DS #: 4962

APN: 137-26-299-002, 137.26.399.015, 137.26.297.002, 137.26-397.024

PROJECT: Summerlin West Village 21. Carriage Hill Drive

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

CITY OF LAS VEGAS
INTER-OFFICE MEMORANDUM

DATE: March 22, 2018

TO:
Land Development Services
Department of Building & Safety

FROM:
Albert Sung, P.E.
Flood Control Project

SUBJECT:	Drainage Study for: **Summerlin West Village 21 - Carriage Hill Drive (Far Hills to East West Collector)**
Cross Streets:	Carriage Hill Drive and Far Hills Avenue
File Number:	F:\Depot\DSMemos\DS4962A.doc
Parcel Number:	137-26-299-002, 137-26-399-015, 137-26-297-002, 137-26-397-024
Zoning Action:	

FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES X	NO

Bill M. to send in Supplement (NC) to replace DIs @ SDMH #8 with Future D.I. further Upstream. 6/4/18

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	FEES	Payment Trn #
1st Submittal	3/6/2018	3/21/2018	See Comments Below	$400.00	493856: $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 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.
2. The referenced *Flood Control Master Plan Update for Summerlin West Planning Area* (SWPA) is still under review; therefore, this study will not be approved prior to the approval of the SWPA Master Update study.
3. The project proposed to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Carriage Hill Drive*. Prior to the final plans approval the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvement s 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.

4. Since the street and the associated storm drain facilities will eventually be accepted by 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.
5. Per the *SWPA Flood Control Master Plan Update*, the size of the storm drain in *Carriage Hill Drive* is 66", not 60" as shown in the subject improvement plans. Review and revise accordingly.
6. Provide maintenance access to both stubs on the west side of the *Carriage Hill Drive*. Include a typical access road section.
7. The future storm drain alignment to the north jogs to the east side of *Carriage Hill Drive*. It is recommended that the alignment remains on the west side of the roadway unless there is a necessary reason for the realignment. Review and revise accordingly.
8. Please provide an explanation for the flow at the future roadway extension to the north. It is expected that there will be no bypass flow onto this proposed portion of *Carriage Hill Drive*? Please clarify.
9. **Report:** The Q_{100} values presented on page 3 of the report in Table 2 for the Interim Condition Hec-1 Summary do not match the Hec-1 report, or the table shown on Figure 7. Please revise.
10. **Fig 8:** The flow velocity listed for section 2 does not match the velocity per the Flowmaster report, please update. Similarly the VxD value shown in the same table for section 2 should updated accordingly.
11. **GR1:** The proposed riprap shown on the north side of the proposed street is called out to have a maximum slope of 2:1, but the *Detail B/DT1* shows a maximum slope of 3:1, please revise.
12. **GR3:** The proposed inlet elevation for the proposed 36" RCP is shown as the same elevation as the outlet elevation, but is shown to be 3244.99 ft in the given HY-8 Culvert analysis, please revise.
13. **GR5:** Provide two nominal inlets at both sides of the roadway at SDMH #8.

    Discuss whether the drop inlet shown north of the proposed improvements is part of proposed or for future conditions, if future please label as future.

    Provide "End of Road" markers at the north end of *Carriage Hill Drive*.
14. **UT8:** The 8" SS is shown to be 18.83' below the proposed RCP, but appears to be much closer, please revise.
15. 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.
16. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

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: T21S/R69E/26
AREA K-26

TRANSACTION REPORT

MAR/22/2018/THU 05:39 PM

FAX(TX)

#	DATE	START T.	RECEIVER	COM.TIME	PAGE	TYPE/NOTE	FILE
001	MAR/22	05:38PM	7023622597	0:01:01	2	MEMORY OK ECM	0886

CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**			**DATE:** **March 22, 2018**
TO: **Land Development Services** Department of Building & Safety			**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Village 21 - Carriage Hill Drive (Far Hills to East West Collector)**		**COPIES TO:** VTN Nevada
Cross Streets:	Carriage Hill Drive and Far Hills Avenue		The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS4962A.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-26-299-002, 137-26-399-015, 137-26-297-002, 137-26-397-024		CCRFCD
Zoning Action:			
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	3/6/2018	3/21/2018	See Comments Below	$400.00	493856: $400
			TOTAL FEES (LDDRS):	**$400.00**	----

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2. The referenced *Flood Control Master Plan Update for Summerlin West Planning Area* (SWPA) is still under review; therefore, this study will not be approved prior to the approval of the SWPA Master Update study.
3. The project proposed to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Carriage Hill Drive*. Prior to the final plans approval the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvement s 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.

Technical Drainage Study for

Summerlin West Village 21
Carriage Hill Drive
Far Hills to East West Collector

Las Vegas, Nevada

W.O. # 7851

Prepared for:
Howard Hughes Corp.

Submitted to:
Public Works Department
City of Las Vegas

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin West Village 21 Carriage Hill Drive Far Hills to East West Collector Date: March 6, 2018

Location of Development: a) Descriptive (Cross Streets) North/South: Carriage Hill Drive

East/West: Far Hills Avenue

b) Section: 3 and 4 Township: 21S Range: 69E

c) APN : 137-26-299-002, 137-26-399-015, 137-26-297-002, 137-26-397-024

Name of Owner: The Howard Hughes Corporation

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: William Meyer **Telephone No.:** (702)-873-7550

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

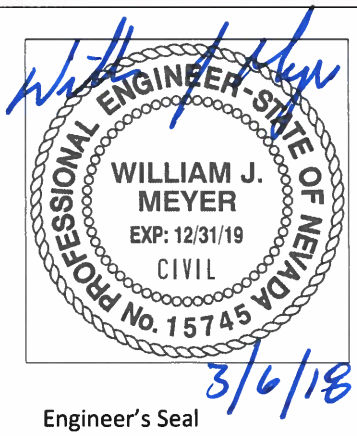
Firm: VTN Nevada

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		Roadway, Storm Drain, Grading

1. Total Owned Land Area: At Site: +/-5 Acres Being Developed/Disturbed: +/-5 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: +/- 67 acres
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: 2017 Flood Control Master Plan Update for Summerlin West Planning Area, Summerlin Village 20/21 Far Hills Ave Drainage & Grading Improvements
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing CCRFCD Facility APCH 000 (8'x6' RCB in Far Hills Avenue)
8. Briefly describe your proposed schedule for the subject project: As soon as possible



3/6/18

Engineer's Seal

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

*New Required Field

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

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

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

II. GRADING PLAN INFORMATION		
Yes	No	
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.

TECHNICAL DRAINAGE STUDY

FOR

SUMMERLIN WEST VILLAGE 21

CARRIAGE HILL DRIVE

FAR HILLS TO EAST-WEST COLLECTOR

CLARK COUNTY, NEVADA

W.O. # 7851

Prepared for:
THE HOWARD HUGHES CORPORATION

Submitted To:
CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS

PROVIDING QUALITY PROFESSIONAL SERVICE SINCE 1960

March 6, 2018
W.O. #7851

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 21 CARRIAGE HILL DRIVE – FAR HILLS TO EAST-WEST COLLECTOR

Mr. Sung,

Transmitted herewith for your review are two (2) copies of the *Technical Drainage Study for Summerlin West Village 21 Carriage Hill – Far Hills to East West Collector.* The site is a ± 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 Y. Ayson, E.I.

William J. Meyer, P.E.

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I. INTRODUCTION

A. STUDY OVERVIEW AND PURPOSE

This Technical Drainage Study serves to provide technical drainage and flood control information for *Summerlin West Village 21 Carriage Hill Drive – Far Hills to East West Collector*. The project proposes roadway improvements and flood protection infrastructure for Carriage Hill Drive between Far Hills Avenue and the East-West Collector. Approval of this drainage study will allow for construction of this project.

B. LOCATION

The site is located within a portion of Section 26, Township 20 South, Range 59 East, M.D.M, Clark County, Nevada. Specifically the site is a portion of Carriage Hill Drive between Summerlin Parkway and Far Hills Drive. (Refer to *Figure 1: Vicinity Map*).

C. DESCRIPTION

The site slopes from the west to the east at approximately 2.8% and is bound by undeveloped land to the west and north, Nevada Power Plant to the east, and by Far Hills Avenue to the south. (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 32003C22150E, 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

(Refer to *Figures 4A and 4B, MPU Facilities Map and MPU Hydrologic Map*)

The proposed site is delineated on the referenced Figures F-36 and H-36 from the 2013 Clark County Regional Flood Control District (CCRFCD) Las Vegas Valley Flood Control Master Plan Update (MPU).

The CCRFCD Facilities APCH 0000, 0003, and 0031 lie within the proposed project. Additionally, the proposed project is adjacent to CCRFCD Facilities APFH 0000 and 0019. The project lies within MPU basins SWFH-8 and SWFH-9. The MPU basins SWFH-8 and SWFH-9 consist of Soil Type D and their land use is described as public facility and residential.

F. REFERENCED HYDROLOGY STUDIES

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

- *Flood Control Master Plan Update for Summerlin West Planning Area* (hereinafter referred to as the Master Study), originally submitted to the City of Las Vegas (CLV) October 9, 2017 (DS4926B), Addendum #2 submitted February 27, 2018 and currently under review.

- *Update #3 to the Technical Drainage Study for Summerlin Village 23B Desert Foothills Drive Improvements (Desert Foothills Drive to Far Hills)* (hereinafter referred to as the Desert Foothills Study) (DS3554)

- *Technical Drainage Study for Village 20/21 Far Hills Ave Drainage and Grading Improvements* (hereinafter referred to as the Far Hills Study) (DS4084L)

- *Technical Drainage Study for Summerlin Village 20/21 Fire Station #47 Access Road Street "A"* (hereinafter referred to as the Fire Station Study) (DS3842C)

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 design precipitation depth for the project has been referenced from the Master Study. The point precipitation values used in the 100-year storm analysis is 3.34 inches. The referenced rainfall map has been included in Appendix D.

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, Commercial, and 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 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
EXISTING CONDITION
HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
OFFX3	67.25	199
EX1	4.85	12
CP	-	212

TABLE 2
INTERIM CONDITION
HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
INT1	9.8	27
INT2	26.1	71
INT3	41.7	110
CARR3	4.9	20
CP	-	191

TABLE 3
ULTIMATE CONDITION
HEC-1 SUMMARY TABLE*

BASIN ID	AREA (ac)	Q100 (CFS)
CST6	-	66
B	13.76	46
A	14.65	48
CARR3	4.85	19

*Refer to Master Study Village 21 Model

III. ONSITE & OFFSITE BASIN ANALYSIS

A. EXISTING CONDITION ANALYSIS

(Refer to *Figure 6: Existing Condition Basin Map*)

Presently, the offsite areas to the west and north of the site are undeveloped, and the offsite area to the east is developed. Far Hills Avenue and the existing storm drain to the south are constructed. According to the Desert Foothills Study and Fire Station Study, offsite runoff generated west of Desert Foothills Drive is diverted southerly by an existing berm to Far Hills Avenue. The runoff is collected by an existing 12'x10' RCB stub (APDF 0000) and does not impact the project (See the referenced Fire Station Study *Figure 5: Proposed Condition Drainage Map,* and the referenced Desert Foothills Study *Figure 6A: Offsite Subbasins Map* and improvement plan Sheet 33, included in Appendix D). Therefore, only offsite flow generated between Desert Foothills and Carriage Hill Drive impact the proposed project.

An existing channel within the Carriage Hill Drive alignment conveys runoff southerly to an existing 8'x6' RCB stub (CCRFCD Facility APCH 0000). The existing channel and RCB stub are shown on the referenced Far Hills Avenue improvement plans included in Appendix D.

1. OFFSITE DRAINAGE BASIN DESCRIPTION

The offsite basin OFFX has been delineated to determine the offsite flow draining to the site in existing condition. Flow generated by OFFX is directed southerly by an existing channel in Carriage Hill to the existing 8'x6' RCB stub in Far Hills Avenue as discussed above.

2. ONSITE DRAINAGE BASIN DESCRIPTION

The onsite basin EX1 has been delineated to determine the flowrate generated by the proposed site in existing condition. In existing condition, 12 cfs (EX1) is generated by the project site. The flow is conveyed southerly within the Carriage Hill Drive alignment to the existing 8'x8' RCB stub in Far Hills Avenue. Hydrologic calculations are included in Appendix B.

B. INTERIM CONDITION ANALYSIS

(Refer to *Figure 7: Interim Condition Basin Map)*

In interim condition, offsite areas are as described in existing condition, and the proposed Carriage Hill Drive improvements are fully developed. Interim ditches/berms are proposed adjacent to Carriage Hill Drive to protect the proposed roadway from offsite flow, and to direct offsite runoff to the Carriage Hill Storm Drain stubs. The proposed improvements will maintain existing condition drainage patterns.

1. OFFSITE DRAINAGE BASIN DESCRIPTION

The offsite basin INT1 has been delineated to quantify the runoff conveyed by the existing wash immediately upstream of the proposed improvements. Runoff generated by INT1 will bypass the proposed improvements and will maintain the same flow patterns as in existing condition. The offsite basins INT2 and INT3 have been delineated to quantify the flows impacting the proposed interim grading and storm drain stubs.

2. ONSITE DRAINAGE BASIN DESCRIPTION

The onsite basin CARR3 represents the developed Carriage Hill Drive. Hydrologic parameters for basin CARR3 has been referenced from the Village 21 analysis in the Master Study (See Appendix D for pertinent calculations). The flow generated by CARR3 is collected by a series of drop inlets in Carriage Hill Drive.

C. ULTIMATE CONDITION ANALYSIS

(Refer to *Figure 8: Ultimate Condition Drainage Map)*

Ultimate condition assumes that the proposed improvements and offsite areas are fully developed. Onsite and offsite ultimate condition drainage information has been referenced from the Master Study. 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

Offsite basins and Concentration Points have been referenced from the Master Study Village 21 analysis. The referenced offsite basins A and B represent the future Village 21 parcels. Flow from CST6, A, and B are collected by proposed storm drain laterals.

2. ONSITE DRAINAGE BASIN DESCRIPTION

The onsite basin CARR3 has been referenced from the Master Study Village 21 analysis, and represents the developed Carriage Hill Drive. This is consistent with the information referenced for interim condition.

IV. INTERIM GRADING

Interim offsite channels are proposed to protect the proposed improvements and to direct flows to proposed storm drain. Facility names for the offsite ditches/berms in the calculations correspond to the tributary offsite basin and facility location. Maximum slope in the proposed channels was selected to verify maximum velocity, and minimum slope was used to verify worst case depth of flow. A summary of the offsite berms/ditches are summarized in Table 4 below. Normal depth calculations have been included in Appendix C.

TABLE 4
DITCH/BERM SUMMARY TABLE

Ditch	Q (cfs)	Slope (%)	Normal Depth (ft)	Channel Depth (ft)	Freeboard (ft)	Velocity (ft/s)	Riprap D_{50}	Side Slopes	Description
INT1	27	4.47	0.60	N/A	N/A	4.22	6"	3:1/3:1	Existing Wash
INT2 (MIN)	71	1.42	1.04	3.00	1.96	4.52	6"	3:1/3:1	12' BW Trap Channel
INT2 (MAX)	71	2.10	0.93	3.00	2.07	5.16	6"	3:1/3:1	12' BW Trap Channel
INT3 (MIN)	110	1.00	1.46	3.00	1.54	4.60	6"	3:1/3:1	12' BW Trap Channel
INT3 (MAX)	110	2.10	1.19	3.00	1.81	5.94	6"	3:1/3:1	12' BW Trap Channel

In general, the proposed offsite grading will consist of riprap lined trapezoidal channels. The proposed offsite channels will have a minimum of 1-foot of freeboard above the calculated water surface elevation. A minimum riprap size of D50=6" was used throughout the site where required. Riprap calculations have been included in Appendix C.

Channel INT1 represents the existing wash to the north of the site. Flow from the existing wash will bypass the project. However, the section was used to determine the necessary riprap protection required to protect north side of the roadway from flow in the existing wash. Riprap protection (D50=6", Thickness = 12" is provided at the northern roadway terminus along the south bank of the existing wash.

Riprap protection (D50=6", Thickness=12") for the storm drain laterals in sump condition has been provided up to a minimum of the calculated ponding depth plus 1-foot of freeboard as determined by inlet control calculations. Inlet control calculations have been included in Appendix C.

