Area (a.c.)	Q100 (cfs)
OFF1	376.73	747
OFF2	192.73	273
INT1	18.62	54
DES1	1.80	7
SUMM1	5.05	20
SUMM3	2.85	13
INT2	15.55	45
SUMM2	3.63	16
SUMM4	4.87	21

PRORATED SUBBASIN SUMMARY
INTERIM CONDITION

BASIN	BASIN AREA		Q100
INT1	18.62		54
INT2	15.55		45
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
INT1A	5.81	31.2%	14
INT1B	12.81	68.8%	31
TOTAL	**18.62**	**100.0%**	**45**
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
INT2A	6.90	44.4%	20
INT2B	2.32	14.9%	7
INT2C	6.33	40.7%	18
TOTAL	**15.55**	**100.0%**	**45**

CHANNEL SUMMARY TABLE

Channel ID	Q (cfs)	Slope (%)	Normal Depth (ft)	Freeboard (ft)	Req'd Channel Depth (ft)	Velocity (ft/s)	Riprap D_{50}	Side Slopes	Channel Description
INT1A (MAX)	14	1.91	0.97	1.12	2.1	4.91	N/A	3:1/3:1	Triangular
INT1A (MIN)	14	1.10	1.08	1.00	2.1	3.99	N/A	3:1/3:1	Triangular
INT1B (MAX)	54	1.91	1.83	1.00	2.8	5.35	8"	3:1/3:1	Triangular
INT1B (MIN)	54	1.10	2.03	1.00	3.0	4.35	8"	3:1/3:1	Triangular
INT2A	20	1.49	1.17	1.13	2.3	4.89	N/A	3:1/3:1	Triangular
INT2B (MAX)	7	6.85	0.67	1.11	1.8	5.18	8"	3:1/3:1	Triangular
INT2B (MIN)	7	1.20	0.93	1.00	1.9	2.70	8"	3:1/3:1	Triangular
OFF1	747	2.00	2.93	1.32	4.2	8.86	12"	3:1/3:1	Trapezoidal
OFF2	273	1.00	0.98	1.14	2.1	5.63	N/A	3:1/3:1	Existing Channel

LEGEND

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

REV	DATE	BY	REVISION

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

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

FIGURE 7A
INTERIM CONDITION 1 BASIN MAP

SUMMERLIN WEST VILLAGE 21
SUMMERLIN PARKWAY EXTENSION

DRAWN BY:
DESIGNED BY: JYA
07/2018
CHECKED BY:
PROJECT NO: 7851-5.8
SCALE: HORIZ. #### VERT. ####

SHEET
FIG 7A
OF SHEETS
DRAWING NO.

H:\7851\Summerlin Parkway Extension\Drainage\2_ADD1\A Figures\Figure 7A - Interim Map.dwg

DRAINAGE STUDY FOR
SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD

(CLV DS05204)

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	3309.530	6.470	3316.000	747.00	14.43	3.23	3319.23	.00	6.47	8.00	8.000	8.000	.00	0 .0
9.633	.0037					.0056	.05	6.47	1.00	8.00	.015	.00	.00	BOX
1009.633	3309.566	6.786	3316.352	747.00	13.76	2.94	3319.29	.00	6.47	8.00	8.000	8.000	.00	0 .0
40.203	.0037					.0050	.20	6.79	.93	8.00	.015	.00	.00	BOX
1049.836	3309.716	7.117	3316.833	747.00	13.12	2.67	3319.51	.00	6.47	8.00	8.000	8.000	.00	0 .0
86.864	.0037					.0045	.39	7.12	.87	8.00	.015	.00	.00	BOX
1136.700	3310.040	7.422	3317.462	747.00	12.58	2.46	3319.92	.10	6.47	8.00	8.000	8.000	.00	0 .0
37.000	.0049					.0045	.17	7.52	.81	7.20	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
1173.700	3310.220	7.386	3317.606	747.00	12.64	2.48	3320.09	.03	6.47	8.00	8.000	8.000	.00	0 .0
34.000	.0050					.0046	.16	7.42	.82	7.12	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
1207.700	3310.390	7.344	3317.734	747.00	12.71	2.51	3320.24	.00	6.47	8.00	8.000	8.000	.00	0 .0
55.600	.0050					.0046	.26	7.34	.83	7.10	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1263.300	3310.670	7.280	3317.950	747.00	12.83	2.55	3320.50	.00	6.47	8.00	8.000	8.000	.00	0 .0
73.100	.0049					.0047	.35	7.28	.84	7.16	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
1336.400	3311.030	7.240	3318.270	747.00	12.90	2.58	3320.85	.00	6.47	8.00	8.000	8.000	.00	0 .0
87.500	.0050					.0048	.42	7.24	.84	7.10	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
1423.900	3311.470	7.183	3318.653	747.00	13.00	2.62	3321.28	.00	6.47	8.00	8.000	8.000	.00	0 .0
136.800	.0050					.0049	.67	7.18	.85	7.14	.015	.00	.00	BOX
1560.700	3312.150	7.155	3319.305	747.00	13.05	2.64	3321.95	.00	6.47	8.00	8.000	8.000	.00	0 .0
165.300	.0050					.0049	.82	7.16	.86	7.11	.015	.00	.00	BOX
1726.000	3312.980	7.122	3320.102	747.00	13.11	2.67	3322.77	.00	6.47	8.00	8.000	8.000	.00	0 .0
69.100	.0051					.0050	.35	7.12	.87	7.08	.015	.00	.00	BOX
1795.100	3313.330	7.107	3320.437	747.00	13.14	2.68	3323.12	.00	6.47	8.00	8.000	8.000	.00	0 .0
58.100	.0050					.0050	.29	7.11	.87	7.13	.015	.00	.00	BOX
1853.200	3313.620	7.113	3320.733	747.00	13.13	2.68	3323.41	.00	6.47	8.00	8.000	8.000	.00	0 .0
232.800	.0050					.0050	1.16	7.11	.87	7.13	.015	.00	.00	BOX

<--Referenced Tailwater Elevation

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

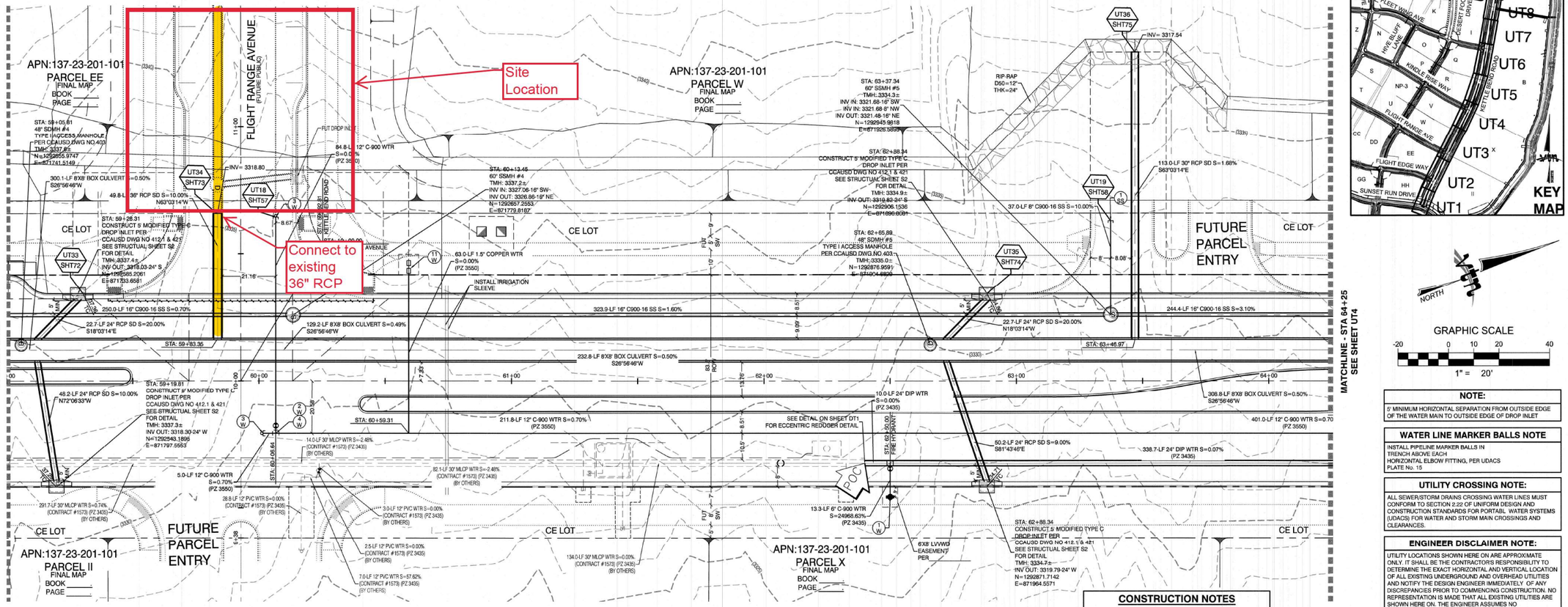
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2086.000	3314.780	7.129	3321.909	747.00	13.10	2.66	3324.57	.00	6.47	8.00	8.000	8.000	.00	0 .0
72.700	.0049				.0050	.36	7.13	.86	7.15	.015	.00	.00	BOX	
2158.700	3315.140	7.137	3322.277	747.00	13.08	2.66	3324.93	.00	6.47	8.00	8.000	8.000	.00	0 .0
236.100	.0050				.0050	1.17	7.14	.86	7.10	.015	.00	.00	BOX	
2394.800	3316.330	7.101	3323.431	747.00	13.15	2.68	3326.12	.00	6.47	8.00	8.000	8.000	.00	0 .0
69.800	.0050				.0050	.35	7.10	.87	7.11	.015	.00	.00	BOX	
2464.600	3316.680	7.106	3323.786	747.00	13.14	2.68	3326.47	.00	6.47	8.00	8.000	8.000	.00	0 .0
4.000	.0050				.0050	.02	7.11	.87	7.12	.015	.00	.00	BOX	
2468.600	3316.700	7.107	3323.806	747.00	13.14	2.68	3326.49	.00	6.47	8.00	8.000	8.000	.00	0 .0
4.000	.0050				.0050	.02	7.11	.87	7.12	.015	.00	.00	BOX	
2472.600	3316.720	7.107	3323.827	747.00	13.14	2.68	3326.51	.00	6.47	8.00	8.000	8.000	.00	0 .0
37.000	.0049				.0050	.18	7.11	.87	7.20	.015	.00	.00	BOX	
2509.600	3316.900	7.128	3324.028	747.00	13.10	2.66	3326.69	.00	6.47	8.00	8.000	8.000	.00	0 .0
4.000	.0050				.0050	.02	7.13	.86	7.12	.015	.00	.00	BOX	
2513.600	3316.920	7.128	3324.048	747.00	13.10	2.66	3326.71	.00	6.47	8.00	8.000	8.000	.00	0 .0
4.000	.0050				.0050	.02	7.13	.86	7.12	.015	.00	.00	BOX	
2517.600	3316.940	7.128	3324.068	747.00	13.10	2.66	3326.73	.00	6.47	8.00	8.000	8.000	.00	0 .0
28.300	.0050				.0050	.14	7.13	.86	7.15	.015	.00	.00	BOX	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-10-2020 Time: 8:46:33

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2545.900	3317.080	7.132	3324.212	747.00	13.09	2.66	3326.87	.00	6.47	8.00	8.000	8.000	.00	0 .0
85.200	.0050				.0050	.42	7.13	.86	7.09	.015	.00	.00	BOX	
2631.100	3317.510	7.115	3324.625	747.00	13.12	2.67	3327.30	.00	6.47	8.00	8.000	8.000	.00	0 .0



SEE SHEET UT3A FOR UTILITY PROFILE

CONSTRUCTION NOTES

WATER

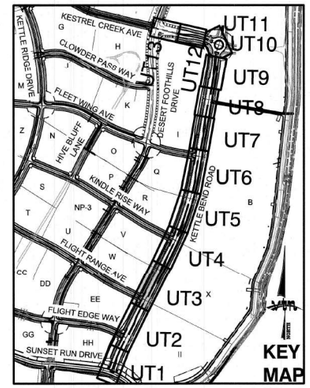
		PUBLIC
FH	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W	1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

SEWER

		PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
SS	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
POC	SEWER POINT OF CONNECTION	





GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

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

UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:
UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5146
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN 3
59+00 TO 64+25

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC 06/28/2019
DESIGNED BY: BCC 06/28/2019
CHECKED BY: WJM 01/13/2020
PROJECT NO: 7961 SCALE: HORIZ. 1"=20' VERT. 1"=4'

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
STATE OF NEVADA
No. 14745
PROFESSIONAL ENGINEER
1/14/20

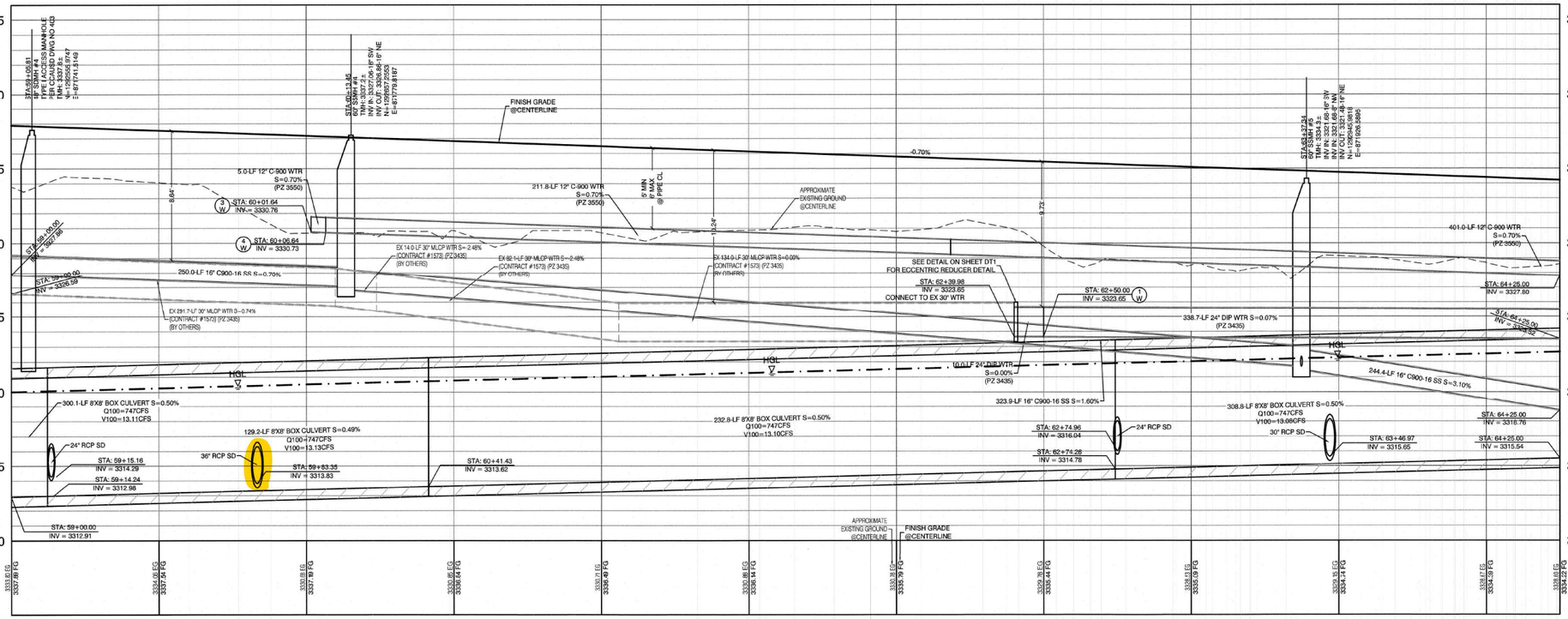
SHEET
UT3
41 OF 94 SHEETS

DRAWING NO.

I:\7961\Kettle Bend Road\Sheet Set\7961-UT1.dwg 1/13/2020 11:39 AM brandonc

SEE SHEET UT3 FOR PLAN VIEW

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



CONSTRUCTION NOTES

		WATER	PUBLIC
1W		FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W		12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W		12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W		12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W		24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W		24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W		24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W		24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W		12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1° HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W		1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
		12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,836 LF.
		24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,419 LF.
	PWC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC
	S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
		8" C-900-16 SANITARY SEWER MAIN	296 LF.
		16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1 SD-6		12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
	PWC	SEWER POINT OF CONNECTION	



NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

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

UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:
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WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

KETTLE BEND ROAD
(PUBLIC)

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

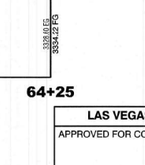
CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2991 WEB WWW.JTNW.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PROFILE 3A

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 05/22/2019
DESIGNED BY: BCC — 05/22/2019
CHECKED BY: WJM — 01/13/2020
PROJECT NO: 7861 — SCALE: HORIZ. 1"=20', VERT. 1"=4'



SHEET
UT3A
42 OF 94 SHEETS
DRAWING NO.

H:\7861\Kettle Bend Road\Sheet Set\7861-UT-1.dwg>1/13/2020 11:39 AM>brandonc

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE
(STREET E)
KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE
APN: 137-23-201-001
CITY OF LAS VEGAS
STATE OF NEVADA

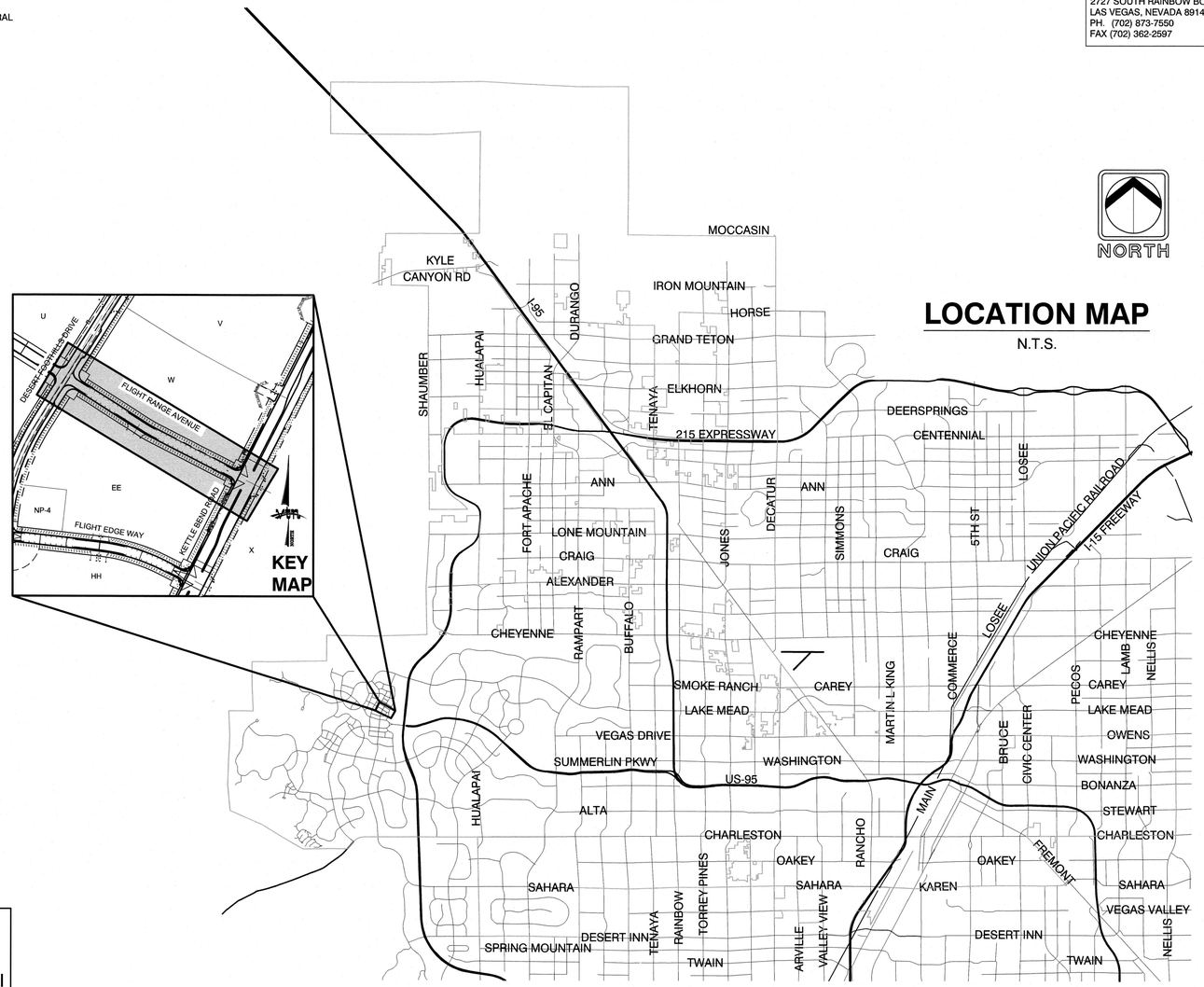
DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC

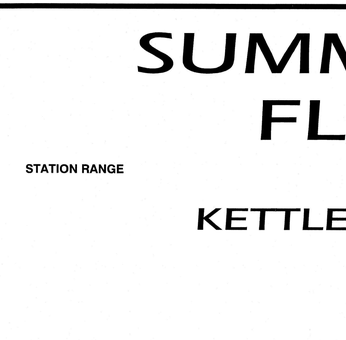
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION	STATION RANGE
1	CV	COVER SHEET	
2	NT	NOTE SHEET	
3	HC1	HORIZONTAL CONTROL PLAN 1	
4	HC2	HORIZONTAL CONTROL PLAN 2	
5	HC3	HORIZONTAL CONTROL PLAN 3	
6	MUTW	MASTER UTILITY WATER	
7	MUTSD	MASTER UTILITY STORM DRAIN	
8	MGRD	MASTER GRADING PLAN	
9	GR1	GRADING PLAN 1	
10	GR2	GRADING PLAN 2	
11	GR3	GRADING PLAN 3	
12	DT1	DETAIL SHEET 1	
13	DT2	DETAIL SHEET 2	
14	UT1	UTILITY PLAN & PROFILE 1	STA: 19+00 TO 16+00
15	UT2	UTILITY PLAN & PROFILE 2	STA: 16+00 TO 13+00
16	UT3	UTILITY PLAN & PROFILE 3	STA:13+00 TO 9+50
17	UT4	UTILITY PLAN & PROFILE 4 STORM DRAIN LATERAL	
18	UT5	UTILITY PLAN & PROFILE 5 WATER LATERAL	
19	UT6	UTILITY PLAN & PROFILE 6 STORM DRAIN LATERAL	
20	TR1	TRAFFIC AND STREETLIGHTING PLAN 1	
21	TR2	TRAFFIC AND STREETLIGHTING PLAN 2	



LOCATION MAP
N.T.S.



KEY MAP

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

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

ENGINEERING FIRM
VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550
FAX (702) 362-2597

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER AND INTENDED SOLELY AS A GENERAL GUIDELINE FOR CONSTRUCTION. ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS AND ORDINANCES, INCLUDING BUT NOT LIMITED TO THE FEDERAL FAIR HOUSING AMENDMENTS ACT, AMERICANS WITH DISABILITIES ACT, THE ARCHITECTURAL BARRIERS ACT AND ANY APPLICABLE UNIFORM STANDARDS, SPECIFICATIONS OR DRAWINGS. THE PERSON OR ENTITY PERFORMING THE CONSTRUCTION SHALL BE SOLELY RESPONSIBLE TO MAKE SURE CONSTRUCTION IS IN CONFORMANCE WITH ALL LOCAL, STATE AND FEDERAL STATUES, LAWS, CODES, REGULATIONS, STANDARDS, GUIDELINES AND ORDINANCES AND FURTHER, IS IN CONFORMANCE WITH ANY APPLICABLE DESIGN CRITERIA, INCLUDING BUT NOT LIMITED TO SOILS REPORTS, TRAFFIC STUDIES, GEOTECHNICAL REPORTS, ARCHITECTURAL PLANS AND SPECIFICATIONS, DRAINAGE PLANS OR STUDIES AND ANY OTHER CRITERIA, STANDARDS OR REQUIREMENTS LISTED IN THE PLANS OR THE GENERAL NOTES RELATED TO THESE PLANS OR PROVIDED BY ANYONE IN REFERENCE TO THIS PROJECT.

APPROVALS

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK DATE

"THE AFFIXED CENTURY LINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS."

NV ENERGY DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NVENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

COX COMMUNICATIONS LAS VEGAS, INC. DATE

SOUTHWEST GAS CORPORATION DATE

LAS VEGAS FIRE & RESCUE DATE

LAS VEGAS VALLEY WATER DISTRICT

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT:---- DATE:
SHEETS:

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

FIRE DEPARTMENT APPROVAL

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



REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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

COVER SHEET

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND
ROAD TO DESERT FOOTHILLS DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	
BCC	BCC	KAM	
10/18/2019	10/18/2019	02/17/2020	

SCALE: --- HORIZ. N/A VERT.

PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

SHEET
CV
1 OF 21 SHEETS

DRAWING NO.

H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Sheet Set\7861-CV.dwg,2/17/2020 9:18 AM,kcampbell

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: NOVA GEOTECHNICAL, PROJECT NO. G-18-176, DATED DECEMBER 30, 2019.
    APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE CITY AND APPROVED PRIOR TO ACCEPTANCE OF FACILITY VIDEO INSPECTION. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT-OF-WAY, AND STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS. THE LOCATION SHALL BE DESCRIBED BY COORDINATES WHICH SHALL BE BASED ON THE OFFICIAL HORIZONTAL AND VERTICAL CONTROL NETWORKS OF THE CITY OF LAS VEGAS. FINAL LOCATION MAPS MUST BE SEALED AND CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINTIES OF ± 0.09 METERS (± 0.3 FEET) HORIZONTALLY AND VERTICALLY. A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).
22. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION.
23. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.
24. REVISED 06/04/18

CITY OF LAS VEGAS STREETLIGHT NOTES:

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION (USS), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS, ETC., LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.
4. ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN NO. #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 320A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TRAFFIC ENGINEERING DIVISION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINTS SHALL BE COORDINATED WITH NV ENERGY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICEPOINTS SHALL BE SHOWN ON THE PLANS.
8. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREETLIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED. AT NO EXPENSE TO THE CITY OF LAS VEGAS.
9. THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC. FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON THE PLANS.