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. The results of the street flow analysis are summarized in Table 5. Refer to Figure 8 for the locations of the cross sections used in the analysis. Street hydraulic calculations are included in Appendix C.

TABLE 5
STREET FLOW ANALYSIS SUMMARY TABLE

Section	Discharge (cfs)	Slope (%)	Velocity (fps)	Depth (ft)	V x D	Tributary Basins
1	9.5	2.10%	3.42	0.35	1.20	1/2 CARR3
2	9.5	2.10%	3.42	0.35	1.20	1/2 CARR3

The normal depth calculation for Section 1 uses a full street section. A separate normal depth calculation for the east and west half streets of Section 2 has been provided, but since the street flow is contained within the top of curb, the resulting depth and velocity for each half street is the same.

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.

VI. STORM DRAIN FACILITES

The project will consist of a storm drain mainline in Carriage Hill Drive with three lateral stubs to the west. The proposed mainline is a CCRFCD Facility (APCH 0031 and 0003) connecting to the existing CCRFCD Facility APCH 0000.

The proposed storm drain mainline is a proposed 60-inch RCP and has been modeled in WSPG for the 100-year Ultimate Condition, which presents the worst case flow rates. The ultimate condition design flow rate has been referenced from the Master Study (Refer to the referenced *Figure A.6.5 Regional Flood Control Facility Map* included in Appendix D). According to the Master Study, a flow rate of 209 cfs (CP-H2) enters the proposed storm drain from upstream, and a total flow rate of 406 cfs (CP3.10A) is conveyed by the storm drain mainline. The total flow change of 197 cfs (406 cfs – 209 cfs = 197 cfs) has been divided equivalently between the 3 modeled junctions. According to the CCRFCD MPU, The 100-year design flow rate for the existing 8'x6' stub in Far Hills is 585 cfs, therefore the proposed discharge flow rate of 406 cfs is less than allowed. The starting HGL of 3220.4 has been referenced from the Far Hills Study. The results of the WSPG model is summarized in Table 7. Pertinent reference material has been included in Appendix D.

TABLE 7
CARRIAGE HILL DRIVE STORM DRAIN MAINLINE
WSPG SUMMARY TABLE

Description	Station	Invert	FG	WSE	Cover (ft)
Existing SD	1000.00	3215.13	3230.0	3217.54	12.5
Existing SD	1038.03	3215.75	3230.0	3218.13	11.9
Existing SD	1164.72	3217.82	3230.0	3220.06	9.9
Connection	1173.69	3217.97	3231.9	3222.86	9.0
SDMH #1	1176.77	3218.02	3231.9	3222.99	8.9
SDMH #2	1392.47	3223.26	3235.8	3230.78	5.0
SDMH #3	1738.48	3230.77	3243.0	3236.69	6.3
SDMH #4	2116.18	3238.96	3251.0	3242.35	8.7
SDMH #5	2338.15	3242.96	3255.3	3246.47	8.8
SDMH #7	2509.88	3245.79	3258.0	3249.41	8.6
SDMH #8	2729.18	3249.41	3261.7	3253.97	7.7
SDMH #9	2857.83	3251.53	3263.8	3257.86	5.9
SH	2929.57	3252.71	3263.8	3259.04	4.8

The three lateral stubs extending west from the mainline have been modeled using Standard Form 6 for both interim and ultimate condition. The lateral extending west from SDMH #10 to the future East-West Collector roadway will be capped in interim condition, and has been designed using the ultimate condition concentration point CST6. The lateral

extending west from SDMH #5 has been modeled to convey the flow from Basin INT2 and Basin B for interim and ultimate condition, respectively. The lateral extending west from SDMH #3 has been modeled to convey the flow from Basin INT3 and Basin A in interim and ultimate condition, respectively. Lateral Standard Form 6 models are included in Appendix C.

Four drop inlets are proposed in Carriage Hill Drive to limit the flow depth in the street to top of curb. Since the design parameters including approach flow rate, slope, depth, and velocity are the same for all the proposed drop inlets, one drop inlet calculation has been provided to represent all onsite drop inlets. The project will consist of four 15-foot Type CM drop inlets designed to intercept the total flow generated by CARR3 (19 cfs). Note that the lateral provided into the future parcels A and B, and the lateral provided in the East-West Collector Road, are sized to convey all flow from the respective area and the flow in Carriage Hill Drive is limited to basin CARR3. Drop inlet calculations are included in Appendix C.

VII. CONCLUSIONS

This *Technical Drainage Study for Summerlin West Village 21 Carriage Hill Drive – Far Hills to East West Collector* has been developed in accordance with Criteria established in the Manual. The proposed development does not adversely affect 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. *Flood Control Master Plan Update for Summerlin West Planning Area,* February 27, 2018.

6. *Update #3 to the Technical Drainage Study for Summerlin Village 23B Desert Foothills Drive Improvements (Desert Foothills Drive to Far Hills).*

7. *Technical Drainage Study for Summerlin Village 23B Fire Station #47.*

8. *Technical Drainage Study for Village 20/21 Far Hills Ave Drainage and Grading Improvements.*

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8) Figure 8 – Ultimate Condition Drainage Map
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3) Inlet Control Calculations
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5) Drop Inlet Calculations
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    b. Figure A.5.6 Village 21 Rainfall Map
    c. Figure A.6.5 Regional Facility Map
    d. Figure A.6.6 Drainage Basin Map
    e. Village 21 Standard Form 4
    f. Village 21 Ultimate Condition HEC-1 Model

2) Update #3 to the Technical Drainage Study for Summerlin Village 23B Desert Foothills Drive Improvements
    a. Figure 6A – Offsite Subbasins Interim Condition
    b. Plan Sheet 33

3) Technical Drainage Study for Fire Station #47
    a. CLV Approval Letter
    b. RFCD Concurrence Letter
    c. Excerpt from Text
    d. Figure 5 – Proposed Conditions Drainage Map

4) Village 20/21 Far Hills Ave Drainage and Grading Improvements
    a. Improvement Plan Sheets 1, 8, 12, and 13

APPENDIX

APPENDIX A
FIGURES

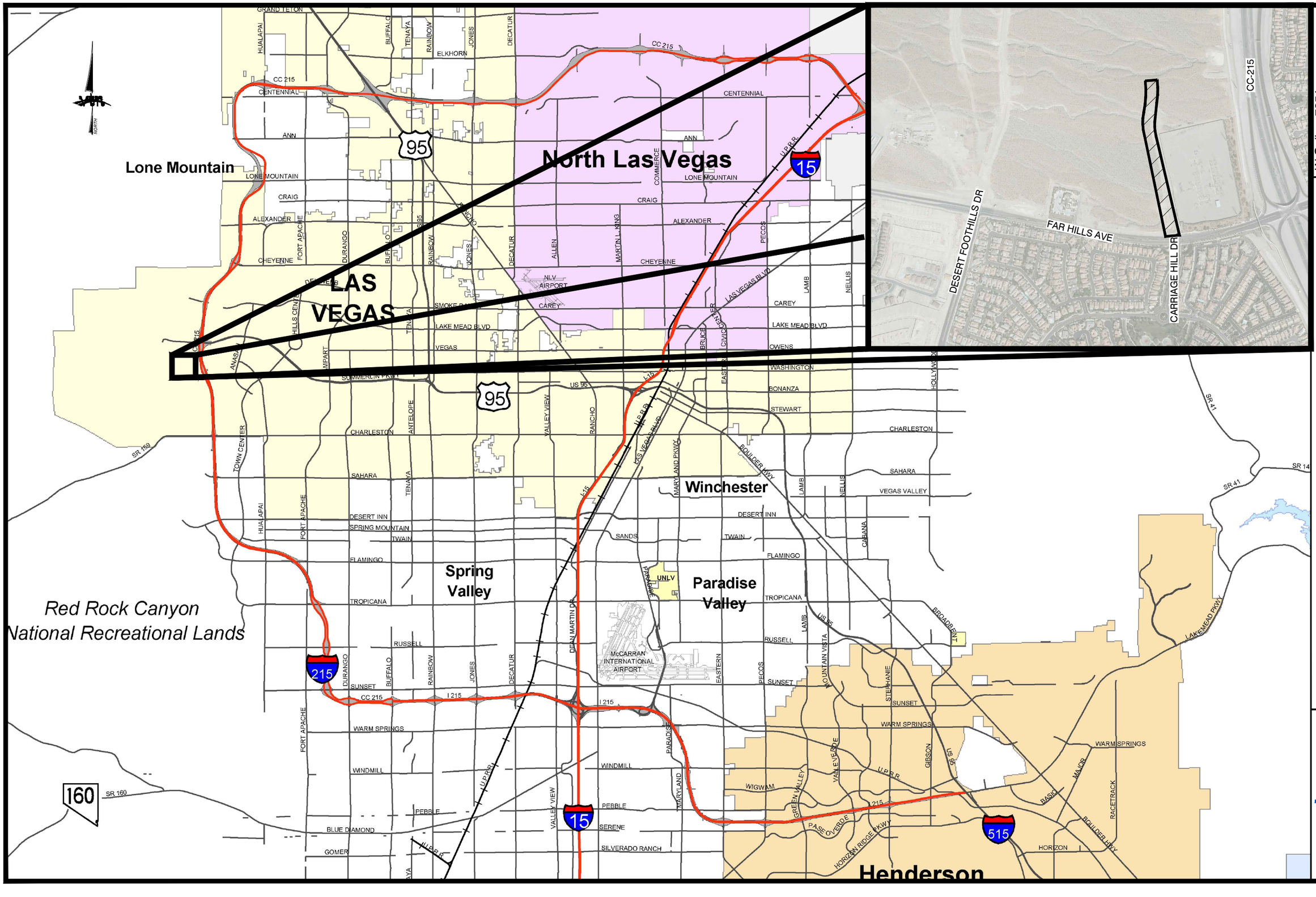
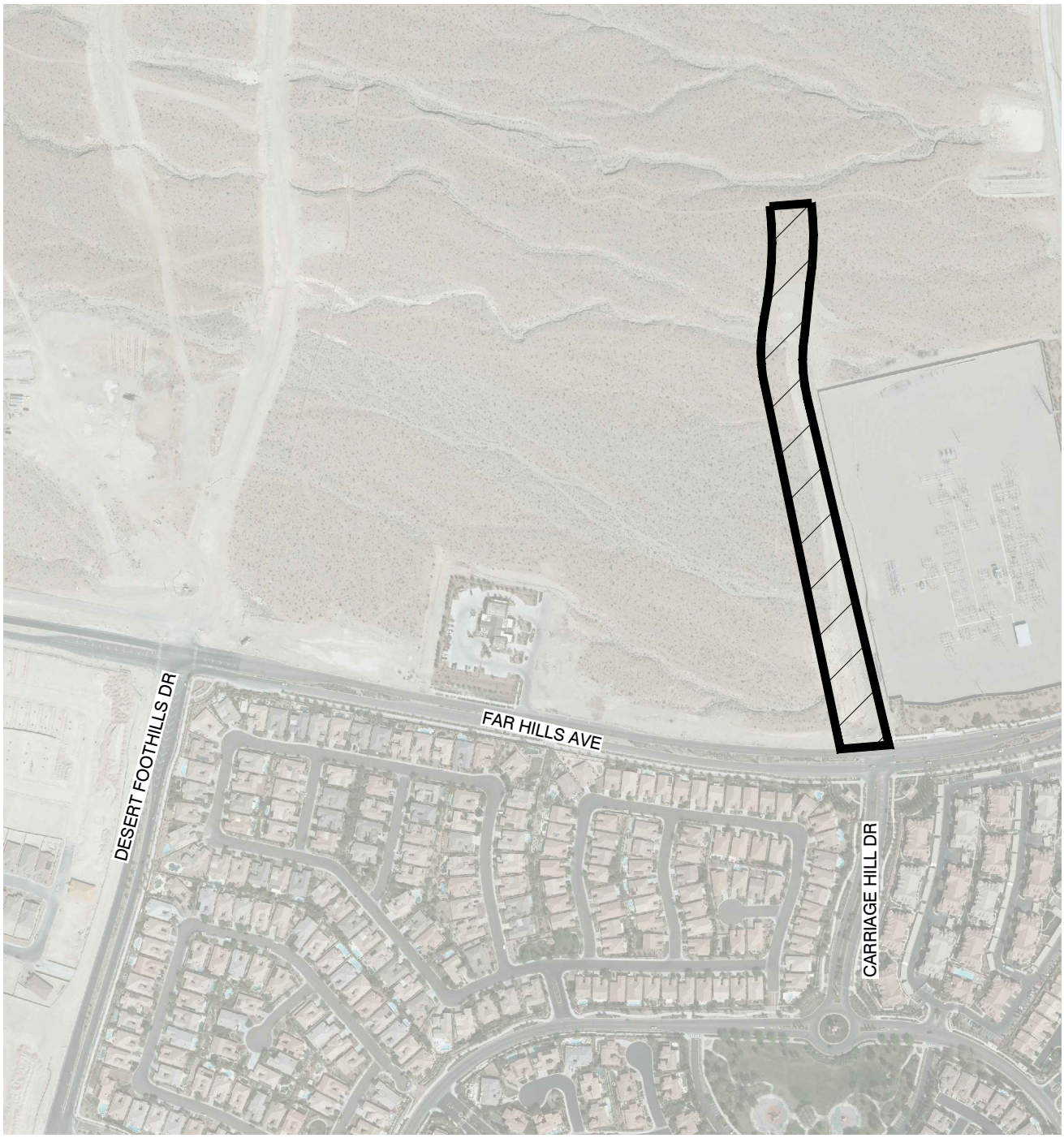


FIGURE 1: VICINITY MAP
SUMMERLIN WEST AREA 1
CARRIAGE HILL DRIVE SOUTH

W.O.#:	7851
DATE:	NOV 2017
BY:	JYA
SCALE:	N.T.S
SHEET	1 OF 1

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Carriage Hill Drive-South\Drainage\A Figures\Figure 1 and 2.dwg;jayson; Nov 15, 2017 - 5:15pm



GRAPHIC SCALE

500 0 250 500 1000

1" = 500'

NORTH

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

SUMMERLIN WEST AREA 1
CARRIAGE HILL DRIVE SOUTH

SITE DESCRIPTION MAP
FIGURE 2

SCALE	HORZ.	1"=500'
	VERT.	N/A
W.O. NO.		7851
DRAWN BY:		JYA
DATE:		NOV 2017
SHEET 1 OF 1		

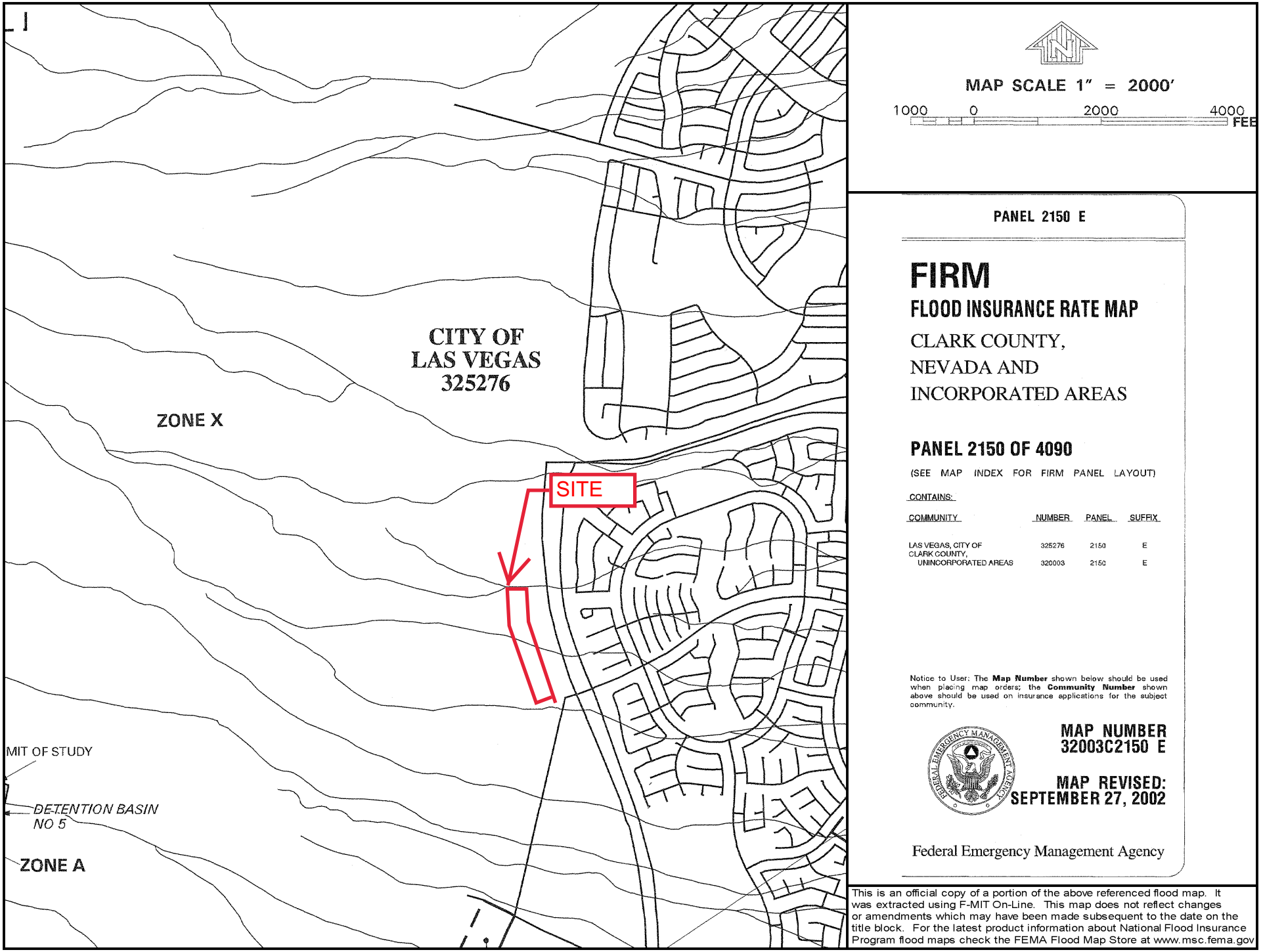


FIGURE 3 - FLOOD INSURANCE RATE MAP

REGIONAL FLOOD CONTROL DISTRICT

2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 24
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin

- 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

N

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

Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)

US95 I-15 I-215

1	2	3				A1	A2
4	5	6				A3	A4
	7	8	9	10		A5	A6
11	12	13	14	15	16	17	
	18	19	20	21	22	23	
	24	25	26	27	28		
	29	30	31	32	33	34	
	35	36	37	38	39	40	
	41	42	43	44	45	46	
	47	48	49	50	51	52	
	53	54	55	56			
	57	58	59				

FIGURE 4A - MPU Facilities

ID / River 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**						
0044	E	11' X 8' RCAP	1565	3140	CSWAA-3	ALLGOW4	8.26	4.24
0073	E	11' X 8' RCAP	2220	2917	CSWAA-2	ALLGOW3	7.68	3.50
0146	E	10' X 8' RCB	3010	2220	CSWAA-1	ALLGOW3	6.98	4.40
0203	E	2: 7' X 5.5' RCB	1136	2220	CSWAA-1	ALLGOW3	6.98	5.28
0225	E	2: 7' X 5.5' RCB Outlet	360	2149	SUM5DB	ALLGOW3	6.74	3.40
APBE		**ANGEL PARK - BELTWAY BRANCH**						
0013	E	3: 12' X 8' RCB	489	4060	CSWFH-9	ALLGOW3	2.65	6.50
0022	E	Conc Chnl 20'W 7'D 2:1 SS	1556	4060	CSWFH-9	ALLGOW3	2.65	1.81
0051	E	Conc Chnl 20'W 7'D 2:1 SS	1583	4060	CSWFH-9	ALLGOW3	2.65	2.77
0081	E	8' X 8' RCBC @ Far Hills	777	423	SWFH-9	ALLGOW3	0.17	2.32
0094	E	Conc Chnl 10'W 5'D 2:1 SS	1465	423	SWFH-9	ALLGOW3	0.17	1.88
0122	E	Conc Chnl 10'W 4'D 2:1 SS	1409	423	SWFH-9	ALLGOW3	0.17	0.80
APCH		**ANGEL PARK - CARRIAGE HILL BRANCH**						
0000	E	8' X 6' RCB	152	585	SWFH-8	ALLGOW3	0.29	0.87
0003	P0	8' X 7' RCB	1461	585	SWFH-8	ALLGOW3	0.29	2.39
0031	P0	8' X 5' RCB	896	585	SWFH-8	ALLGOW3	0.29	0.60
APD2		**ANGEL PARK - DESERT FOOTHILLS 2 BRANCH**						
0002	P0	7' X 7' RCB	964	948	SWAA-2	ALLGOW3	0.70	2.00
APD5		**ANGEL PARK - DESERT FOOTHILLS 5 BRANCH**						
0000	P0	8' X 6' RCB	685	1701	CSWFH-2	ALLGOW3	1.09	1.89
0013	P0	72" RCP	1436	1701	CSWFH-2	ALLGOW3	1.09	4.18
APD6		**ANGEL PARK - DESERT FOOTHILLS 6 BRANCH**						
0000	P0	6' X 6' RCB	2604	1076	CSWFH-6	ALLGOW3	0.56	6.15
APDF		**ANGEL PARK - DESERT FOOTHILLS BRANCH**						
0000	P0	12' X 10' RCB	1356	2897	CSWFH-7	ALLGOW3	1.81	2.20
0026	P0	12' X 10' RCB	2463	1962	CSWFH-3	ALLGOW3	1.25	1.62
0073	P0	10' X 8' RCB	2679	1962	CSWFH-3	ALLGOW3	1.25	4.10
0123	P0	6' X 5' RCB	5355	1701	CSWFH-2	ALLGOW3	1.09	6.53
APF2		**ANGEL PARK - FAR HILLS 2 BRANCH**						
0000	P0	8' X 6' RCB	1046	669	CSWFH-5	ALLGOW3	0.38	1.00
APFH		**ANGEL PARK - FAR HILLS BRANCH**						
0000	E	2: 8' X 8' RCB	995	3862	CSWFH-8	ALLGOW3	2.48	3.50
0019	E	2: 8' X 8' RCB	250	3392	CCSWFH-7	ALLGOW3	2.18	4.19
0024	E	16' X 8' RCAP	1943	3392	CCSWFH-7	ALLGOW3	2.18	5.10
0061	P0	8' X 6' RCB	1492	669	CSWFH-5	ALLGOW3	0.38	2.00
0089	P0	8' X 6' RCB	2902	669	CSWFH-5	ALLGOW3	0.38	2.00
0144	P0	7' X 6' RCB	1556	669	CSWFH-5	ALLGOW3	0.38	5.50
APM5		**ANGEL PARK - MIDDLE 5 BRANCH**						
0000	E	384 ac-ft Detention Basin #5		7001	SUM5IN	ALLGOW3	6.74	
0001	E	12,153 cfs PMF Spillway		12153	SUM5IN	ALLGOW3	6.74	
0008	P0	Conc Chnl 50'W 4.5'D 2:1 SS	2102	3725	CDB54-6R	ALLGOW3	4.30	5.20
0009	P0	Conc Chnl 50'W 4.5'D 2:1 SS	4180	3624	CDB55-8	ALLGOW3	2.45	5.80
0047	E	Diversion Berm with Gabion Bank Protection	1000	3725	CDB54-6R	ALLGOW3	4.30	1.30
0056	P0	Conc Chnl 80'W 4'D 2:1 SS	264	3725	CDB54-6R	ALLGOW3	4.30	1.30
0057	P0	Conc Chnl 50'W 3'D 2:1 SS	9922	1821	CDB54-4	ALLGOW3	1.01	6.80
0059	P0	Conc Chnl 100'W 3'D 2:1 SS	8923	2358	CDB54-5	ALLGOW3	2.45	7.00
0212	P0	Conc Chnl 30'W 3.5'D 2:1 SS	6695	1238	CDB55-2	ALLGOW3	0.74	7.50
0213	P0	Conc Chnl 50'W 2.5'D 2:1 SS	6522	1125	CDB55-5	ALLGOW3	0.62	7.30
APSP		**ANGEL PARK - SUMMERLIN PARKWAY**						
0135	E	Conc Chnl 10'W 6'D 2:1 SS	2030	1173	C8B-1	ALLGOW3	1.14	2.40
0177	E	9' X 8' RCBC @ Anasazi	330	867	C11B-1	ALLGOW3	0.84	1.70
0183	E	Conc Chnl 10'W 6'D 2:1 SS	1680	867	C11B-1	ALLGOW3	0.84	1.70
GO02		**GOWAN SOUTH FACILITIES (CHEYENNE CHANNEL)**						
0257	E	Conc Chnl 10'W 6.75'D 1.5:1 SS	4293	2577	CCJ-C	ALLGOW3	2.97	4.10
GOB2		**GOWAN LONE MOUNTAIN SYST. 2 BELTWAY**						
0000	P0	36" RCP Outlet	118	75	DET22	ALLGOW3	0.76	6.76
0001	P0	123 ac-ft Village 22 Detention Basin		1344	CSV22-DB	ALLGOW3	0.76	
0020	P0	8' X 7' RCB	657	1247	SV22-2	ALLGOW3	0.70	8.30
0033	P0	8' X 6' RCB	3359	1247	SV22-2	ALLGOW3	0.70	6.90
0096	P0	6' X 5' RCB	1332	1247	SV22-2	ALLGOW3	0.70	6.00

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOB3		**GOWAN LONE MOUNTAIN SYST. 3 BELTWAY**						
0000	P0	66" RCP	1877	530	SV22-3	ALLGOW3	0.28	6.60
0035	P0	54" RCP	965	530	SV22-3	ALLGOW3	0.28	6.40
GOBE		**GOWAN LONE MOUNTAIN SYST. BELTWAY**						
0000	E	20' X 10' RCBC @ Access Rd	30	958	CSV22-3	GW3SC	0.28	5.67
0001	E	Conc Chnl 20'W 5'D 2:1 SS	3355	958	CSV22-3	GW3SC	0.28	6.50
0065	E	Conc Chnl 20'W 6'D 2:1 SS	1220	958	CSV22-3	GW3SC	0.28	1.90
0088	E	2: 10'X9' RCBC @ Lake Mead	400	471	CDET22	ALLGOW3	0.96	0.50
0096	E	Conc Chnl 20'W 9'D 2:1 SS	627	471	CDET22	ALLGOW3	0.96	0.50
0108	E	Conc Chnl 20'W 6'D 2:1 SS	1021	471	CDET22	ALLGOW3	0.96	0.50
0127	E	Conc Chnl 20'W 6'D 2:1 SS	638	442	SV22-1	ALLGOW3	0.20	0.50
0139	E	Conc Chnl 10'W 5.5'D 2:1 SS	1500	442	SV22-1	ALLGOW3	0.20	1.02
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0010	E	Conc Chnl 20'W 10'D 0:1 SS	3037	2946	CRCLMT1R	GW3SC	2.61	2.78
0068	E	Transition Structure	100	2946	CRCLMT1R	GW3SC	2.61	3.50
0070	E	20' X 6' RCBC @ Cliff Shadows	350	1162	CRCSV223	ALLGOW3	5.68	2.44
0077	E	Conc Chnl 20'W 6'D 0:1 SS	1229	1162	CRCSV223	ALLGOW3	5.68	6.11
0100	E	Conc Chnl 20'W 10'D 0:1 SS	200	1162	CRCSV223	ALLGOW3	5.68	5.67
0115	E	66" RCP Outlet	670	679	DET26	ALLGOW3	4.43	
0128	E	333 ac-ft Village 26 Detention Basin		3767	VIL26IN	ALLGOW3	4.43	
0137	P0	14' X 14' RCB	4335	3767	VIL26IN	ALLGOW3	4.43	0.50
0216	P0	Conc Chnl 50'W 4.5'D 2:1 SS	3761	3693	CSV26-1	ALLGOW3	4.15	6.08
0289	P0	Conc Chnl 50'W 3.5'D 2:1 SS	6215	2396	30	ALLGOW3	2.51	7.95
0290	E	Natural Wash 363'W	4850	1465	SV26-1	ALLGOW3	1.64	22.50
0370	E	Natural Wash 450'W	7000	2396	30	ALLGOW3	2.51	8.50
GOL4		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4**						
0000	E	14' X 8' RCB	554	2257	CLMT1R	ALLGOW3	2.33	2.50
0010	E	2: 9' X 8' RCB	820	2257	CLMT1R	ALLGOW3	2.33	4.74
0025	E	Soil Cement Chnl 60'W 8'D 3-4:1 SS	320	2257	CLMT1R	ALLGOW3	2.33	2.00
0026	E	Soil Cement Chnl 42'W 6'D 3-4:1 SS	700	2257	CLMT1R	ALLGOW3	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

2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F - 24

LEGEND

ID (Facility Identifier) AABB
- Parent Stream Name
- Stream Name

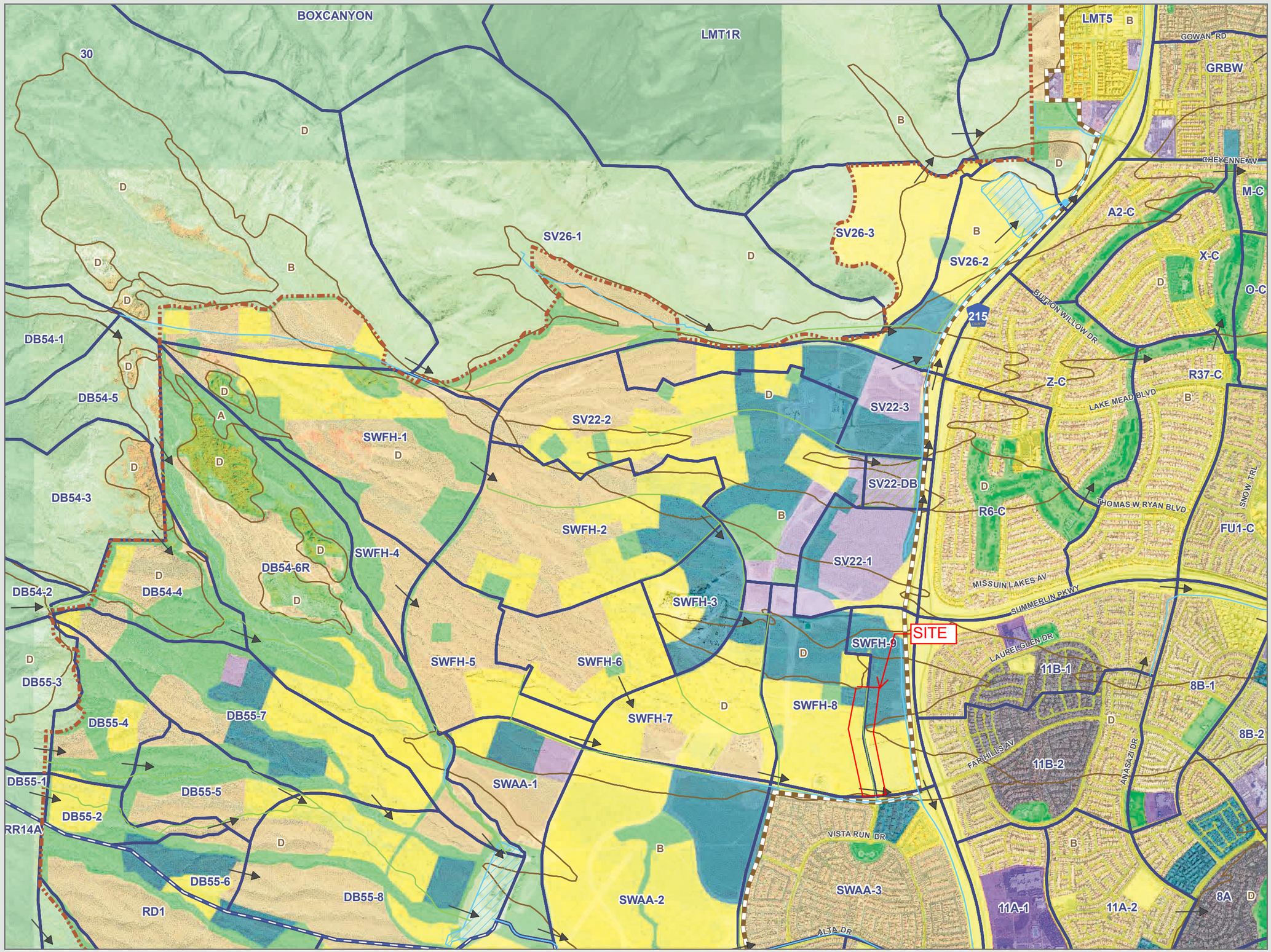
River Mile 0000
- Distance Above Confluence with Parent Stream (Miles)
- Miles in Hundredths