REVISED JUNE 28, 2016 (LD VERSION)

LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES NOTES:

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE PUBLIC RIGHTS-OF-WAY OF THE CITY OF LAS VEGAS AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CITY OF LAS VEGAS AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

CITY OF LAS VEGAS FIRE DEPARTMENT NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6631 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALEY WATER DISTRICT'S - APPROVED PRODUCTS LIST ARE ALLOWED TO BE INSTALLED.
3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [IFC § 105.6.15]
4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. [IFC § 3310, § 3312]
5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTERLINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. [IFC § 507.5.7.3]
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TESTS WITH PRIOR FIRE PREVENTION APPROVAL. [IFC § 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.2.1, NFPA 24]
8. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. [IFC § 507]
9. PRIVATE HYDRANTS SHALL BE PAINTED RED. [IFC § 507.5.7.1]
10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. [IFC § 507]
11. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: [IFC § C102]

    RESIDENTIAL - 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.
    COMMERCIAL - 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.
12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS. [IFC § C102.8]
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [IFC § C102.10]
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.4]
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.7]
17. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. [IFC § C102.6]
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. FOR SYSTEMS REQUIRED TO HAVE TWO (2) SOURCES OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD-INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. FOR SYSTEMS PERMITTED TO HAVE ONE SOURCE OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 3 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD-INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. [IFC § C104]
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. [IFC § 503.2.3]
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12%. ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. [IFC § 503.2.7, § 503.2.8]
21. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FT OUTSIDE AND 28 FT INSIDE TURNING RADIUS. [IFC § 503.2.4]
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13FT 6 INS. [IFC § 503.2.1]
23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 33 FT WITH PARKING ON BOTH SIDES MEASURED TO FACE OF CURB. NOT LESS THAN 28 FT WIDE WITH PARKING RESTRICTED TO ONE SIDE MEASURED TO FACE OF CURB. NOT LESS THAN 24 FT WIDE WITH NO PARKING ON EITHER SIDE MEASURED TO FACE OF CURB. FIRE LANES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FT. [IFC § 503.2.1.1]
24. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. [IFC § 503.1.1]
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. CLV REGULATION AND MOU
26. ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. CLV REGULATION
27. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF NO CURB IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. [IFC § 503.3]
28. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. IFC § 503.6
29. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS, OR HAVING FOUR OR MORE TRAVEL LANES AND A TRAFFIC COUNT OF MORE THAN 30,000 VEHICLES PER DAY, ALL HYDRANTS BEING UTILIZED TO DELIVER FIRE FLOW TO THE PROPOSED LOCATION SHALL BE LOCATED ON THE SAME SIDE OF THE STREET AS THE PROPOSED DEVELOPMENT. CLV REGULATION

EFFECTIVE DATE: FEBRUARY 4th, 2019

CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.
3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
4. WHEN A DESIGNATED "SUGGESTED ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.
5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL UTILIZE TYPE XI RETROREFLECTIVE SHEETING IN ACCORDANCE WITH CGAUSS 627 AND 716 AND SHALL HAVE AN ANTI-GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.
10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.
11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.
13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.
14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.
15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

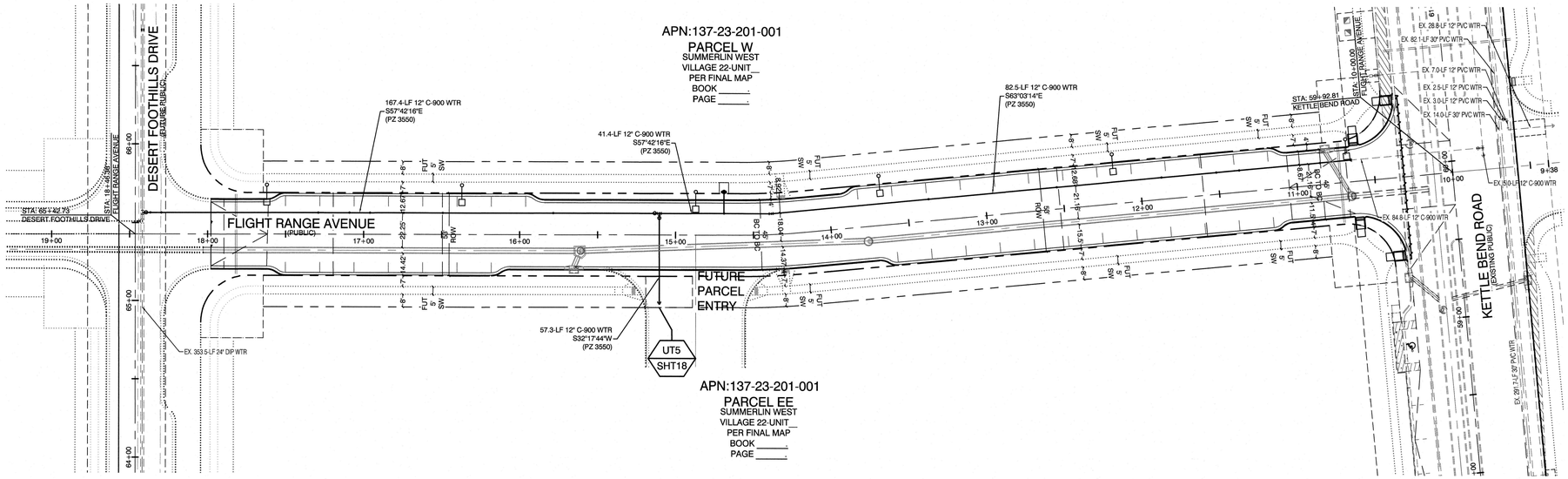
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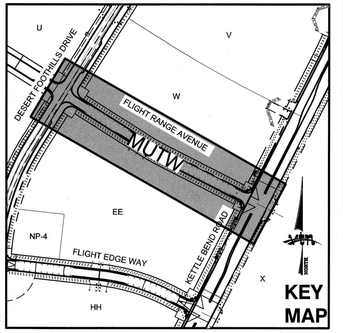
LAS VEGAS VALLEY WATER DISTRICT STANDARD NOTES

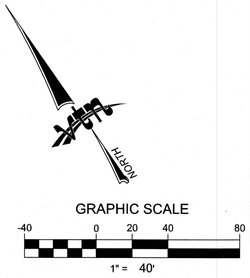
LVVWD PROJECT #----

(REVISED 01/09/2017)

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. **WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.**
2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE **2010** EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). **THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.**
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE **2010** EDITION OF THE UDACS.
9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND S







WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER LINE MARKER BALLS NOTE

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

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

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

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

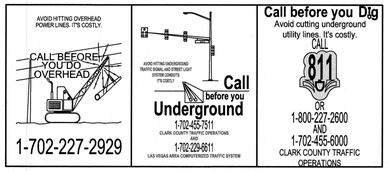
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03



CONSTRUCTION NOTES

UT # SHT #

UTILITY PROFILE REFERENCE LABEL
UT # = SHEET INDEX
SHT# = SHEET NUMBER

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-6148
PH. (702) 873-7550 FAX (702) 382-2597 WEB WWW.VTNRV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER UTILITY WATER

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

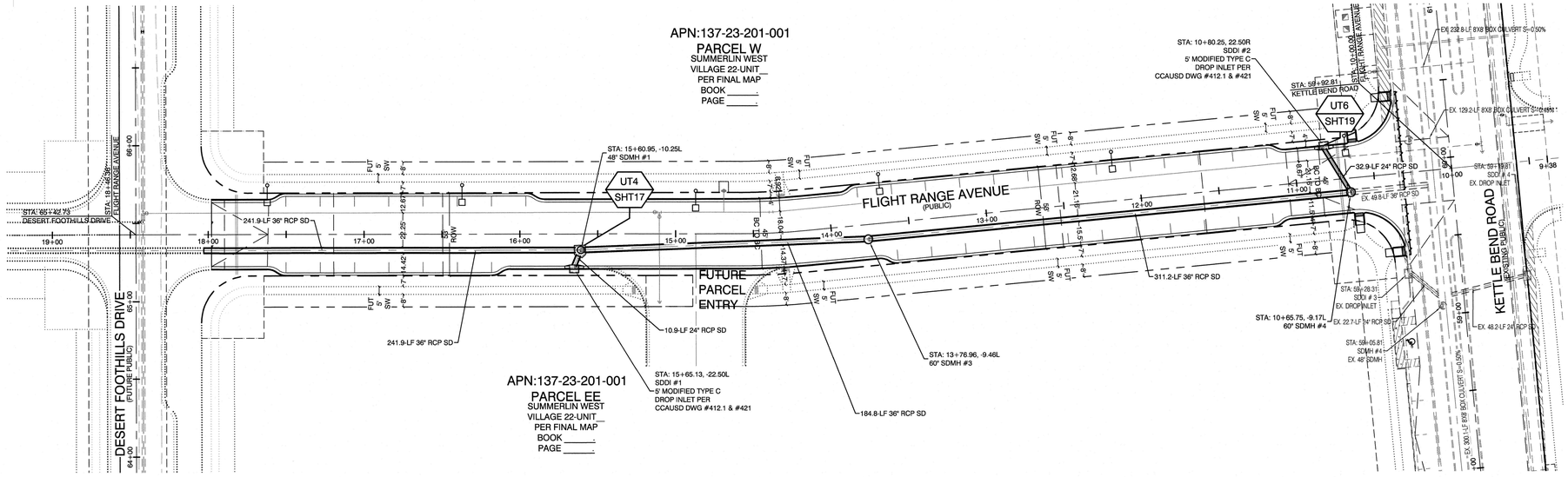
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DESIGNED BY: BCC 10/21/2019
CHECKED BY: WJM 02/17/2020
SCALE: 1"=40' HORIZ. N/A VERT.
PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

SHEET
MUTW
6 OF **21** SHEETS

DRAWING NO.

H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Sheet Set\7861-MUTW.dwg-1/29/2020 1:22 PM-bmeyer



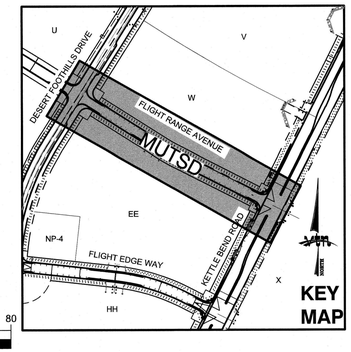
FLIGHT RANGE AVENUE
(PUBLIC)



GRAPHIC SCALE

-40 0 20 40 80

1" = 40'



CONSTRUCTION NOTES

UT # / SHT # — UTILITY PROFILE REFERENCE LABEL
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NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

DROP INLET NOTE:

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL)

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
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BENCHMARK

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
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FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.



1-702-227-2929



Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL
811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 150
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

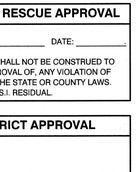
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 382-2297 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER UTILITY STORM DRAIN

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
BCC 10/21/2019	BCC 10/21/2019	WJM 02/17/2020	1"=40'	VERT. N/A

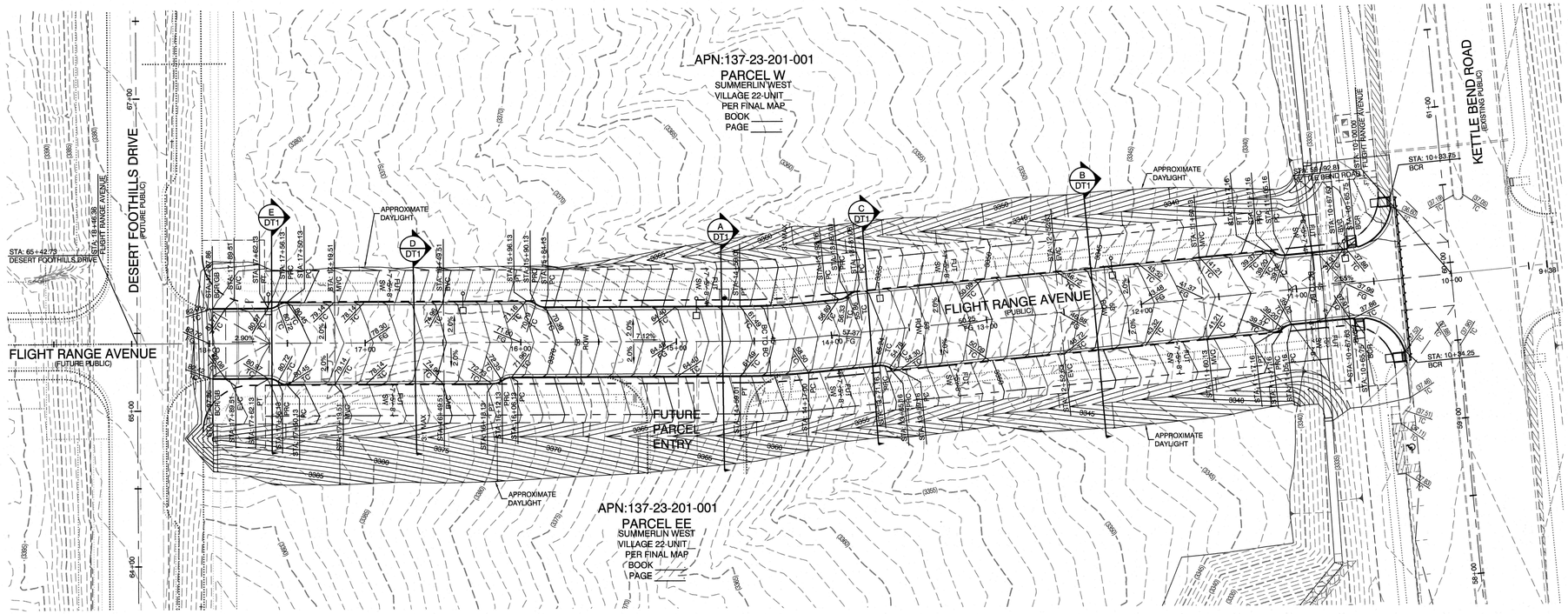
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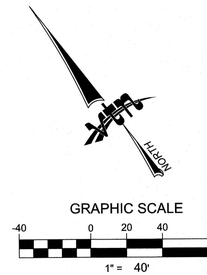


SHEET
MUTSD
7 OF 21 SHEETS

DRAWING NO.