Existing Facility.....E
Proposed or Modified Facility..... P
Contingency Level
- Category B.....P0
- Master Plan.....P1
- Preliminary Design.....P2
- Design.....P3

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



REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H- 24
HYDROLOGIC SUMMARY

LEGEND

- Ultimate Development Boundary
- Watershed Boundary (ID)
- Subbasin Boundary
- Drought Ordinance Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Category A Remove & Replace/ Parallel Facilities
- Category B Remove & Replace/ Parallel Facilities

Type Hydrologic Soil Groups

- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential/Rock Outcrops

Typical Land Use

1		Undeveloped Land, Open Desert
2		Parks, Golf Courses
3		Rural
4 / 14*		Low Density Residential
5 / 15*		Medium Density Residential
6 / 16*		High Density Residential
7 / 17*		Public Facility, Residential
8 / 18*		Very High Density Residential
9 / 19*		Commerical, Retail, Casino, High Rise Condominiums
10 / 20*		Light Industrial
11 / 21*		Heavy Industrial
12 / 22*		Schools
13		Lakes

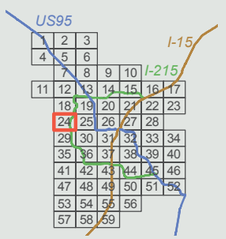
* Drought Ordinance Applied

N

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

Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)



PBS&J PB

FIGURE 4B - MPU HYDROLOGIC SUMMARY

152

731

502

152

INT1

156

INT2

152

INT3

502

NORTH

GRAPHIC SCALE

500 0 250 500 1000

1" = 500'

LEGEND

BASIN BOUNDARY

300 SOIL NUMBER

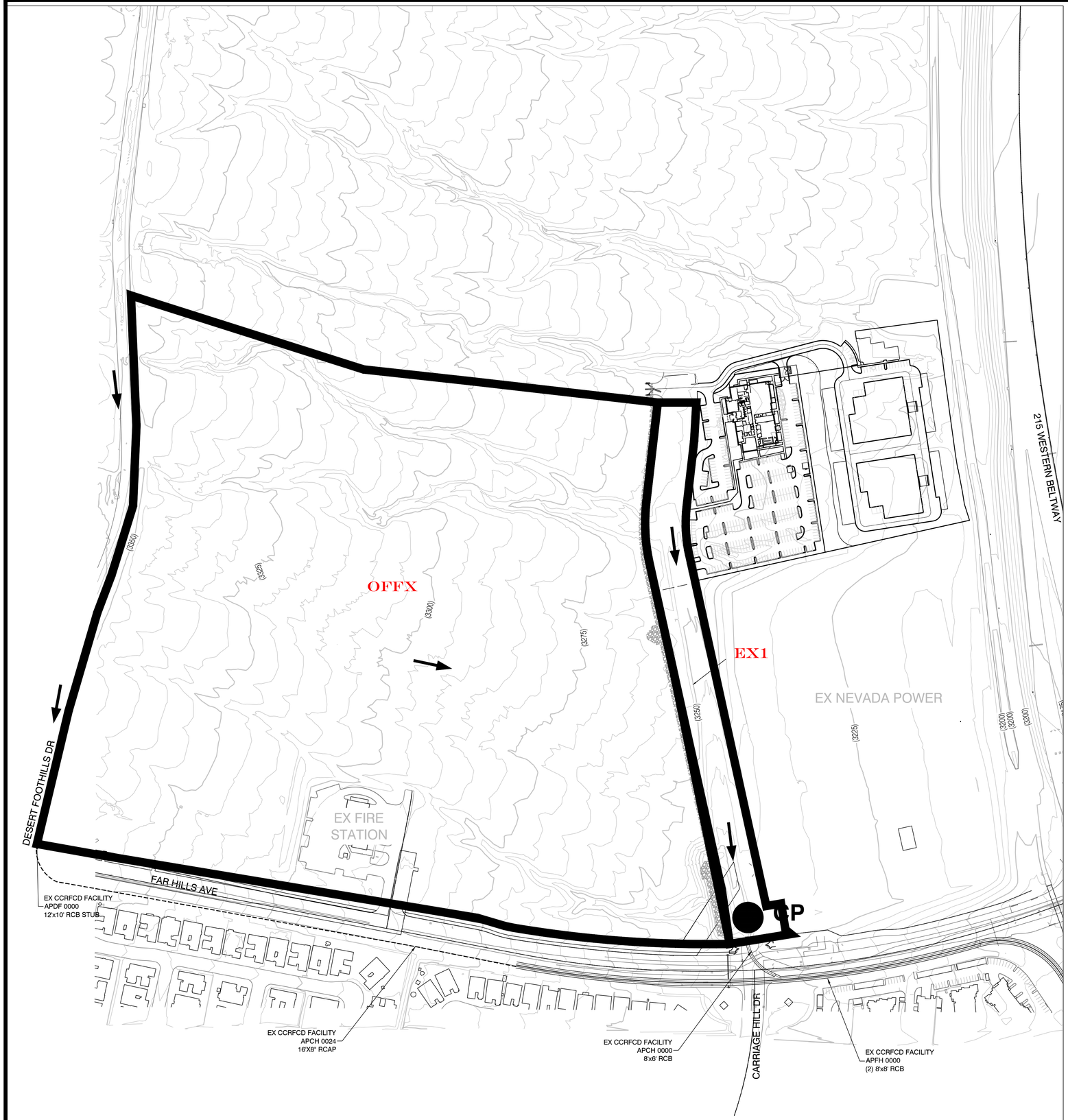
SOIL BOUNDARY

W.O.#:	7851
DATE:	MAR 2018
BY:	JYA
SCALE:	1"=500'
SHEET	1 OF 1

FIGURE 5
SOILS MAP

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Carriage Hill Drive-South\Drainage\A Figures\Figure 5 - Soils Map.dwg;jayson; Mar 05, 2018 - 3:26pm



NORTH

GRAPHIC SCALE

150 0 75 150 300

1" = 150'

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- EX1 — BASIN DESIGNATION
- FLOW ARROW

EXISTING CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	AREA (ac)	Q100 (CFS)
OFFX	67.25	199
EX1	4.85	12
CP	-	212

REV	DATE	BY	REVISION

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

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

FIGURE 6: EXISTING CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE - FAR HILLS TO EAST WEST COLLECTOR

DRAWN BY: SVB/JYA	SEPT 2017		
DESIGNED BY: SVB/JYA	SEPT 2017		
CHECKED BY: WJM	SEPT 2017	SCALE:	HORZ: VERT:
PROJECT NO: 7809			

SHEET

OF SHEETS

DRAWING NO.

H:\7801\Carriage Hill Drive-South\Drainage\A Figures\Figure 6 - Existing Drainage Map.dwg

GRAPHIC SCALE

150 0 75 150 300

1" = 150'

NORTH

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- INT1 BASIN ID
- FLOW ARROW

INTERIM CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
INT1	9.8	27
INT2	26.1	71
INT3	41.7	110
CARR3	4.9	19
CP	-	197

CHANNEL SUMMARY TABLE

Channel ID	Q (cfs)	Slope (%)	Normal Depth (ft)	Channel Depth (ft)	Freeboard (ft)	Velocity (ft/s)	Riprap D_{50}	Side Slopes	Description
INT1	27	4.47	0.60	N/A	N/A	4.22	6"	3:1/3:1	Existing Wash
INT2 (MIN)	71	1.42	1.04	3.00	1.96	4.52	6"	3:1/3:1	12' BW Trap Channel
INT2 (MAX)	71	2.10	0.93	3.00	2.07	5.16	6"	3:1/3:1	12' BW Trap Channel
INT3 (MIN)	110	1.00	1.46	3.00	1.54	4.60	6"	3:1/3:1	12' BW Trap Channel
INT3 (MAX)	110	2.10	1.19	3.00	1.81	5.94	6"	3:1/3:1	12' BW Trap Channel

REV | DATE | BY | REVISION

THE HOWARD HUGHES CORPORATION
10700 W. CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89135

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
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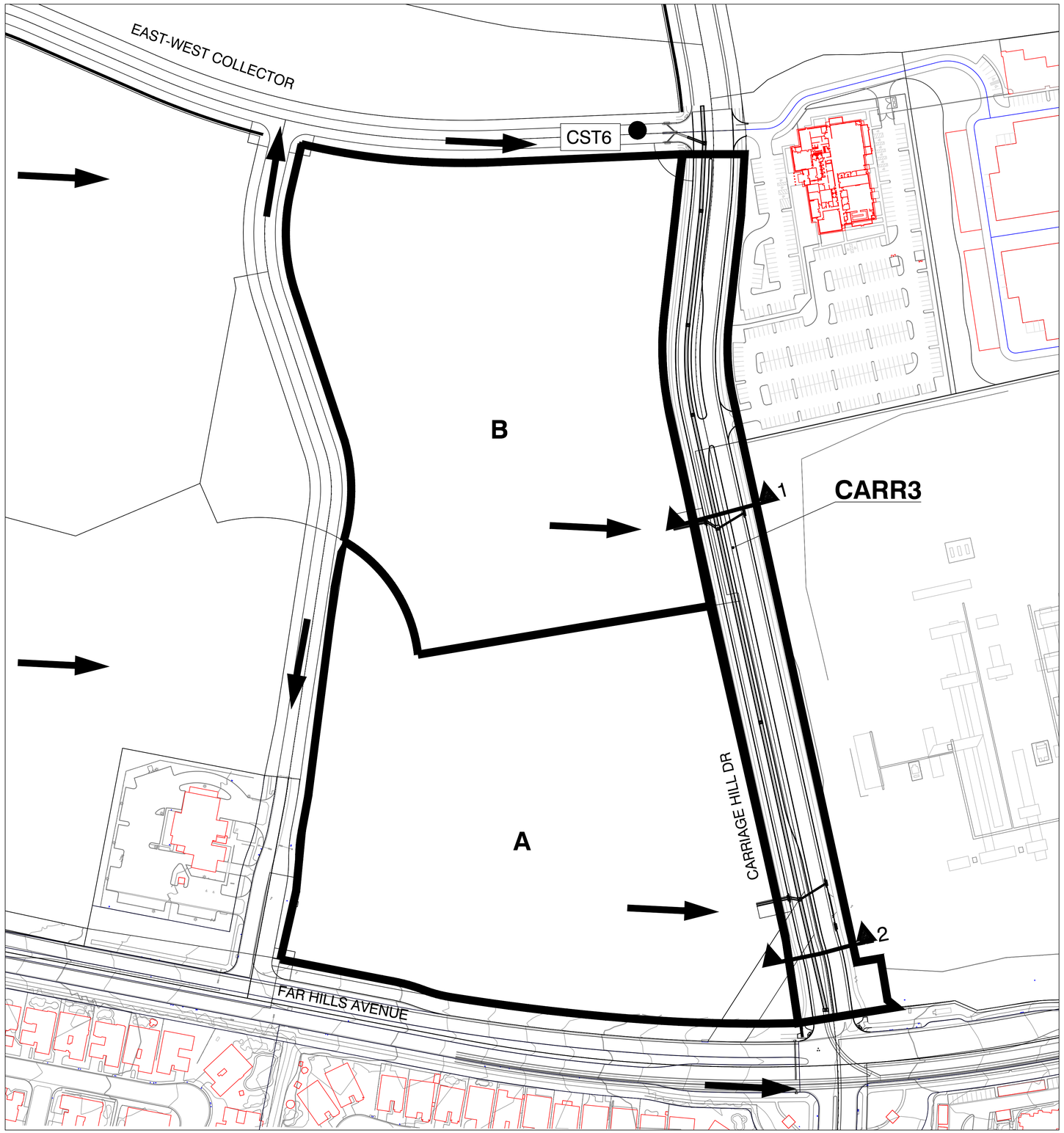
FIGURE 7: INTERIM CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE - FAR HILLS TO EAST WEST COLLECTOR

DRAWN BY: JYA/WJM — FEB 2018
DESIGNED BY: — FEB 2018
CHECKED BY: WJM
PROJECT NO: 7851
SCALE: N/A HORIZ. N/A VERT.

SHEET
OF SHEETS
DRAWING NO.

H:\7851\Carriage Hill Drive-South\Drainage\A Figures\Figure 7 - Interim Drainage Map.dwg



NORTH

GRAPHIC SCALE

100 0 50 100 200

1" = 100'

LEGEND

- BASIN BOUNDARY
- A — BASIN DESIGNATION
- CROSS SECTION
- CONCENTRATION POINT

ULTIMATE CONDITION HEC-1 SUMMARY TABLE*

BASIN ID	AREA (ac)	Q100 (CFS)
CST6	-	66
B	13.76	46
A	14.65	48
CARR3	4.85	19

*Refer to Village 21 HEC-1 model

STREET FLOW ANALYSIS SUMMARY TABLE

Section	Discharge (cfs)	Slope (%)	Velocity (fps)	Depth (ft)	V x D	Tributary Basins
1	9.5	2.10%	3.42	0.35	1.20	1/2 CARR3
2	9.5	2.10%	3.72	0.35	1.30	1/2 CARR3

REVISION | BY | DATE | REV

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

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
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FIGURE 8: ULTIMATE CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE - FAR HILLS
TO EAST WEST COLLECTOR

DRAWN BY: JYA 9/2017
DESIGNED BY: JYA 9/2017
CHECKED BY: WJM 9/2017
SCALE: #### HORIZ. #### VERT.
PROJECT NO: 7809

SHEET FIG 8 OF SHEETS
DRAWING NO.

H:\7809\Carriage Hill Drive South\Drainage\A Figures\Figure 8 - Ultimate Drainage Map.dwg

APPENDIX B
HYDROLOGIC CALCULATIONS

SOIL INFORMATION

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

February 27, 2018

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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Soil Map..... 5
Soil Map.....6
Legend.....7
Map Unit Legend..... 9
Map Unit Descriptions..... 9
Las Vegas Valley Area, Nevada, Part of Clark County.....11
156—Vace-Wechech association..... 11
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: 1:5,010 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 12, Sep 15, 2017

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

Date(s) aerial images were photographed: Sep 19, 2015—Nov 23, 2016

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	68.2	97.4%
502	Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes	1.8	2.6%
Totals for Area of Interest		**70.1**	**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: Desert Fans 4-6 P.Z. (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: Desert Fans 4-6 P.Z. (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 cool hills to R030XB029NV (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

RUNOFF CURVE NUMBERS
(SEMIARID RANGELANDS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

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

[2]*Poor:* <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: >70% ground cover.

[3]Curve numbers for group A have been developed only for desert shrub.

Revision	Date

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

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

See Table 602A

Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

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

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

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

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

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

Revision	Date

CURVE NUMBERS FOR SOILS

Soil # 156 Vace - Wechech association				
Soil	Percent	Group	Existing$_1$	Commercial$_2$
Vace and Similar	45%	D	88	95
Wechech and Similar	25%	D	88	95
Wechech, steep, and similar	15%	D	88	95
Weiser	8%	B	77	92
Irongold	4%	D	88	95
Commski	2%	B	77	92
Threelakes	1%	A	63	89
Total	**100%**		**87**	**95**

Soil # 502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes				
Soil	Percent	Group	Existing$_1$	Commercial$_2$
Canutio	55%	A	63	89
Cave	40%	D	88	95
Arizo	5%	D	88	95
Total	**100%**		**75**	**92**

Notes:

1- Referenced from Table 602 (4 of 4), Desert Shrub, Poor Condition

2- Referenced from Table 602 (1 of 4) Commercial

Curve Number calculations for basins

Basin	Type	Soil	1	3	CN Value
EX1	156	100	100%		**87**
OFFX	156	100%	97%	3%	**87**
INT1	156	100%	100%		**87**
INT2	156	100%	100%		**87**
INT3	156	95%	100%		**86**
	502	5%	95%	5%	

LAG TIME CALCULATIONS

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Summerlin V21 Carriage Hill Drive
W.O. # 7851 **CALCULATED BY:** JYA

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

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

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

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
EXISTING CONDITION								
EX1	1630	3266	3220	0.028	14.8	2.5	29.4	5.0
OFFX	1652	3341	3236	0.063	14.8	3.7	29.4	7.4
INTERIM CONDITION								
INT1	1628	3355	3260	0.058	14.8	3.6	29.4	7.1
INT2	1985	3354	3257	0.049	14.8	3.3	29.4	6.5
INT3	2300	3351	3220	0.057	14.8	3.5	29.4	7.0

STANDARD FORM 4

DEVELOPMENT: Summerlin V21 Carriage Hill Drive

CONDITION: Existing/Interim

W.O. # 7851 **CALCULATED BY:** JYA

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

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

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

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

SUB-BASIN 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.	RAINFALL Inches
EXISTING CONDITION																	
EX1	87	0.761	4.85	0.0076	50	2.0	3.42	1630	2.8	2.5	5.0	7.15	1680	19.33	10.57	0.106	
OFFX	87	0.761	67.25	0.1051	50	1.0	4.31	1652	6.3	3.7	7.4	4.83	1702	19.46	9.14	0.091	
INTERIM CONDITION																	
INT1	87	0.758	9.83	0.0154	100	1.0	6.15	1628	5.8	3.6	7.1	4.98	1728	19.60	11.13	0.111	
INT2	87	0.758	26.12	0.0408	100	1.0	6.15	1985	4.9	3.3	6.5	6.36	2085	21.58	12.50	0.125	
INT3	86	0.751	41.66	0.0651	100	1.0	6.28	2300	5.7	3.5	7.0	6.63	2400	23.33	12.92	0.129	

EXISTING CONDITION
HEC-1 ANALYSIS

```
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   26FEB18  TIME  12:49:07  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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

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
            1           ID   CARRIAGE HILL DRIVE - SOUTH
            2           ID   EXISTING CONDITION
            3           ID   FILE: 7851-CH-EX.DAT
            4           ID   11/16/2017
            5           ID   100YR STORM EVENT
            6           IT       5     0     300
            7           IN       5     0
            8           IO       5     0
            9           JR    PREC    1.00
                        *

           10           KK  OFFX
           11           BA   .1051
           12           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
           13           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
           14           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
           15           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
           16           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
           17           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
           18           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
           19           PC    .998    .999   1.00
           20           PB   3.34
           21           LS           87.0
           22           UD   .091
                        *

           23           KK  EX1
           24           BA   0.0076
           25           LS           87.0
           26           UD   0.106
                        *

           27           KK  CP
           28           KM   COMBINE OFFX AND EX1
           29           HC       2
                        *
           30           ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

    10      OFFX
                 .
                 .
    23           .      EX1
                 .           .
                 .           .
```

```
   27      CP    ............

 (***) 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   26FEB18  TIME  12:49:07  *                                  *          (916) 756-1104              *
 *                                      *                                  *                                      *
 ****************************************                                  ****************************************



                         CARRIAGE HILL DRIVE - SOUTH
                         EXISTING CONDITION
                         FILE: 7851-CH-EX.DAT
                         11/16/2017
                         100YR STORM EVENT

    8 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 0  STARTING DATE
                       ITIME        1200  STARTING TIME
                          NQ         101  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     13    0  ENDING DATE
                      NDTIME        2020  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE    8.33 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
+                OFFX         .11     1   FLOW         199.
                                          TIME         3.50

 HYDROGRAPH AT
+                EX1          .01     1   FLOW          12.
                                          TIME         3.50

  2 COMBINED AT
+                CP           .11     1   FLOW         212.
                                          TIME         3.50



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

INTERIM CONDITION
HEC-1 ANALYSIS

```
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   05MAR18  TIME  14:57:46  *                 *           (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.

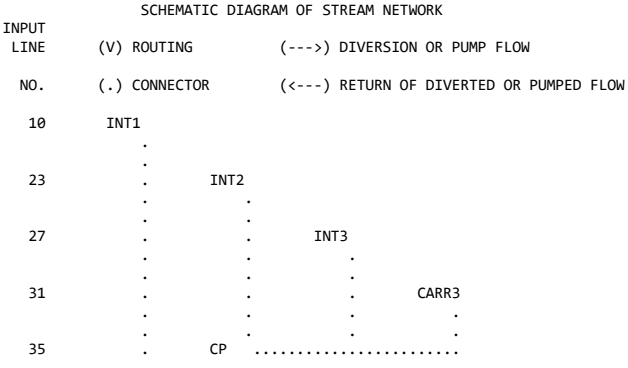
THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, 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
            1           ID   CARRIAGE HILL DRIVE - SOUTH
            2           ID   INTERIM CONDITION
            3           ID   FILE: 7851-CH-INT.DAT
            4           ID   11/16/2017
            5           ID   100YR STORM EVENT
            6           IT       5     0     300
            7           IN       5     0
            8           IO       5     0
            9           JR    PREC    1.00
                        *

           10           KK   INT1
           11           BA   .0154
           12           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
           13           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
           14           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
           15           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
           16           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
           17           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
           18           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
           19           PC    .998    .999   1.00
           20           PB   3.34
           21           LS            87.0
           22           UD   .111
                        *

           23           KK   INT2
           24           BA   .0408
           25           LS            87.0
           26           UD   .125
                        *

           27           KK   INT3
           28           BA   .0651
           29           LS            86.0
           30           UD   .129
                        *

           31           KK   CARR3
           32           BA   .0076
           33           LS            98.0
           34           UD   .089
                        *

           35           KK   CP
           36           KM   COMBINE INT2, INT3, AND CARR3
           37           HC       3
                        *
           38           ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*               JUN  1998              *
*            VERSION 4.1               *
*                                      *
*  RUN DATE   05MAR18  TIME  14:57:46  *
*                                      *
****************************************
```

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

CARRIAGE HILL DRIVE - SOUTH
INTERIM CONDITION
FILE: 7851-CH-INT.DAT
11/16/2017
100YR STORM EVENT

```
   8 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 0  STARTING DATE
                       ITIME        1200  STARTING TIME
                          NQ         101  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     13    0  ENDING DATE
                       NDTIME        2020  ENDING TIME
                       ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE    8.33 HOURS

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

     JP          MULTI-PLAN OPTION
                       NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00
1
```

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1
					1.00
HYDROGRAPH AT					
+	INT1	.02	1	FLOW	27.
				TIME	3.58
HYDROGRAPH AT					

```
+                 INT2        .04     1   FLOW          71.
                                          TIME        3.58

 HYDROGRAPH AT
+                 INT3        .07     1   FLOW         110.
                                          TIME        3.58

 HYDROGRAPH AT
+                 CARR3       .01     1   FLOW          19.
                                          TIME        3.50

  3 COMBINED AT
+                 CP          .11     1   FLOW         197.
                                          TIME        3.58


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

APPENDIX C
HYDRAULIC CALCULATIONS

CHANNEL
NORMAL DEPTH CALCULATIONS

Worksheet for INT1 (Existing Wash)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.47	%
Discharge	27.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3272.17
0+03	3272.09
0+15	3270.45
0+32	3261.51
0+41	3258.75
0+53	3258.75
0+56	3258.47
0+62	3259.59
0+86	3269.57
0+93	3270.44

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 3272.17)	(0+93, 3270.44)	0.035

Options

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

Results

Normal Depth	0.60	ft
Elevation Range	3258.47 to 3272.17 ft	
Flow Area	6.40	ft²

Worksheet for INT1 (Existing Wash)

Results

Wetted Perimeter		19.84	ft
Hydraulic Radius		0.32	ft
Top Width		19.72	ft
Normal Depth		0.60	ft
Critical Depth		0.67	ft
Critical Slope		0.02486	ft/ft
Velocity		4.22	ft/s
Velocity Head		0.28	ft
Specific Energy		0.88	ft
Froude Number		1.31	
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	0.60	ft
Critical Depth	0.67	ft
Channel Slope	4.47	%
Critical Slope	0.02486	ft/ft

Cross Section for INT1 (Existing Wash)

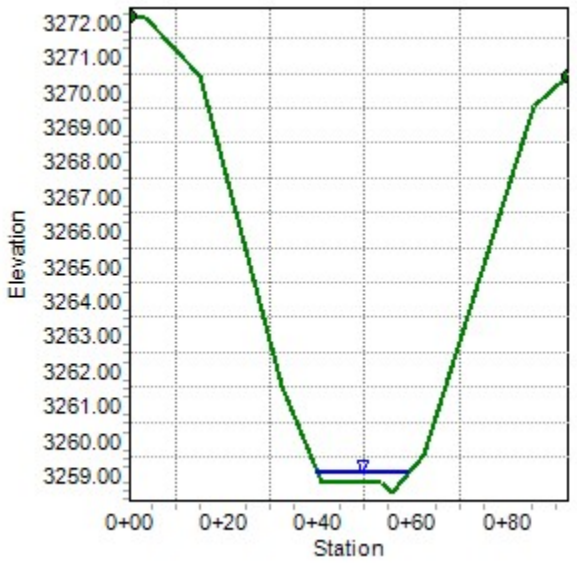
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.47	%
Normal Depth	0.60	ft
Discharge	27.00	ft³/s

Cross Section Image



Worksheet for INT2 (MIN)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	1.42	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	71.00	ft^3/s

Results

Normal Depth	1.04	ft
Flow Area	15.70	ft^2
Wetted Perimeter	18.57	ft
Hydraulic Radius	0.85	ft
Top Width	18.23	ft
Critical Depth	0.95	ft
Critical Slope	0.01972	ft/ft
Velocity	4.52	ft/s
Velocity Head	0.32	ft
Specific Energy	1.36	ft
Froude Number	0.86	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.04	ft
Critical Depth	0.95	ft
Channel Slope	1.42	%

Worksheet for INT2 (MIN)

GVF Output Data

Critical Slope	0.01972	ft/ft

Cross Section for INT2 (MIN)

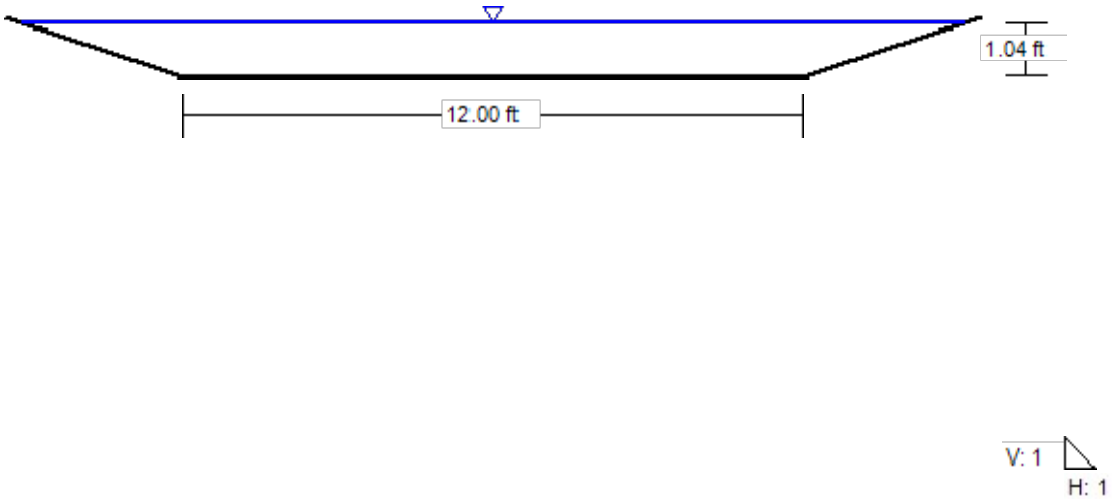
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	1.42	%
Normal Depth	1.04	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	71.00	ft³/s

Cross Section Image



Worksheet for INT2 (MAX)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	2.10	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	71.00	ft³/s

Results

Normal Depth	0.93	ft
Flow Area	13.75	ft²
Wetted Perimeter	17.88	ft
Hydraulic Radius	0.77	ft
Top Width	17.58	ft
Critical Depth	0.95	ft
Critical Slope	0.01972	ft/ft
Velocity	5.16	ft/s
Velocity Head	0.41	ft
Specific Energy	1.34	ft
Froude Number	1.03	
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	0.93	ft
Critical Depth	0.95	ft
Channel Slope	2.10	%

Worksheet for INT2 (MAX)

GVF Output Data

Critical Slope	0.01972	ft/ft

Cross Section for INT2 (MAX)

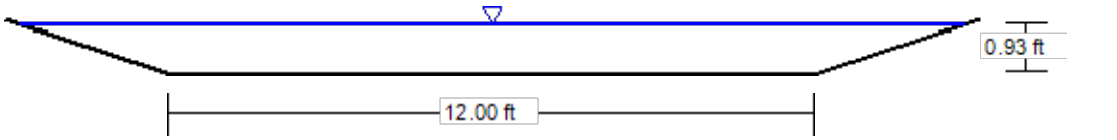
Project Description

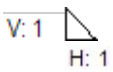
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	2.10	%
Normal Depth	0.93	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	71.00	ft³/s

Cross Section Image





Worksheet for INT3 (MIN)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	1.00	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	110.00	ft³/s

Results

Normal Depth	1.46	ft
Flow Area	23.93	ft²
Wetted Perimeter	21.24	ft
Hydraulic Radius	1.13	ft
Top Width	20.76	ft
Critical Depth	1.24	ft
Critical Slope	0.01835	ft/ft
Velocity	4.60	ft/s
Velocity Head	0.33	ft
Specific Energy	1.79	ft
Froude Number	0.75	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.46	ft
Critical Depth	1.24	ft
Channel Slope	1.00	%

Worksheet for INT3 (MIN)

GVF Output Data

Critical Slope	0.01835	ft/ft

Cross Section for INT3 (MIN)

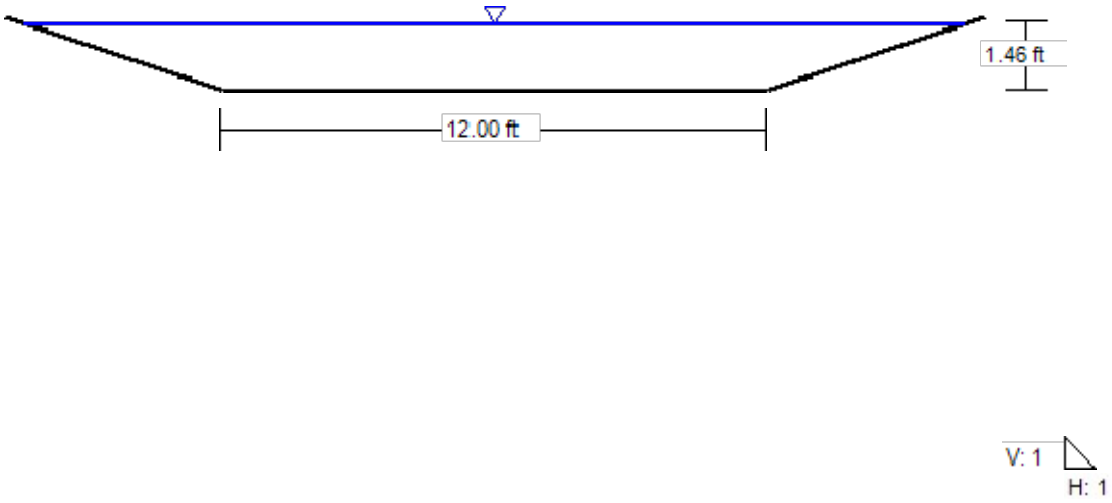
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	1.00	%
Normal Depth	1.46	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	110.00	ft³/s

Cross Section Image



Worksheet for INT3 (MAX)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	2.10	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	110.00	ft³/s

Results

Normal Depth	1.19	ft
Flow Area	18.52	ft²
Wetted Perimeter	19.52	ft
Hydraulic Radius	0.95	ft
Top Width	19.14	ft
Critical Depth	1.24	ft
Critical Slope	0.01835	ft/ft
Velocity	5.94	ft/s
Velocity Head	0.55	ft
Specific Energy	1.74	ft
Froude Number	1.06	
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	1.19	ft
Critical Depth	1.24	ft
Channel Slope	2.10	%

Worksheet for INT3 (MAX)

GVF Output Data

Critical Slope	0.01835	ft/ft

Cross Section for INT3 (MAX)