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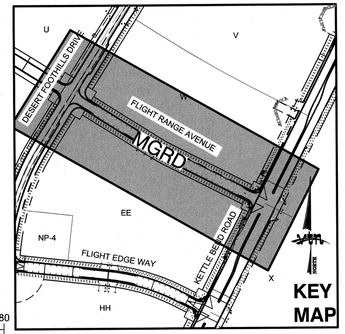




GRAPHIC SCALE

-40 0 20 40 80

1" = 40'



BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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BENCHMARK

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-176, DATED DECEMBER 30, 2019

SIGHT VISIBILITY ZONES:

NO STRUCTURE, WALLS, VEGETATION, OR OBJECT OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.





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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #XXXXXXX

WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 150
LAS VEGAS, NEVADA 89135
702-791-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 382-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

CITY OF LAS VEGAS

MASTER GRADING PLAN

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

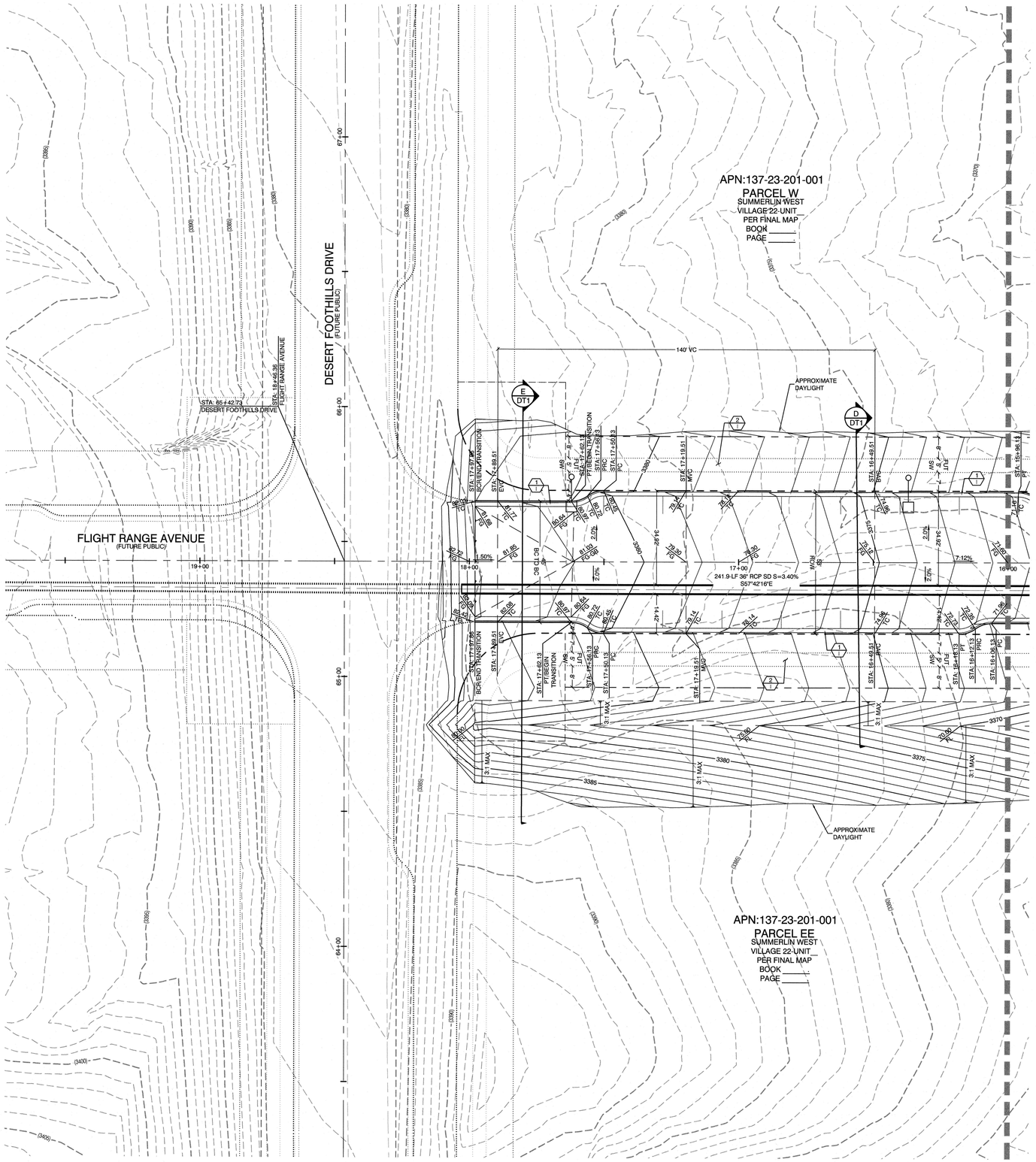
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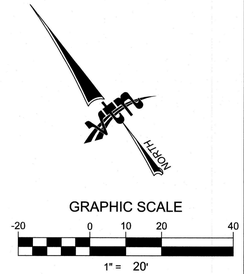
PROFESSIONAL ENGINEER · STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
NO. 15745
2/17/20

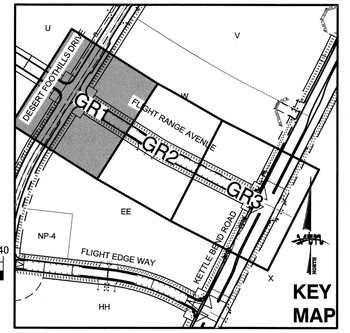
SHEET
MGRD
8 OF 21 SHEETS

DRAWING NO.

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CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. FUTURE SIDEWALK
3. CONSTRUCT HANDICAP RAMP SEE SHEET DT2
4. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
5. FIELD VERIFY AND MATCH EXISTING

BASIS OF BEARING

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PROJECT #G-18-176, DATED DECEMBER 30, 2019

SIGHT VISIBILITY ZONES:

NO STRUCTURE, WALLS, VEGETATION, OR OBJECT OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DIG OVERHEAD
1-702-227-2929

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

ENGINEER DISCLAIMER NOTE:

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #XXXXXXX

WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-207-4500

CITY OF LAS VEGAS

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

GRADING PLAN 1

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

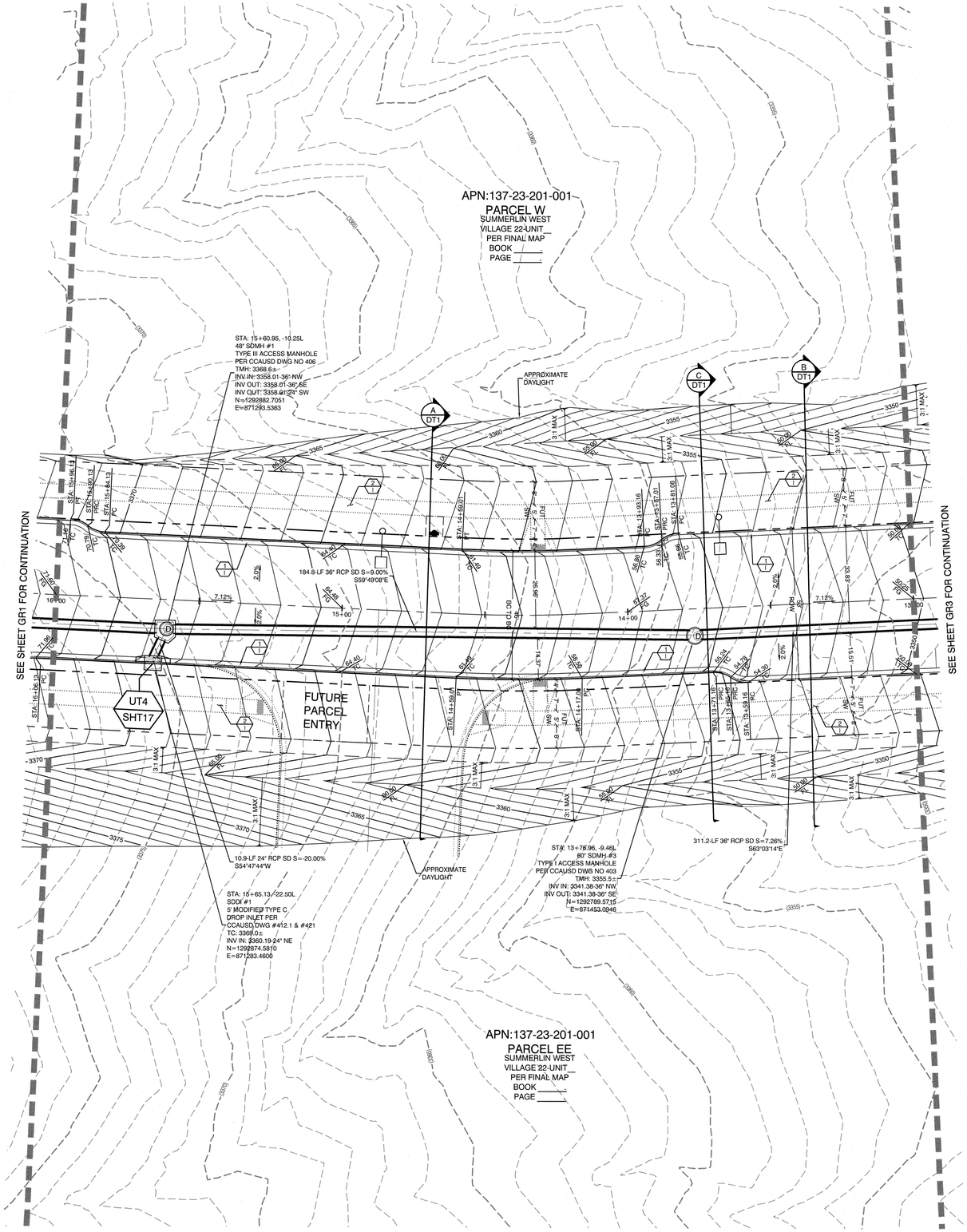
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CHECKED BY: WJM	02/17/2020		VERT.
PROJECT NO: 7861			

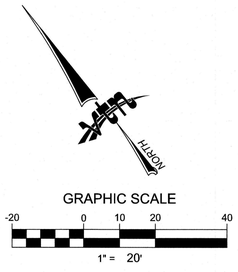
PROFESSIONAL ENGINEER · STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

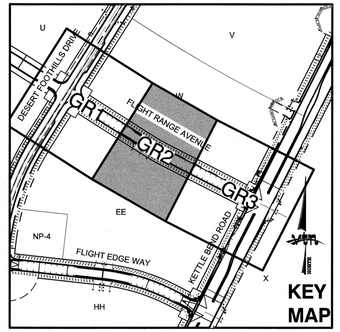
SHEET
GR1
9 OF **21** SHEETS

DRAWING NO.