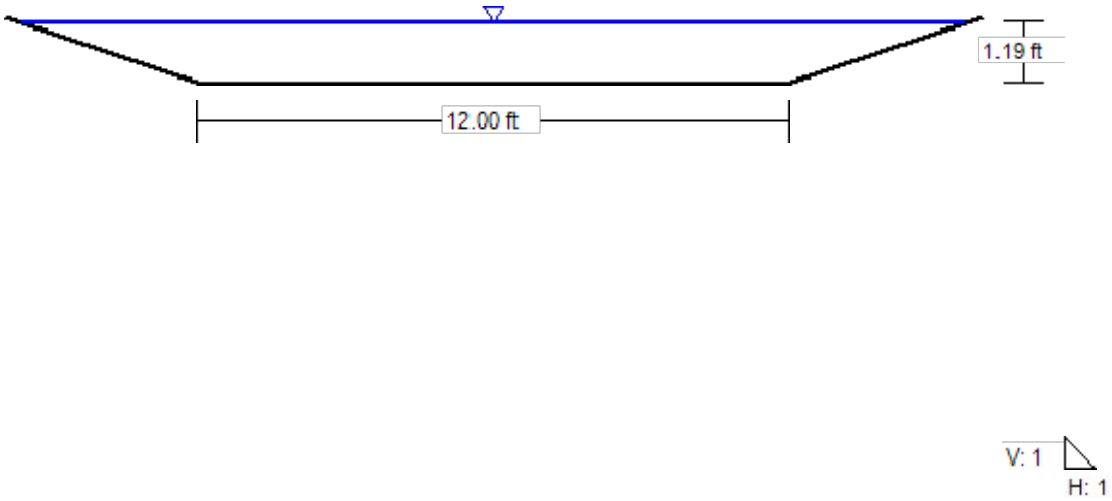
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	2.10	%
Normal Depth	1.19	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	12.00	ft
Discharge	110.00	ft³/s

Cross Section Image



RIPRAP CALCULATIONS

RIP-RAP CALCULATIONS

DEVELOPMENT Summerlin West Village 21 Carriage Hill Drive
Work Order # 7851 **CALCULATED BY** JYA

EQUATIONS

$$V = \frac{3(d_{50})^{0.5}(S_s - 1)}{S^{0.17}} \qquad n = 0.0395(D_{50})^{1/6}$$

Where : V = Velocity, in fps; d_{50} = Mean Rock Size, in feet; S = Channel Slope; & S_s = Specific Gravity

NOTES: Equations are referenced from pages 746 and 747 of the CCRFCD HC&DDM
Minimum rip rap size utilized is D_{50} = 0.5 ft

Section	Q_{100} (cfs)	Max. Velocity (fps)	Slope (ft/ft)	Specific Gravity	D_{50} (ft)	n-value
INT1	27	4.22	0.045	2.65	0.5	0.035
INT2	71	5.16	0.021	2.65	0.5	0.035
INT3	110	5.94	0.021	2.65	0.5	0.035

INLET CONTROL CALCULATIONS

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 110 cfs

Maximum Flow: 110 cfs

Table 1 - Summary of Culvert Flows at Crossing: Carriage Hill Drive

Headwater Elevation (ft)	Total Discharge (cfs)	Lateral SDMH#2 West (Interim Condition) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3230.24	0.00	0.00	0.00	1
3230.43	11.00	11.00	0.00	1
3231.18	22.00	22.00	0.00	1
3231.83	33.00	33.00	0.00	1
3232.52	44.00	44.00	0.00	1
3233.36	55.00	55.00	0.00	1
3234.40	66.00	66.00	0.00	1
3235.66	77.00	77.00	0.00	1
3237.12	88.00	88.00	0.00	1
3238.80	99.00	99.00	0.00	1
3240.73	110.00	110.00	0.00	1
3243.00	121.65	121.65	0.00	Overtopping

Rating Curve Plot for Crossing: Carriage Hill Drive

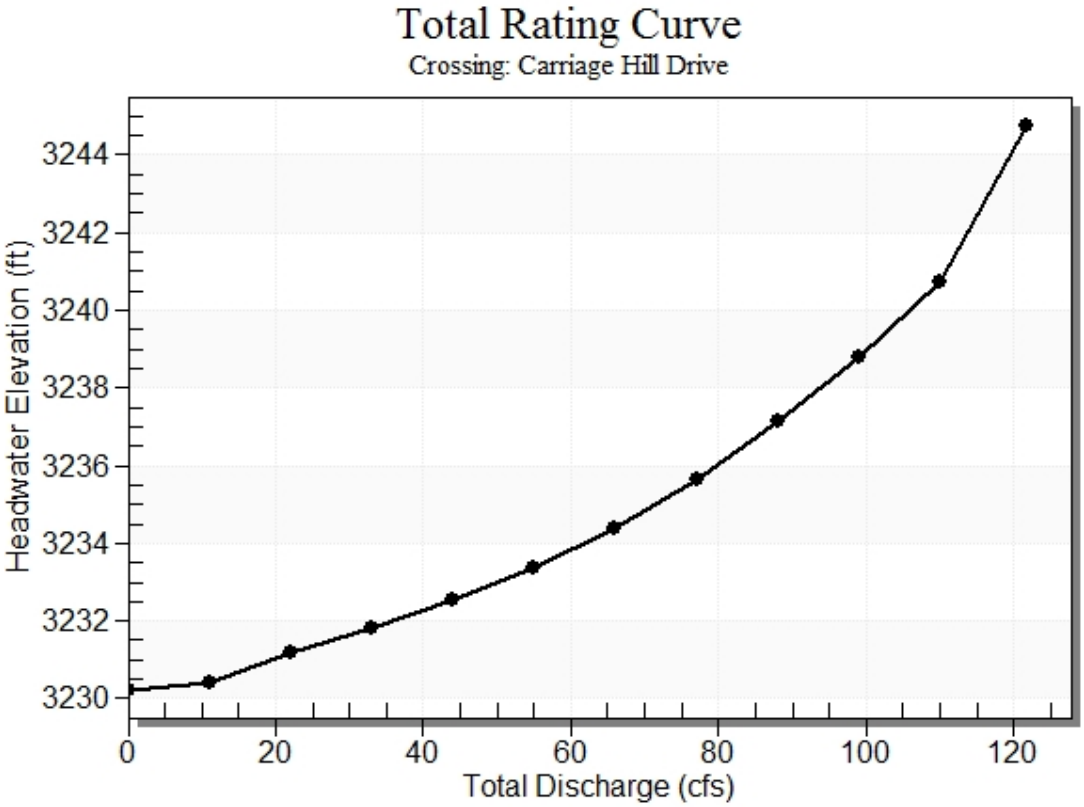


Table 2 - Culvert Summary Table: Lateral SDMH#2 West (Interim Condition)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3230.24	0.000	1.180	0-NF	0.000	0.000	3.000	5.620	0.000	0.000
11.00	11.00	3230.43	1.372	1.243	1-JS1f	0.498	1.049	3.000	5.620	1.630	0.000
22.00	22.00	3231.18	2.125	1.465	1-JS1f	0.705	1.508	3.000	5.620	3.260	0.000
33.00	33.00	3231.83	2.772	1.834	1-JS1f	0.875	1.862	3.000	5.620	4.890	0.000
44.00	44.00	3232.52	3.462	2.350	5-JS1f	1.018	2.158	3.000	5.620	6.520	0.000
55.00	55.00	3233.36	4.302	3.015	5-JS1f	1.150	2.404	3.000	5.620	8.150	0.000
66.00	66.00	3234.40	5.343	3.827	5-JS1f	1.270	2.600	3.000	5.620	9.780	0.000
77.00	77.00	3235.66	6.599	4.786	5-JS1f	1.389	2.741	3.000	5.620	11.409	0.000
88.00	88.00	3237.12	8.059	5.893	5-S2n	1.500	2.831	1.795	5.620	19.950	0.000
99.00	99.00	3238.80	9.739	7.576	5-S1f	1.610	2.712	3.000	5.620	14.669	0.000
110.00	110.00	3240.73	11.672	8.551	5-S2n	1.720	3.000	2.126	5.620	20.552	0.000

****

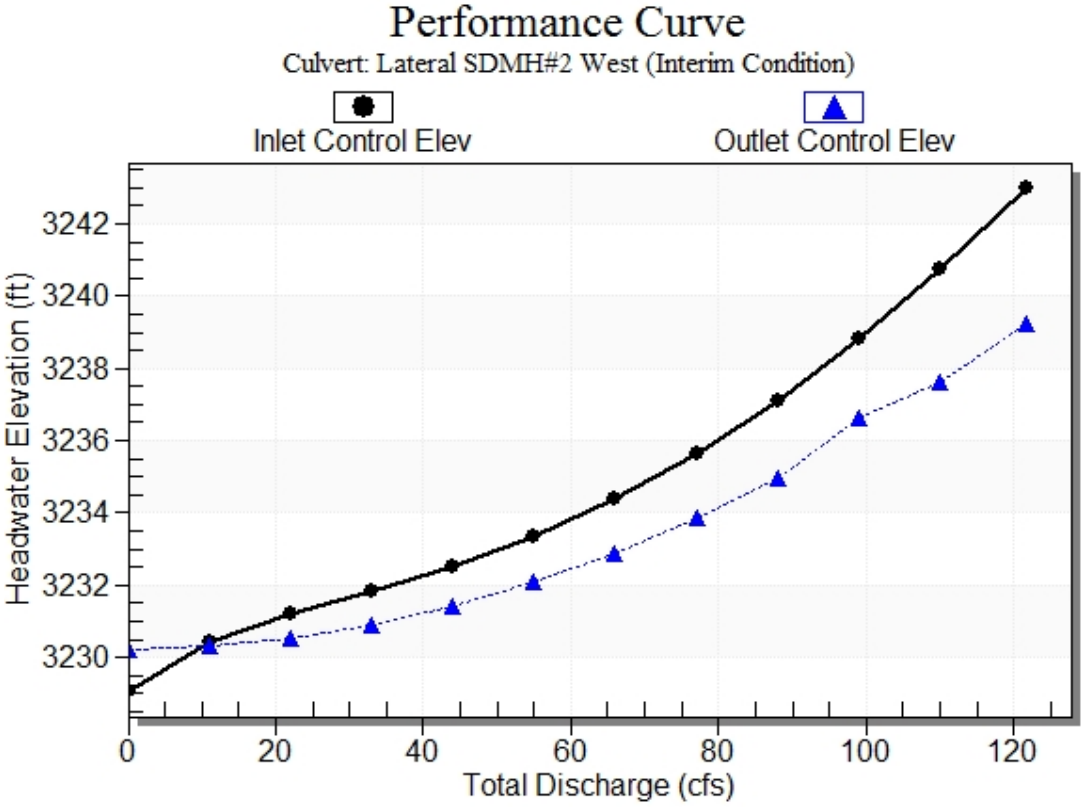
Straight Culvert

Inlet Elevation (invert): 3229.06 ft, Outlet Elevation (invert): 3224.62 ft

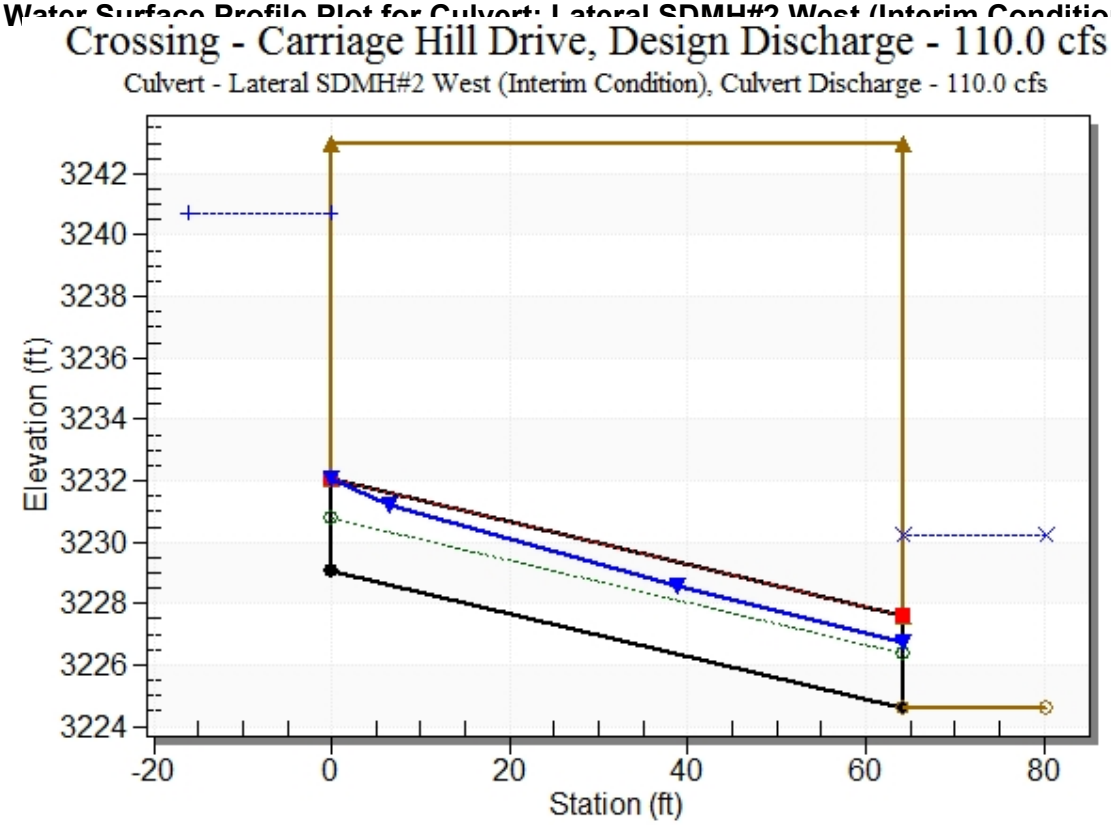
Culvert Length: 64.35 ft, Culvert Slope: 0.0692

****

Culvert Performance Curve Plot: Lateral SDMH#2 West (Interim Condition)



Water Surface Profile Plot for Culvert: Lateral SDMH#2 West (Interim Condition)



Site Data - Lateral SDMH#2 West (Interim Condition)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3229.06 ft

Outlet Station: 64.20 ft

Outlet Elevation: 3224.62 ft

Number of Barrels: 1

Culvert Data Summary - Lateral SDMH#2 West (Interim Condition)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Carriage Hill Drive)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	3230.24	5.62
11.00	3230.24	5.62
22.00	3230.24	5.62
33.00	3230.24	5.62
44.00	3230.24	5.62
55.00	3230.24	5.62
66.00	3230.24	5.62
77.00	3230.24	5.62
88.00	3230.24	5.62
99.00	3230.24	5.62
110.00	3230.24	5.62

Tailwater Channel Data - Carriage Hill Drive

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 3230.24 ft

Roadway Data for Crossing: Carriage Hill Drive

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 64.20 ft

Crest Elevation: 3243.00 ft

Roadway Surface: Paved

Roadway Top Width: 64.20 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 71 cfs

Maximum Flow: 71 cfs

Table 1 - Summary of Culvert Flows at Crossing: Carriage Hill Drive

Headwater Elevation (ft)	Total Discharge (cfs)	Lateral SDMH#4 West (Interim Condition) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3246.48	0.00	0.00	0.00	1
3246.58	7.10	7.10	0.00	1
3246.78	14.20	14.20	0.00	1
3247.33	21.30	21.30	0.00	1
3247.92	28.40	28.40	0.00	1
3248.65	35.50	35.50	0.00	1
3249.55	42.60	42.60	0.00	1
3250.64	49.70	49.70	0.00	1
3251.90	56.80	56.80	0.00	1
3253.36	63.90	63.90	0.00	1
3255.03	71.00	71.00	0.00	1
3258.00	82.12	82.12	0.00	Overtopping

Rating Curve Plot for Crossing: Carriage Hill Drive

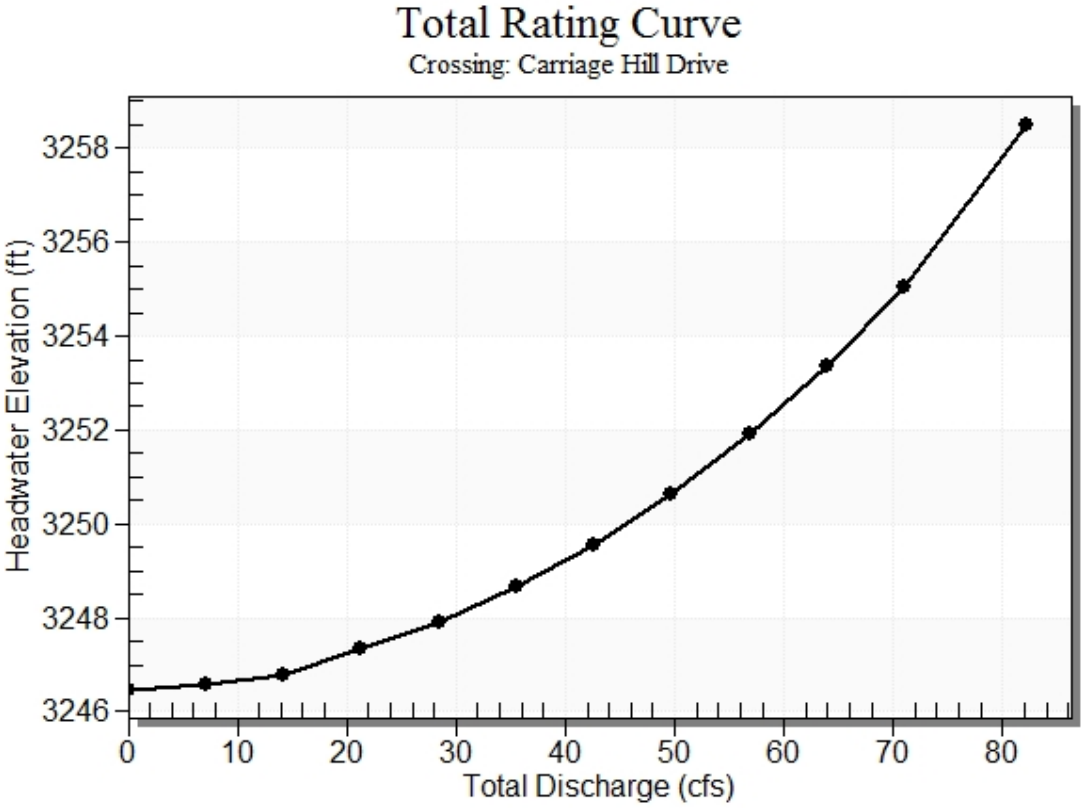


Table 2 - Culvert Summary Table: Lateral SDMH#4 West (Interim Condition)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3246.48	0.000	1.490	0-NF	0.000	0.000	2.500	5.800	0.000	0.000
7.10	7.10	3246.58	1.156	1.587	1-S1f	0.432	0.879	2.500	5.800	1.515	0.000
14.20	14.20	3246.78	1.794	1.752	1-JS1f	0.608	1.269	2.500	5.800	3.030	0.000
21.30	21.30	3247.33	2.342	2.091	1-JS1f	0.753	1.566	2.500	5.800	4.545	0.000
28.40	28.40	3247.92	2.934	2.567	5-JS1f	0.879	1.815	2.500	5.800	6.060	0.000
35.50	35.50	3248.65	3.659	3.178	5-JS1f	0.991	2.020	2.500	5.800	7.575	0.000
42.60	42.60	3249.55	4.561	3.925	5-JS1f	1.098	2.182	2.500	5.800	9.090	0.000
49.70	49.70	3250.64	5.647	4.862	5-S1f	1.199	2.296	2.500	5.800	10.605	0.000
56.80	56.80	3251.90	6.908	5.826	5-JS1f	1.298	2.373	2.500	5.800	12.120	0.000
63.90	63.90	3253.36	8.371	6.980	5-JS1f	1.396	2.170	2.500	5.800	13.634	0.000
71.00	71.00	3255.03	10.041	8.270	4-FFf	1.493	2.500	2.500	5.800	15.149	0.000

****

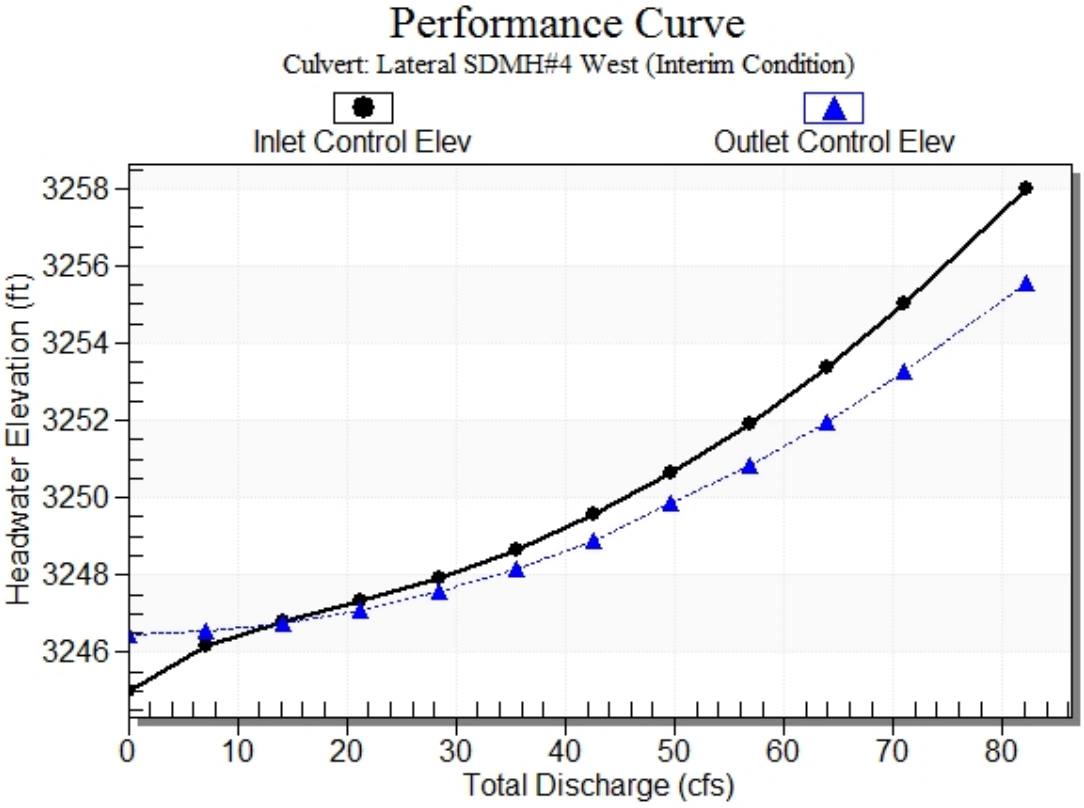
Straight Culvert

Inlet Elevation (invert): 3244.99 ft, Outlet Elevation (invert): 3240.68 ft

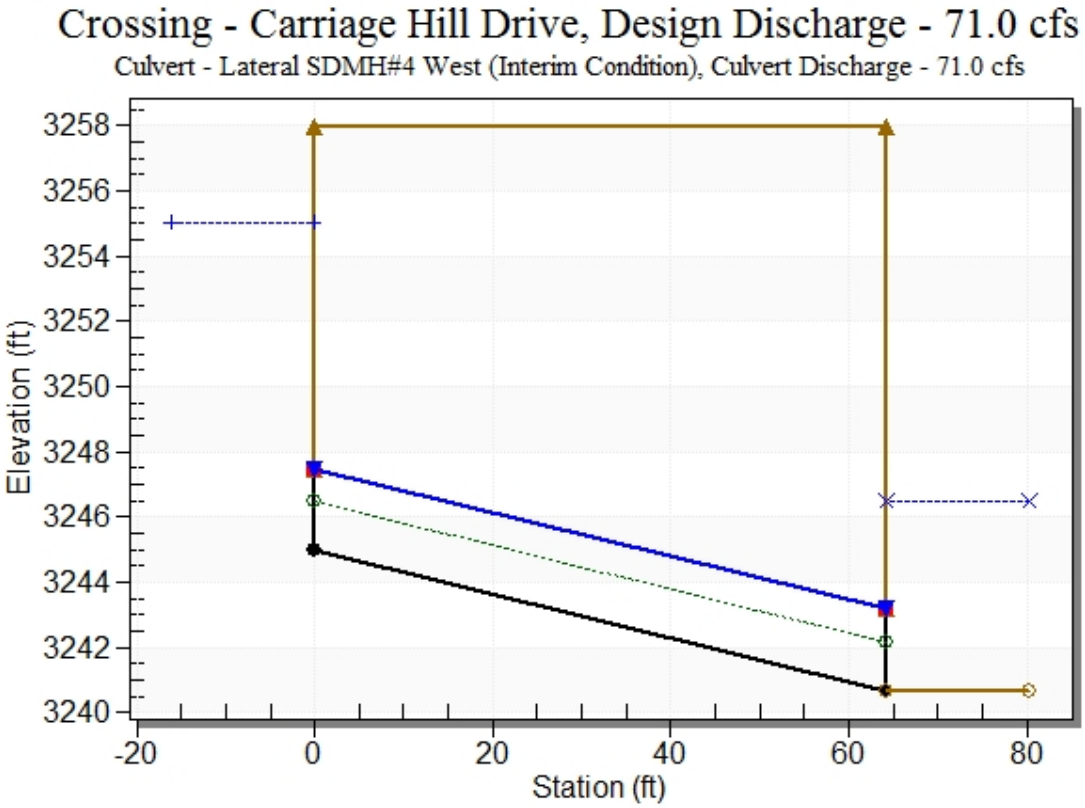
Culvert Length: 64.34 ft, Culvert Slope: 0.0671

****

Culvert Performance Curve Plot: Lateral SDMH#4 West (Interim Condition)



Water Surface Profile Plot for Culvert: Lateral SDMH#4 West (Interim Condition)



Site Data - Lateral SDMH#4 West (Interim Condition)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3244.99 ft

Outlet Station: 64.20 ft

Outlet Elevation: 3240.68 ft

Number of Barrels: 1

Culvert Data Summary - Lateral SDMH#4 West (Interim Condition)

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: Carriage Hill Drive)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	3246.48	5.80
7.10	3246.48	5.80
14.20	3246.48	5.80
21.30	3246.48	5.80
28.40	3246.48	5.80
35.50	3246.48	5.80
42.60	3246.48	5.80
49.70	3246.48	5.80
56.80	3246.48	5.80
63.90	3246.48	5.80
71.00	3246.48	5.80

Tailwater Channel Data - Carriage Hill Drive

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 3246.48 ft

Roadway Data for Crossing: Carriage Hill Drive

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 64.20 ft

Crest Elevation: 3258.00 ft

Roadway Surface: Paved

Roadway Top Width: 64.20 ft

STREET NORMAL DEPTH CALCULATIONS

Worksheet for Carriage Hill Section 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.10	%
Discharge	9.50	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.00	0.00
0+02.00	0.13
0+02.00	0.17
0+29.00	0.71
0+29.00	1.04
0+38.00	1.21
0+47.00	1.04
0+47.00	0.71
0+74.00	0.17
0+74.00	0.13
0+76.00	0.00
0+76.00	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+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 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 Carriage Hill Section 1

Results

Normal Depth		0.35	ft
Elevation Range	0.00 to 1.21 ft		
Flow Area		2.78	ft²
Wetted Perimeter		22.86	ft
Hydraulic Radius		0.12	ft
Top Width		22.07	ft
Normal Depth		0.35	ft
Critical Depth		0.41	ft
Critical Slope		0.00678	ft/ft
Velocity		3.42	ft/s
Velocity Head		0.18	ft
Specific Energy		0.53	ft
Froude Number		1.70	
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	0.35	ft
Critical Depth	0.41	ft
Channel Slope	2.10	%
Critical Slope	0.00678	ft/ft

Cross Section for Carriage Hill Section 1

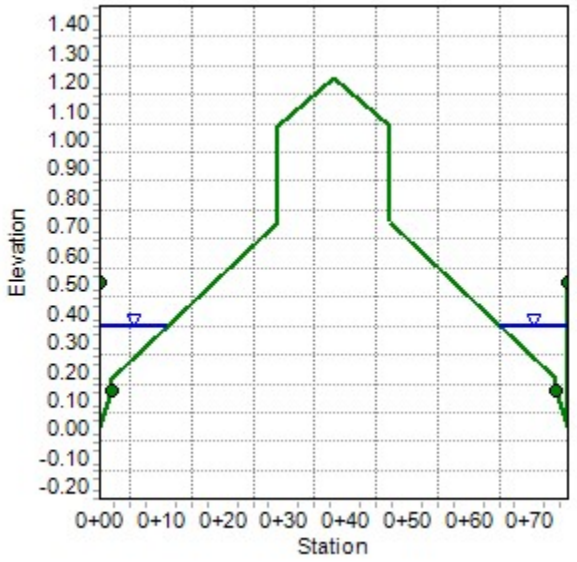
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.10	%
Normal Depth	0.35	ft
Discharge	9.50	ft³/s

Cross Section Image



Worksheet for Carriage Hill Section 2 East

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.10	%
Discharge	4.75	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+40.00	1.18
0+47.00	1.04
0+47.00	0.71
0+74.00	0.17
0+74.00	0.13
0+76.00	0.00
0+76.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+40.00, 1.18)	(0+47.00, 0.71)	0.013
(0+47.00, 0.71)	(0+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 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

Results

Normal Depth	0.35	ft
Elevation Range	0.00 to 1.18 ft	
Flow Area	1.39	ft²
Wetted Perimeter	11.44	ft

Worksheet for Carriage Hill Section 2 East

Results

Hydraulic Radius		0.12	ft
Top Width		11.05	ft
Normal Depth		0.35	ft
Critical Depth		0.41	ft
Critical Slope		0.00678	ft/ft
Velocity		3.42	ft/s
Velocity Head		0.18	ft
Specific Energy		0.53	ft
Froude Number		1.70	
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	0.35	ft
Critical Depth	0.41	ft
Channel Slope	2.10	%
Critical Slope	0.00678	ft/ft

Cross Section for Carriage Hill Section 2 East

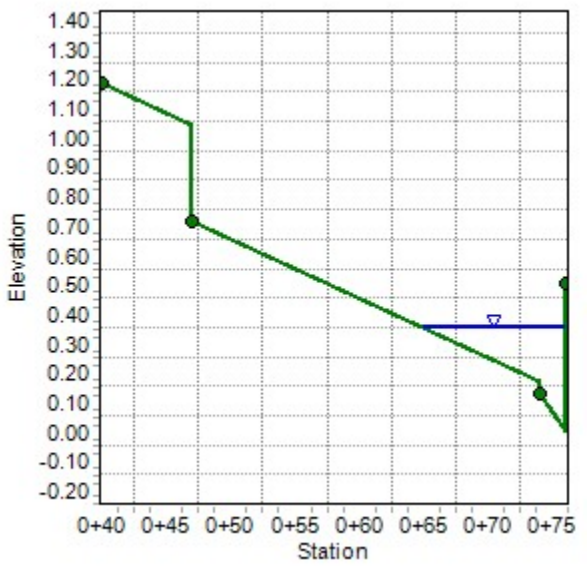
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.10	%
Normal Depth	0.35	ft
Discharge	4.75	ft³/s

Cross Section Image



Worksheet for Carriage Hill Section 2 West

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.10	%
Discharge	4.75	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.00	0.00
0+02.00	0.13
0+02.00	0.17
0+38.00	0.89

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+38.00, 0.89)	0.016

Options

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

Results

Normal Depth	0.35	ft
Elevation Range	0.00 to 0.89 ft	
Flow Area	1.39	ft²
Wetted Perimeter	11.44	ft
Hydraulic Radius	0.12	ft
Top Width	11.05	ft
Normal Depth	0.35	ft

Worksheet for Carriage Hill Section 2 West

Results

Critical Depth		0.41	ft
Critical Slope		0.00678	ft/ft
Velocity		3.42	ft/s
Velocity Head		0.18	ft
Specific Energy		0.53	ft
Froude Number		1.70	
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	0.35	ft
Critical Depth	0.41	ft
Channel Slope	2.10	%
Critical Slope	0.00678	ft/ft

Cross Section for Carriage Hill Section 2 West

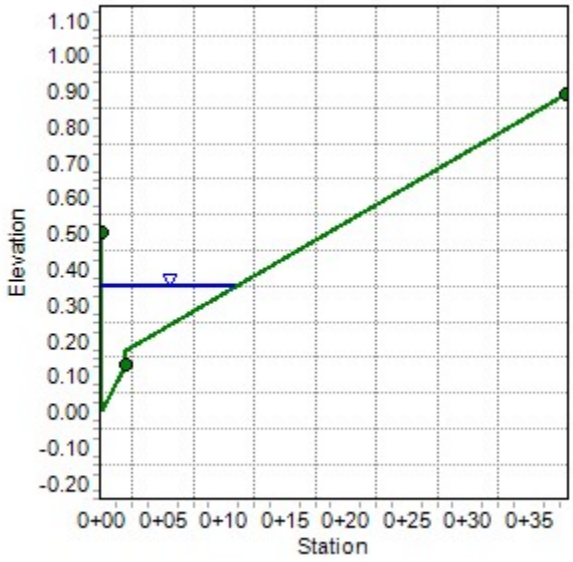
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.10	%
Normal Depth	0.35	ft
Discharge	4.75	ft³/s