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CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. FUTURE SIDEWALK
3. CONSTRUCT HANDICAP RAMP SEE SHEET DT2
4. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
5. FIELD VERIFY AND MATCH EXISTING

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

DROP INLET NOTE:

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL)

CONSTRUCTION NOTES

UT # / SHT #: UTILITY PROFILE REFERENCE LABEL
UT #= SHEET INDEX
SHT#= SHEET NUMBER

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-176, DATED DECEMBER 30, 2019

SIGHT VISIBILITY ZONES:

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ENGINEER DISCLAIMER NOTE:

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WILLIAM J MEYER , P.E. No. 15745 DATE

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A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7550 FAX (702) 365-2597 WEB WWW.JTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 2

SUMMERLIN WEST VILLAGE 22 FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

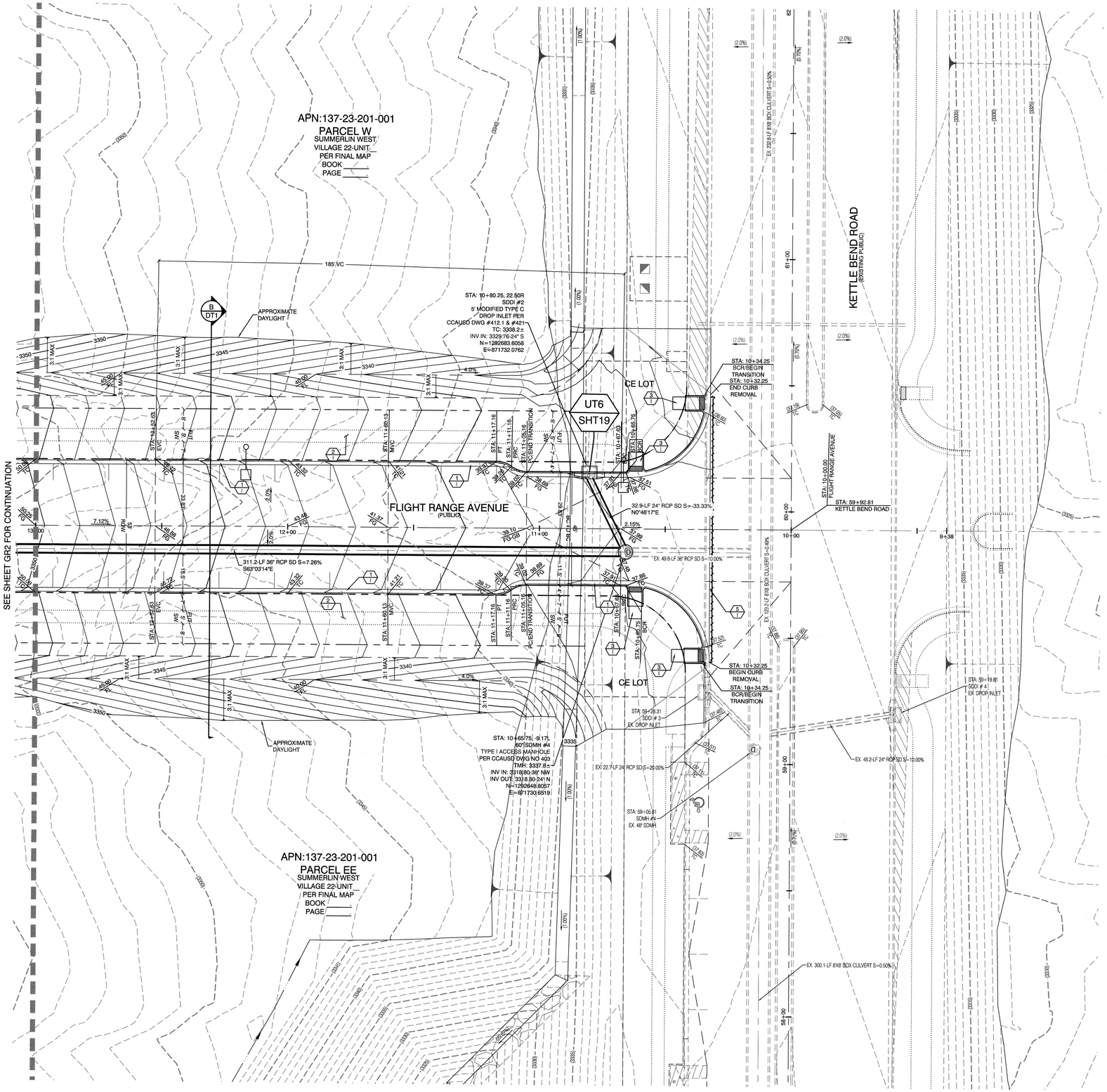
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PROJECT NO: 7861			N/A	VERT.	

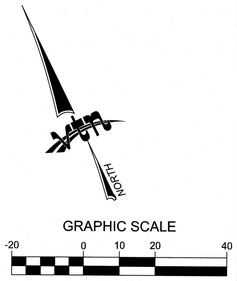
PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

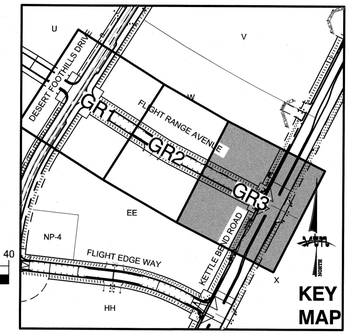
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GR2
10 OF **21** SHEETS

DRAWING NO.

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AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
ITS-CCSTC

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
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WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 382-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 3

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
BCC	BCC	WJM	7891

10/18/2019 — 10/18/2019 — 02/17/2020

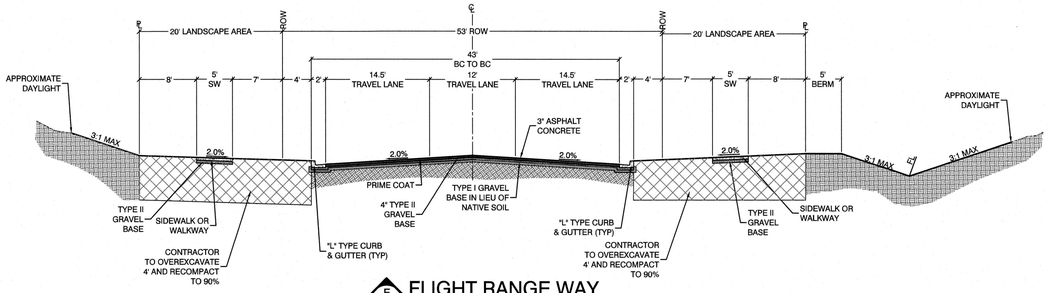
SCALE: 1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

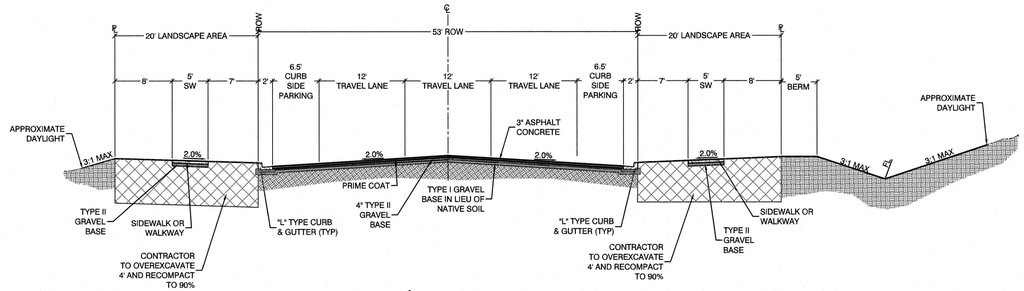
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GR3
11 OF 21 SHEETS

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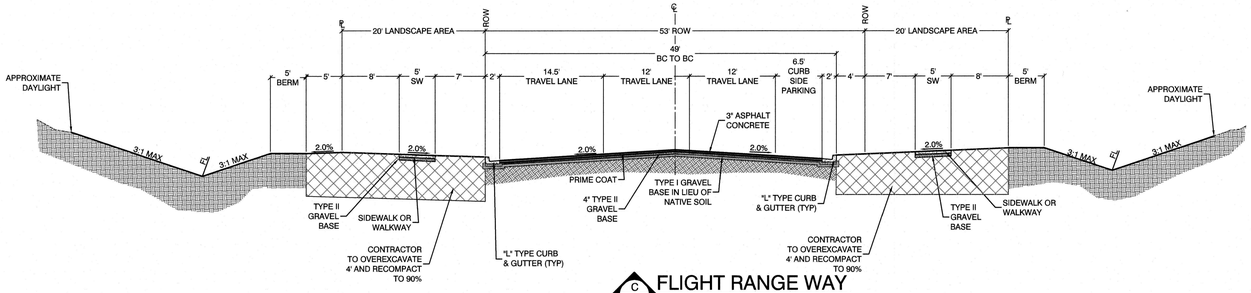
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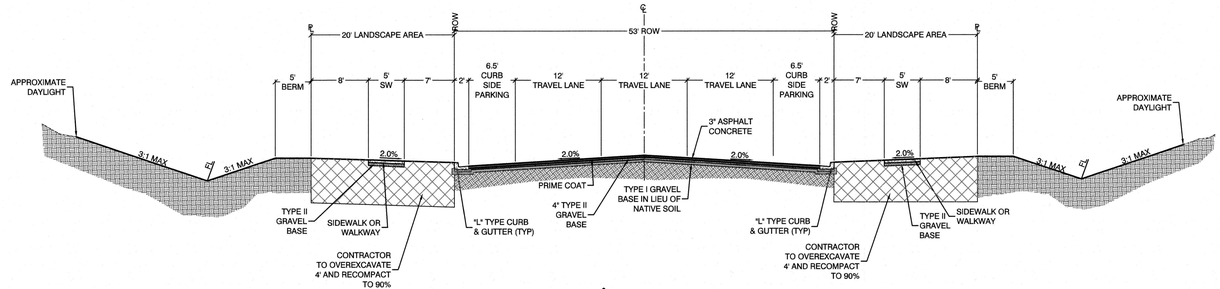
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NTS



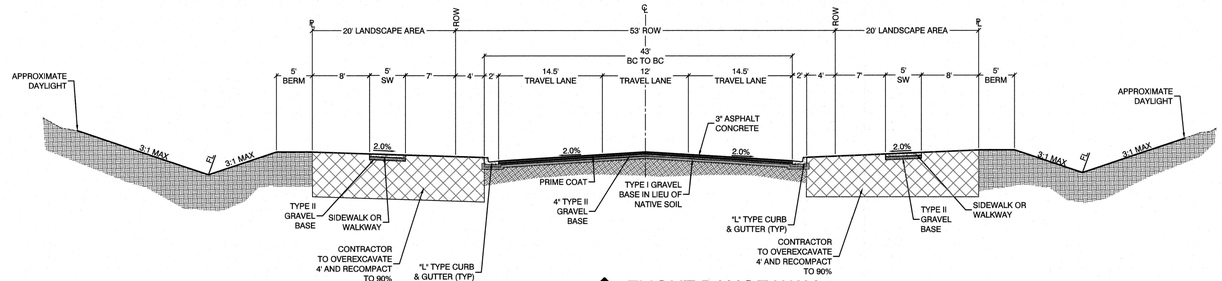
D FLIGHT RANGE WAY
NTS



C FLIGHT RANGE WAY
NTS



B FLIGHT RANGE WAY
NTS



A FLIGHT RANGE WAY
NTS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
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702-791-4000

CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DETAIL SHEET 1

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

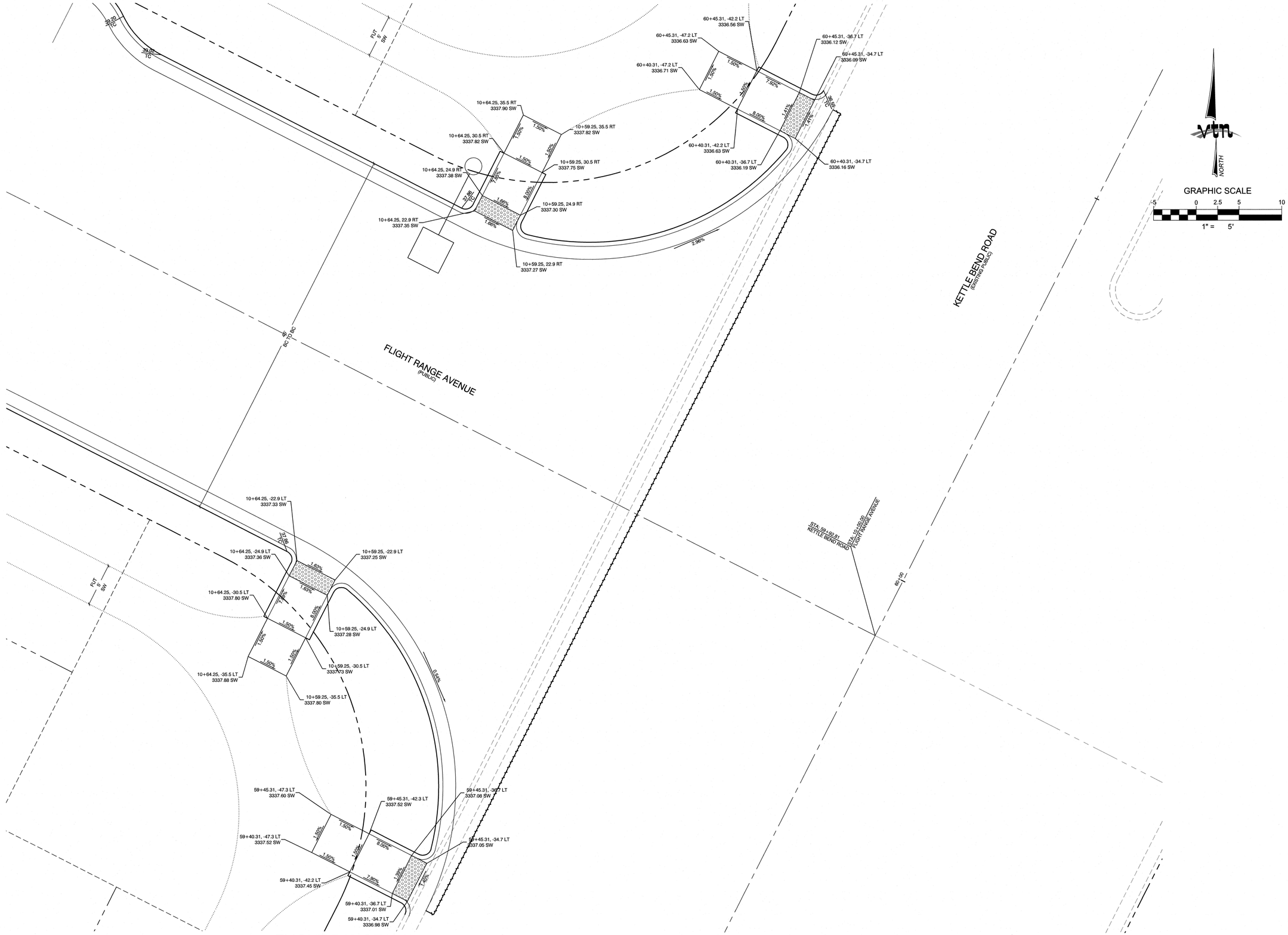
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CHECKED BY: WJM	02/17/2020		
PROJECT NO: 7881			

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

SHEET
DT1
12 OF 21 SHEETS

DRAWING NO.

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FLIGHT RANGE WAY AND KETTLE BEND ROAD INTERSECTION HANDICAP RAMPS

NTS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
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LAS VEGAS, NEVADA 89135
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DETAIL SHEET 2

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

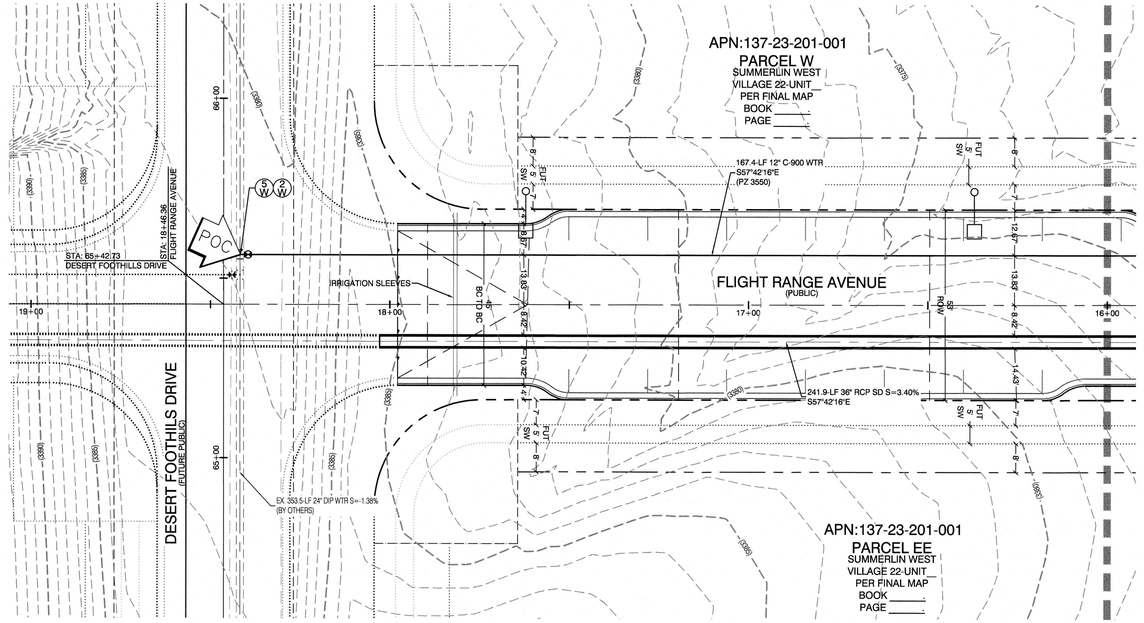
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CHECKED BY: WJM	02/17/2020		
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WILLIAM J. MEYER
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2/17/20

SHEET
DT2
13 OF **21** SHEETS

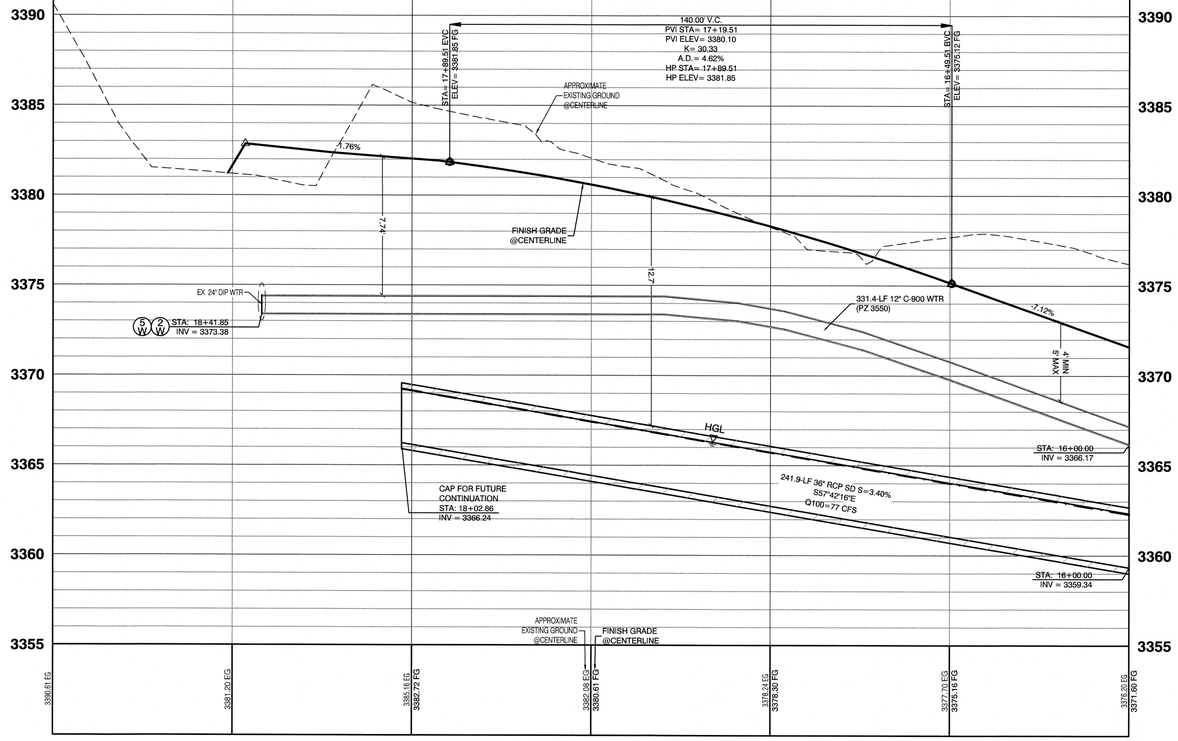
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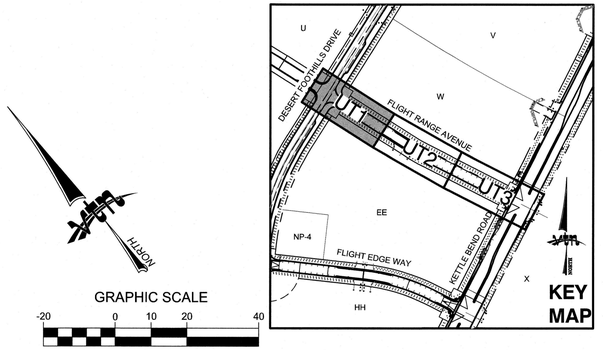


FLIGHT RANGE AVENUE
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



FLIGHT RANGE AVENUE
(PUBLIC)



WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

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

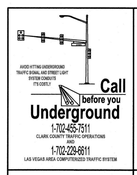
FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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

UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:
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CONSTRUCTION NOTES

		WATER	PUBLIC
1 W	⬢	FIRE HYDRANT ASSEMBLY; (PER UDACS PLATE NO. 39 & 40)	1 EA.
2 W	⊖	12" GATE VALVE (PER UDACS PLATE 39)	3 EA.
3 W	⊂	12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
4 W	⊃	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
5 W	⊃	24"X12" TEE (PER UDACS PLATE 31)	1 EA.
6 W	⌐	12" 5° BEND (PER UDACS PLATE 31)	1 EA.
	———	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	826 LF.
	POC	WATER POINT OF CONNECTION	

BASIS OF BEARING
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 150
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 1 19+00 TO 16+00

SUMMERLIN WEST VILLAGE 22 FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

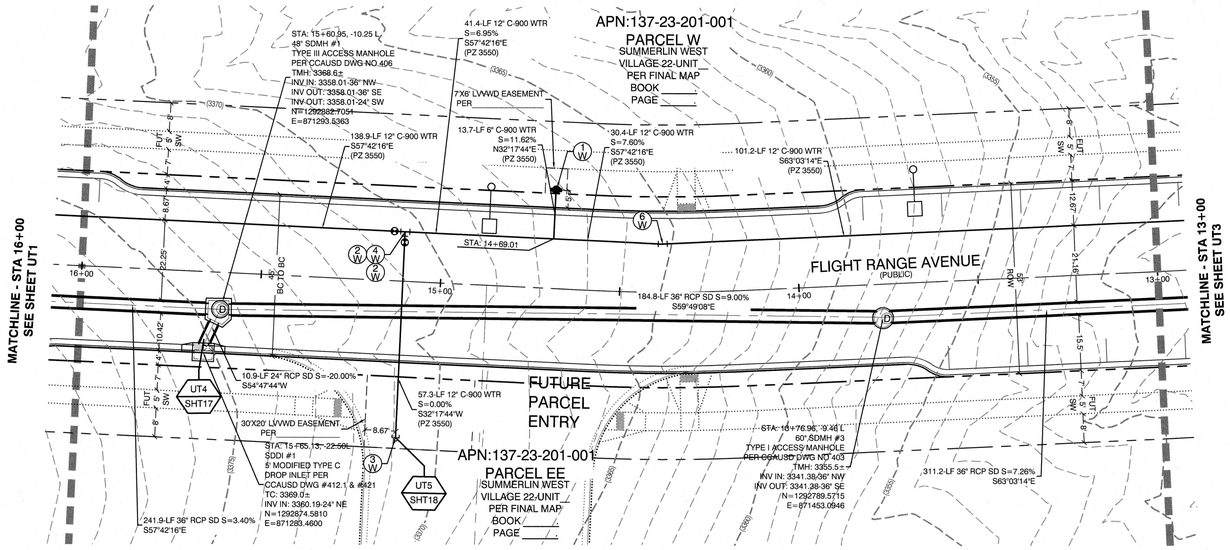
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BCC 10/18/2019	BCC 10/18/2019	WJM 02/17/2020	7861	1"=20' 1"=4'	VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA No. 15745 WILLIAM J. MEYER EXP: 12/31/21 CIVIL
2/17/20

SHEET
UT1
14 OF **21** SHEETS

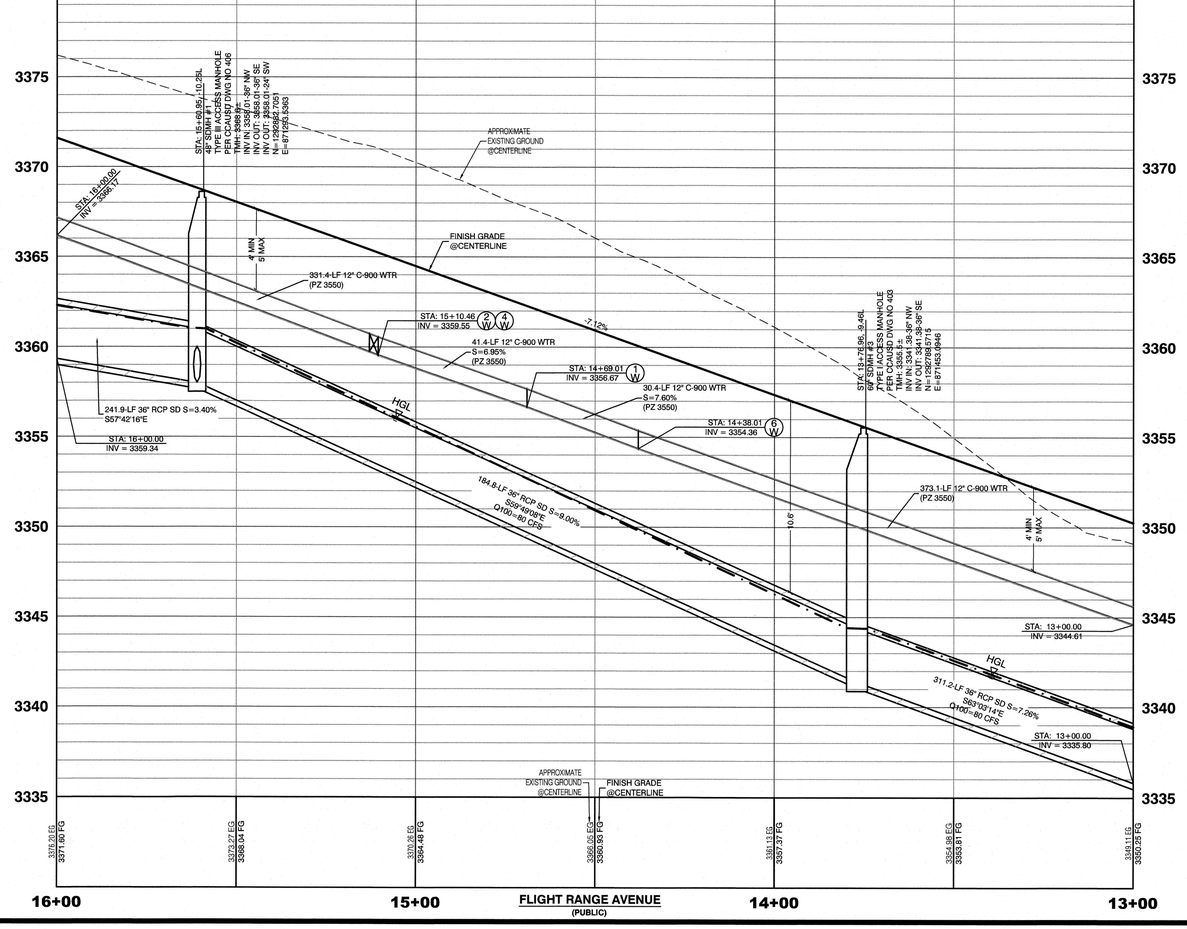
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H:\7861\Flight Range Avenue - Kettle Bend to Desert Foothills\Sheet Set\7861-UT.dwg2/17/2020 1:31 PMbrandonc



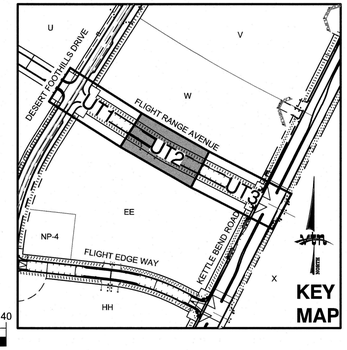
FLIGHT RANGE AVENUE
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'





GRAPHIC SCALE
-20 0 10 20 40
1" = 20'



WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

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

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

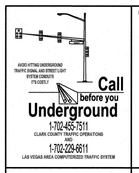
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

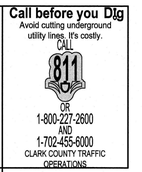
WATER MAIN JOINT DEFLECTION
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02.

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

UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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CONSTRUCTION NOTES

		WATER	PUBLIC
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2 W	⊖	12" GATE VALVE (PER UDACS PLATE 39)	3 EA.
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	POC	WATER POINT OF CONNECTION	

BASIS OF BEARING
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

DROP INLET NOTE:
WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS. CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL)

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2997 WEB WWW.LTMNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 2
16+00 TO 13+00

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

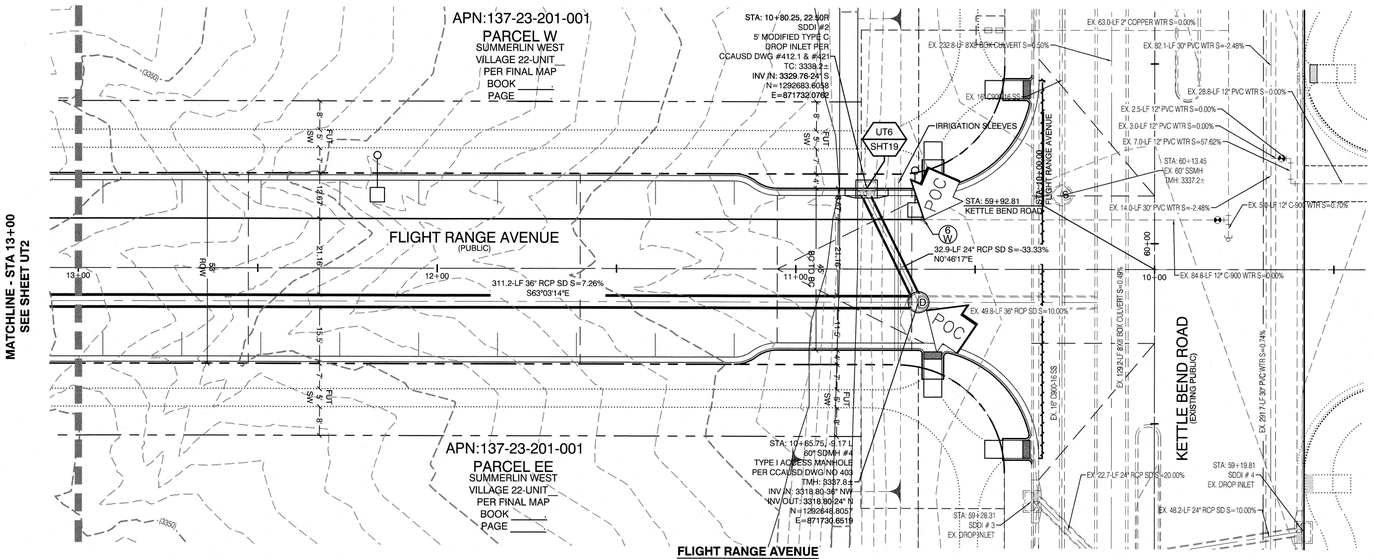
DRAWN BY: BCC	10/18/2019	SCALE:	1"=20' HORIZ. 1"=4' VERT.
DESIGNED BY: BCC	10/18/2019		
CHECKED BY: WJM	02/17/2020		
PROJECT NO: 7861			

PROFESSIONAL ENGINEER - STATE OF NEVADA
No. 17345
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
2/17/20

SHEET
UT2
15 OF **21** SHEETS

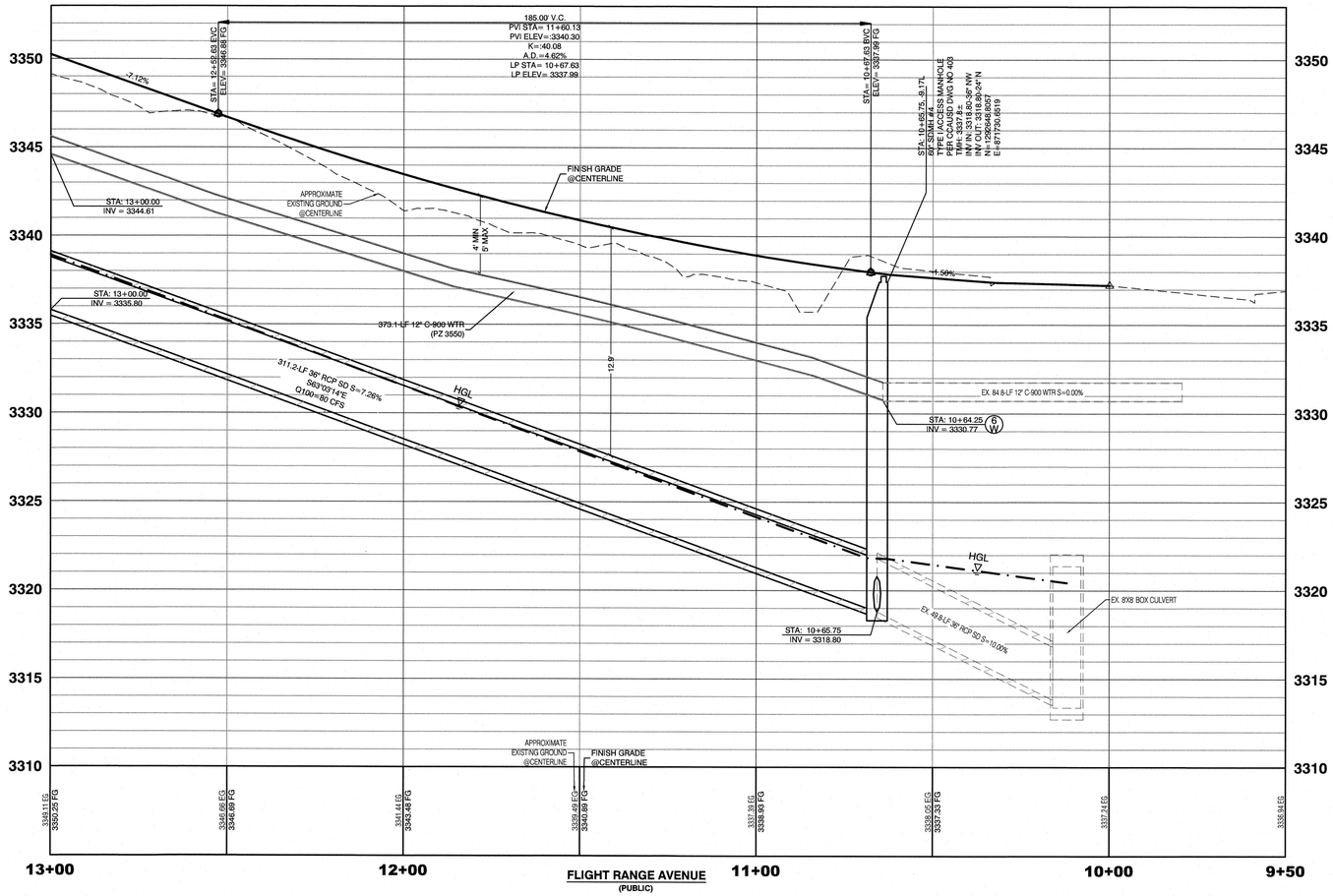
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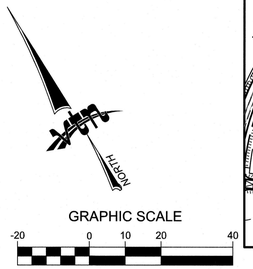
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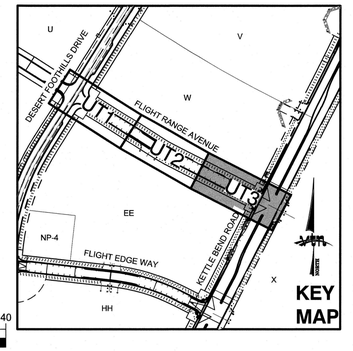


PROFILE SCALES:

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VERT. = 1"=4'







WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

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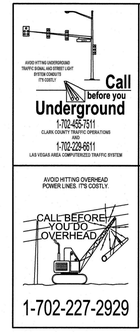
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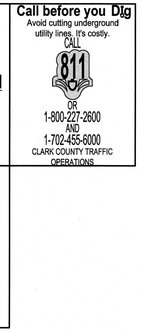
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CONSTRUCTION NOTES

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	POC	WATER POINT OF CONNECTION	

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2006)
NAVD88 ELEVATION: 969.574 METERS (3,246.63 FEET)

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T21S,R59E,S03

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

DROP INLET NOTE:

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL)

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 382-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 3
13+00 TO 9+50

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

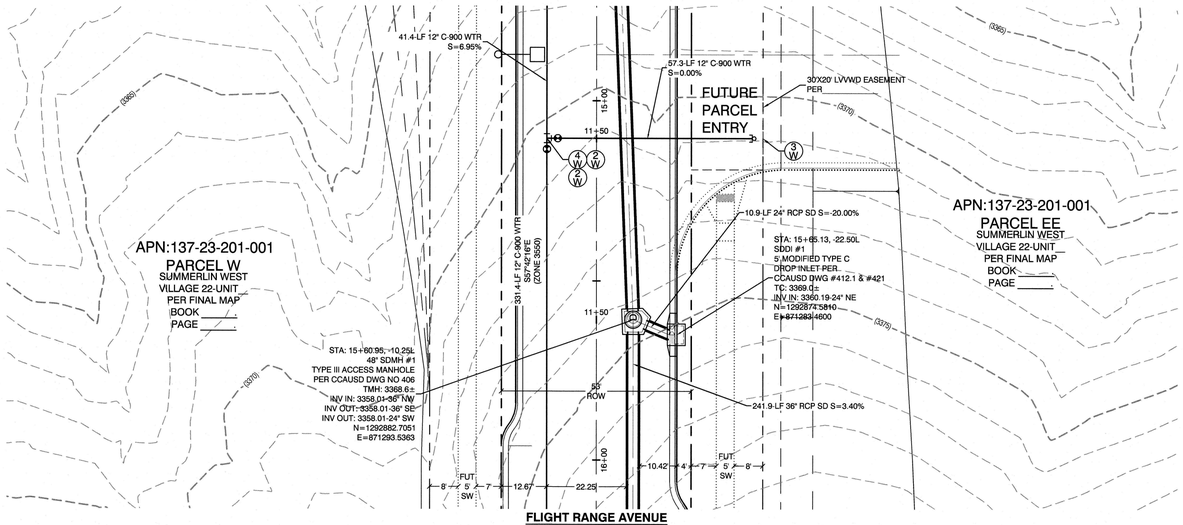
DRAWN BY: BCC — 10/18/2019
DESIGNED BY: BCC — 10/18/2019
CHECKED BY: WJM — 02/17/2020
PROJECT NO: 7861
SCALE: 1"=20' HORZ, 1"=4' VERT.

PROFESSIONAL ENGINEER-STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

SHEET
UT3
16 OF 21 SHEETS

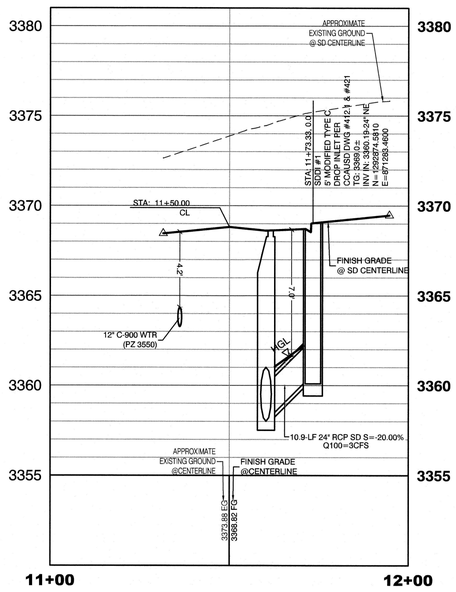
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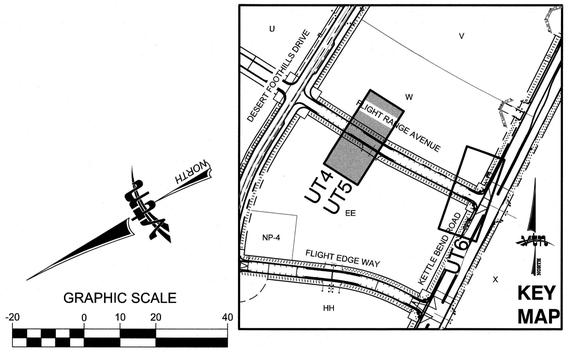


PROFILE SCALES:

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



FLIGHT RANGE AVENUE
(PUBLIC)



WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER LINE MARKER BALLS NOTE

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

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

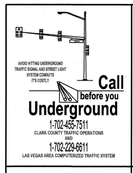
FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL. WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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CONSTRUCTION NOTES

		WATER	PUBLIC
1 W	⬢	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	1 EA.
2 W	⊖	12" GATE VALVE (PER UDACS PLATE 39)	3 EA.
3 W	⊲	12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
4 W	⊃	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
5 W	⊃	24"X12" TEE (PER UDACS PLATE 31)	1 EA.
6 W	⌐	12" 5° BEND (PER UDACS PLATE 31)	1 EA.
	———	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	826 LF.
	POC	WATER POINT OF CONNECTION	

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2006) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

DROP INLET NOTE:

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL)

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 150
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2397 WEB WWW.LTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 4
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

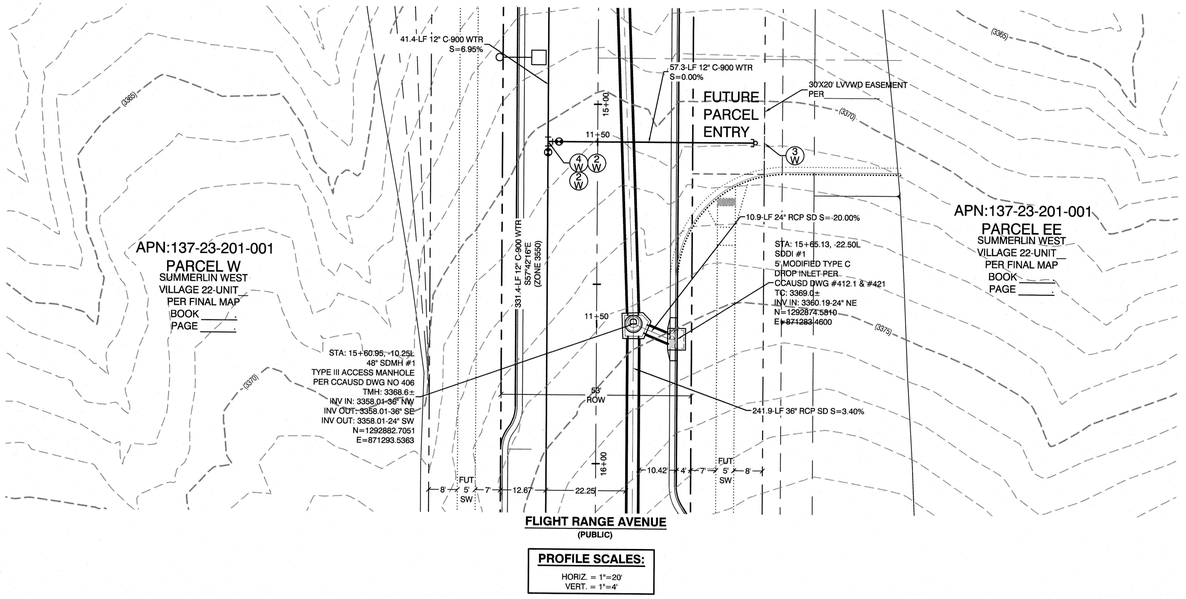
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BCC 10/23/2019	BCC 10/23/2019	WJM 02/17/2020	7891	HORIZ: 1"=20' VERT: 1"=4'

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
STATE OF NEVADA
PROFESSIONAL ENGINEER
No. 15745
02/17/20

SHEET
UT4
17 OF 21 SHEETS

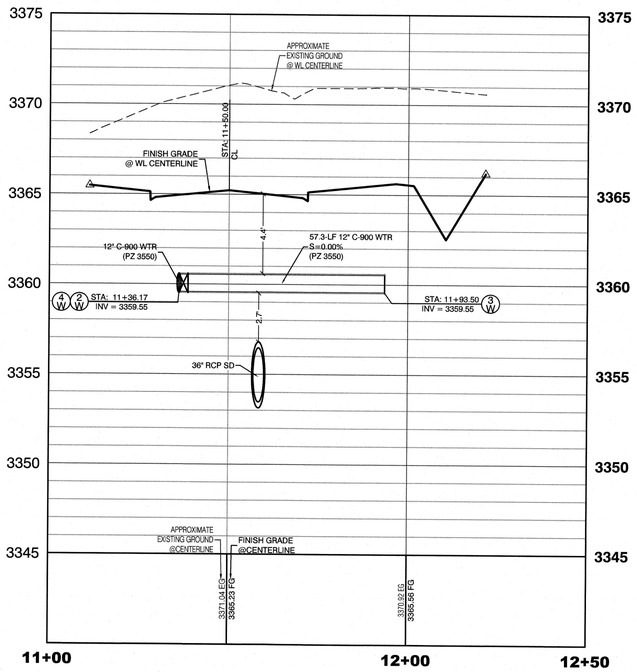
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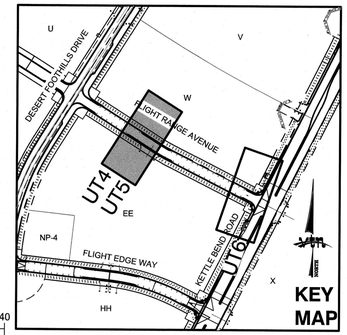


FLIGHT RANGE AVENUE
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



FLIGHT RANGE AVENUE
(PUBLIC)





GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

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

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

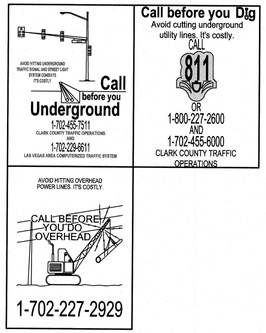
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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CONSTRUCTION NOTES

		WATER	PUBLIC
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	SDCO	WATER POINT OF CONNECTION	

BASIS OF BEARING
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

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NOTE:
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LAS VEGAS FIRE & RESCUE APPROVAL
BY:_____ DATE:_____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 5
WATER LATERAL

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

DRAWN BY: BCC	10/23/2019	SCALE:	HORIZ. 1"=20' VERT. 1"=4'
DESIGNED BY: BCC	10/23/2019		
CHECKED BY: WJM	02/17/2020		
PROJECT NO: 7981			

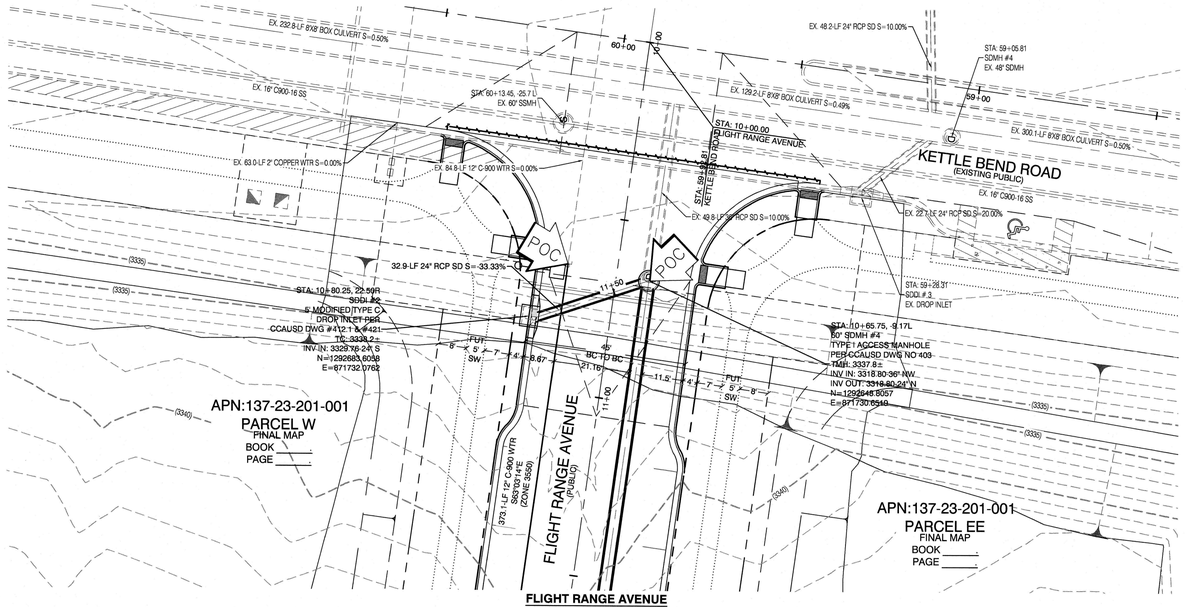
PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
NO. 15745

2/17/20

SHEET
UT5
18 OF 21 SHEETS

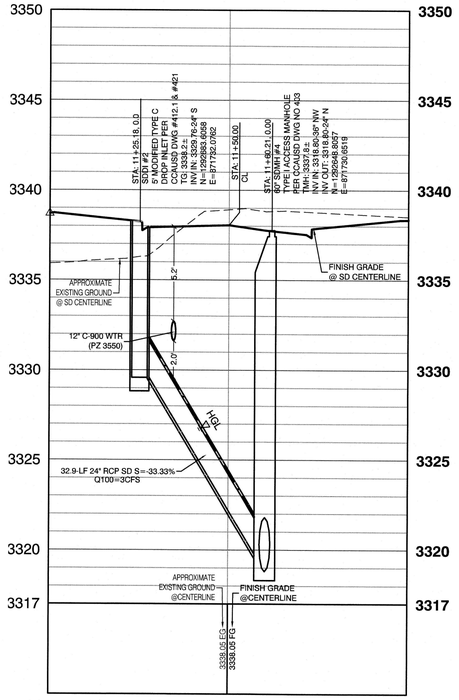
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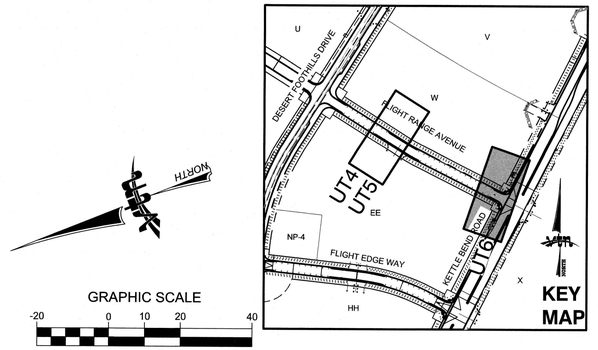


FLIGHT RANGE AVENUE
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



FLIGHT RANGE AVENUE
(PUBLIC)



WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

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CONSTRUCTION NOTES

		WATER	PUBLIC
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	POC	WATER POINT OF CONNECTION	

BASIS OF BEARING
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

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LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 791-0000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 382-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 6
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
FLIGHT RANGE AVENUE-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC	BCC	WJM	7861	HORIZ. 1"=20' VERT. 1"=4'
10/23/2019	10/23/2019	02/17/2020		

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
2/17/20

SHEET
UT6
19 OF **21** SHEETS

DRAWING NO.

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