Cross Section Image



DROP INLET CALCULATIONS

Drop Inlet Interception

Project: Summerlin West Village 21 Carriage Hill Drive
Work Order no.: 7851
Calculated By: JYA
Date: Feb-18

Inlet ID: All onsite inlets
Drainage Condition: 100-Year Ultimate
Flow Summary: 1/4CARR3 = 4.75
Inlet Description: 15' Type CM

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	4.75
Longitudinal Slope (ft/ft)	S_o	0.021
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	3.42
Street Flow Depth (ft)	D	0.35
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	12.5
Length of Curb Opening (ft)	L_c	14.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	6.25
Effective Curb Opening Lenth (ft)	L_{ce}	7.25

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)	16.06
E - grate Flow Ratio	Q_w/Q_s	0.61
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	1.80
Q_s - Side Flow (cfs)	$Q-Q_w$	2.95
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	9.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.50
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**3.82**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.09
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.93
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	9.38
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.86**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**4.69**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.06**

WSPG
MAINLINE MODEL

100-YEAR ULTIMATE CONDITION

CARRIAGE HILL DRIVE STORM DRAIN MAINLINE WSPG SUMMARY TABLE					
Description	**Station**	**Invert**	**FG**	**WSE**	**Cover (ft)**
Existing SD	1000.00	3215.13	3230.0	3217.54	12.5
Existing SD	1038.03	3215.75	3230.0	3218.13	11.9
Existing SD	1164.72	3217.82	3230.0	3220.06	9.9
Connection	1173.69	3217.97	3231.9	3222.86	9.0
SDMH #1	1176.77	3218.02	3231.9	3222.99	8.9
SDMH #2	1392.47	3223.26	3235.8	3230.78	5.0
SDMH #3	1738.48	3230.77	3243.0	3236.69	6.3
SDMH #4	2116.18	3238.96	3251.0	3242.35	8.7
SDMH #5	2338.15	3242.96	3255.3	3246.47	8.8
SDMH #7	2509.88	3245.79	3258.0	3249.41	8.6
SDMH #8	2729.18	3249.41	3261.7	3253.97	7.7
SDMH #9	2857.83	3251.53	3263.8	3257.86	5.9
SH	2929.57	3252.71	3263.8	3259.04	4.8

```
T1 Summerlin West Village 21 Carriage Hill
T2 Far Hills to East West Collector
T3 60" RCP with 2017 SWPA Revised Flow Rates
SO   1000.00 3215.13   5      .013               3220.40
R    1038.03 3215.75   5      .013
R    1164.72 3217.82   5      .013                              60.56
R    1173.69 3217.97   5      .013
WX   1173.69 3217.97   1      .013
R    1176.77 3218.02   1      .013                                    -9.50
JX   1392.47 3223.26   1  2   .013   65.6          3223.26         47.19
R    1738.48 3230.77   1      .013
JX   2116.18 3238.96   1  3   .013   65.7          3238.96         45.00
R    2338.15 3242.96   1      .013
R    2509.88 3245.79   1      .013                              18.96
R    2729.18 3249.41   1      .013                                    -3.71
JX   2857.83 3251.53   1  4   .013   65.7          3251.53         72.00
R    2857.83 3251.53   1      .013                                    22.03
SH   2929.57 3252.71   1
CD   1  4   0    .00    5.00     0.00  0.00  0.00
CD   2  4   0    .00    3.50     0.00  0.00  0.00
CD   3  4   0    .00    3.00     0.00  0.00  0.00
CD   4  4   0    .00    4.00     0.00  0.00  0.00
CD   5  3   0    .00    6.00     8.00  0.00  0.00
Q           209.000
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 3- 5-2018 Time:10:59:31

Summerlin West Village 21 Carriage Hill
Far Hills to East West Collector
60" RCP with 2017 SWPA Revised Flow Rates

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	3215.130	2.408	3217.538	406.00	21.08	6.90	3224.44	.00	4.31	8.00	6.000	8.000	.00	0 .0
38.030	.0163					.0201	.76	2.41	2.39	2.58	.013	.00	.00	BOX
1038.030	3215.750	2.378	3218.128	406.00	21.34	7.07	3225.20	.94	4.31	8.00	6.000	8.000	.00	0 .0
29.455	.0163					.0208	.61	3.32	2.44	2.57	.013	.00	.00	BOX
1067.485	3216.231	2.352	3218.583	406.00	21.58	7.23	3225.82	.97	4.31	8.00	6.000	8.000	.00	0 .0
97.235	.0163					.0227	2.20	3.32	2.48	2.57	.013	.00	.00	BOX
1164.720	3217.820	2.242	3220.062	406.00	22.64	7.96	3228.02	.00	4.31	8.00	6.000	8.000	.00	0 .0
8.970	.0167					.0244	.22	2.24	2.66	2.55	.013	.00	.00	BOX
1173.690	3217.970	2.231	3220.201	406.00	22.75	8.04	3228.24	.00	4.31	8.00	6.000	8.000	.00	0 .0
WALL	EXIT													
1173.690	3217.970	4.892	3222.862	406.00	20.79	6.71	3229.57	.00	4.89	1.45	5.000	.000	.00	0 .0
3.080	.0162					.0223	.07	4.89	1.00	5.00	.013	.00	.00	PIPE
1176.770	3218.020	4.974	3222.994	406.00	20.69	6.65	3229.64	.00	4.89	.72	5.000	.000	.00	0 .0
JUNCT STR	.0243					.0200	4.31	4.97	.70		.013	.00	.00	PIPE
1392.470	3223.260	7.515	3230.775	340.40	17.34	4.67	3235.44	.00	4.79	.00	5.000	.000	.00	0 .0
346.010	.0217					.0171	5.91	7.52	.00	3.66	.013	.00	.00	PIPE
1738.480	3230.770	5.916	3236.686	340.40	17.34	4.67	3241.35	.00	4.79	.00	5.000	.000	.00	0 .0
JUNCT STR	.0217							5.92	.00		.013	.00	.00	PIPE

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 3- 5-2018 Time:10:59:31

Summerlin West Village 21 Carriage Hill
Far Hills to East West Collector
60" RCP with 2017 SWPA Revised Flow Rates

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
2116.180	3238.960	3.386	3242.345	274.70	19.41	5.85	3248.20	.00	4.56	4.68	5.000	.000	.00	0 .0
221.970	.0180					.0165	3.67	3.39	1.97	3.34	.013	.00	.00	PIPE
2338.150	3242.960	3.511	3246.471	274.70	18.64	5.40	3251.87	.10	4.56	4.57	5.000	.000	.00	0 .0
171.730	.0165					.0152	2.61	3.61	1.83	3.45	.013	.00	.00	PIPE
2509.880	3245.790	3.615	3249.405	274.70	18.07	5.07	3254.48	.00	4.56	4.48	5.000	.000	.00	0 .0
60.429	.0165					.0143	.86	3.61	1.73	3.45	.013	.00	.00	PIPE
2570.309	3246.788	3.687	3250.475	274.70	17.69	4.86	3255.34	.00	4.56	4.40	5.000	.000	.00	0 .0
80.383	.0165					.0132	1.06	3.69	1.66	3.45	.013	.00	.00	PIPE
2650.692	3248.115	3.864	3251.979	274.70	16.87	4.42	3256.40	.00	4.56	4.19	5.000	.000	.00	0 .0
44.772	.0165					.0119	.53	3.86	1.51	3.45	.013	.00	.00	PIPE
2695.465	3248.854	4.060	3252.914	274.70	16.09	4.02	3256.93	.00	4.56	3.91	5.000	.000	.00	0 .0
24.897	.0165					.0108	.27	4.06	1.36	3.45	.013	.00	.00	PIPE
2720.362	3249.264	4.284	3253.549	274.70	15.34	3.65	3257.20	.00	4.56	3.50	5.000	.000	.00	0 .0
8.818	.0165					.0100	.09	4.28	1.20	3.45	.013	.00	.00	PIPE

```
 2729.180  3249.410    4.560  3253.970    274.70   14.62    3.32  3257.29     .00    4.56     2.83    5.000     .000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
JUNCT STR   .0165                                        .0081     1.04    4.56    1.00             .013       .00   .00  PIPE
         |         |        |         |         |                |        |       |        |        |        |       |       |
 2857.830  3251.530    6.203  3257.733    209.00   10.64    1.76  3259.49     .00    4.12      .00    5.000     .000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
         |         |        |         |         |                |        |       |        |        |        |       |       |
 2857.830  3251.530    6.331  3257.861    209.00   10.64    1.76  3259.62     .00    4.12      .00    5.000     .000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   71.740    .0000                                        .0032     9.20    6.33     .00     .00    .013       .00   .00  PIPE
```


Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 3- 5-2018 Time:10:59:31

Summerlin West Village 21 Carriage Hill
Far Hills to East West Collector
60" RCP with 2017 SWPA Revised Flow Rates

```
********************************************************************************************************************************** ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-    -|
 L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
         |         |        |         |         |               |         |       |        |        |       |       |      |
 2929.570  3252.710    6.331  3259.041    209.00   10.64    1.76  3260.80     .00    4.12      .00    5.000     .000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
```

100-YEAR INTERIM CONDITION

```
T1 Summerlin West Village 21 Carriage Hill
T2 Far Hills to East West Collector
T3 60" RCP with 2017 SWPA Revised Flow Rates
SO   1000.00 3215.13   5      .013               3220.40
R    1038.03 3215.75   5      .013
R    1164.72 3217.82   5      .013                              60.56
R    1173.69 3217.97   5      .013
WX   1173.69 3217.97   1      .013
R    1176.77 3218.02   1      .013                                    -9.50
JX   1392.47 3223.26   1  2   .013  116.5           3223.26         47.19
R    1738.48 3230.77   1      .013
SH   2116.18 3238.96   1
CD   1  4   0    .00    5.00     0.00  0.00  0.00
CD   2  4   0    .00    3.50     0.00  0.00  0.00
CD   3  4   0    .00    3.00     0.00  0.00  0.00
CD   4  4   0    .00    4.00     0.00  0.00  0.00
CD   5  3   0    .00    6.00     8.00  0.00  0.00
Q             80.500
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 3- 5-2018 Time: 2: 5:38

Summerlin West Village 21 Carriage Hill
Far Hills to East West Collector
60" RCP with 2017 SWPA Revised Flow Rates

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	3215.130	5.270	3220.400	197.00	4.67	.34	3220.74	.00	2.66	8.00	6.000	8.000	.00	0 .0
13.453	.0163					.0006	.01	5.27	.36	1.56	.013	.00	.00	BOX
1013.453	3215.349	5.025	3220.374	197.00	4.90	.37	3220.75	.00	2.66	8.00	6.000	8.000	.00	0 .0
12.573	.0163					.0006	.01	5.02	.39	1.56	.013	.00	.00	BOX
1026.026	3215.554	4.791	3220.345	197.00	5.14	.41	3220.76	.00	2.66	8.00	6.000	8.000	.00	0 .0
11.705	.0163					.0007	.01	4.79	.41	1.56	.013	.00	.00	BOX
1037.731	3215.745	4.568	3220.313	197.00	5.39	.45	3220.76	.00	2.66	8.00	6.000	8.000	.00	0 .0
.299	.0163					.0008	.00	4.57	.44	1.56	.013	.00	.00	BOX
1038.030	3215.750	4.562	3220.312	197.00	5.40	.45	3220.76	.06	2.66	8.00	6.000	8.000	.00	0 .0
10.798	.0163					.0008	.01	4.62	.45	1.56	.013	.00	.00	BOX
1048.828	3215.927	4.350	3220.276	197.00	5.66	.50	3220.77	.07	2.66	8.00	6.000	8.000	.00	0 .0
9.822	.0163					.0009	.01	4.42	.48	1.56	.013	.00	.00	BOX
1058.650	3216.087	4.150	3220.237	197.00	5.93	.55	3220.78	.07	2.66	8.00	6.000	8.000	.00	0 .0
HYDRAULIC JUMP														
1058.650	3216.087	1.581	3217.668	197.00	15.57	3.77	3221.43	.50	2.66	8.00	6.000	8.000	.00	0 .0
106.070	.0163					.0153	1.62	2.08	2.18	1.56	.013	.00	.00	BOX
1164.720	3217.820	1.612	3219.432	197.00	15.27	3.62	3223.05	.00	2.66	8.00	6.000	8.000	.00	0 .0
8.970	.0167					.0148	.13	1.61	2.12	1.55	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 3- 5-2018 Time: 2: 5:38

Summerlin West Village 21 Carriage Hill
Far Hills to East West Collector
60" RCP with 2017 SWPA Revised Flow Rates

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
1173.690	3217.970	1.617	3219.587	197.00	15.23	3.60	3223.19	.00	2.66	8.00	6.000	8.000	.00	0 .0
WALL EXIT														
1173.690	3217.970	3.619	3221.589	197.00	12.94	2.60	3224.19	.00	4.01	4.47	5.000	.000	.00	0 .0
3.080	.0162					.0074	.02	3.62	1.24	2.77	.013	.00	.00	PIPE
1176.770	3218.020	3.676	3221.696	197.00	12.73	2.52	3224.21	.00	4.01	4.41	5.000	.000	.00	0 .0
JUNCT STR	.0243					.0142	3.07	3.68	1.20		.013	.00	.00	PIPE
1392.470	3223.260	1.564	3224.823	80.50	15.34	3.65	3228.48	.00	2.54	4.64	5.000	.000	.00	0 .0
128.846	.0217					.0205	2.64	1.56	2.54	1.55	.013	.00	.00	PIPE
1521.316	3226.056	1.594	3227.650	80.50	14.94	3.47	3231.12	.00	2.54	4.66	5.000	.000	.00	0 .0
80.479	.0217					.0185	1.49	1.59	2.45	1.55	.013	.00	.00	PIPE
1601.795	3227.803	1.650	3229.453	80.50	14.24	3.15	3232.60	.00	2.54	4.70	5.000	.000	.00	0 .0
41.435	.0217					.0162	.67	1.65	2.29	1.55	.013	.00	.00	PIPE
1643.230	3228.703	1.708	3230.411	80.50	13.58	2.86	3233.27	.00	2.54	4.74	5.000	.000	.00	0 .0
26.525	.0217					.0142	.38	1.71	2.14	1.55	.013	.00	.00	PIPE

1669.755	3229.278	1.769	3231.047	80.50	12.95	2.60	3233.65	.00	2.54	4.78	5.000	.000	.00	0	.0		
18.743	.0217					.0124	.23	1.77	2.00	1.55	.013	.00	.00	PIPE			
1688.498	3229.685	1.832	3231.517	80.50	12.35	2.37	3233.88	.00	2.54	4.82	5.000	.000	.00	0	.0		
13.813	.0217					.0109	.15	1.83	1.87	1.55	.013	.00	.00	PIPE			

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 3- 5-2018 Time: 2: 5:38

Summerlin West Village 21 Carriage Hill
Far Hills to East West Collector
60" RCP with 2017 SWPA Revised Flow Rates

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	
1702.311	3229.985	1.898	3231.883	80.50	11.77	2.15	3234.03	.00	2.54	4.85	5.000	.000	.00	0	.0		
10.512	.0217					.0096	.10	1.90	1.75	1.55	.013	.00	.00	PIPE			
1712.823	3230.213	1.966	3232.179	80.50	11.22	1.96	3234.14	.00	2.54	4.88	5.000	.000	.00	0	.0		
7.950	.0217					.0084	.07	1.97	1.63	1.55	.013	.00	.00	PIPE			
1720.774	3230.386	2.038	3232.424	80.50	10.70	1.78	3234.20	.00	2.54	4.91	5.000	.000	.00	0	.0		
6.114	.0217					.0074	.05	2.04	1.52	1.55	.013	.00	.00	PIPE			
1726.888	3230.519	2.112	3232.631	80.50	10.20	1.62	3234.25	.00	2.54	4.94	5.000	.000	.00	0	.0		
4.527	.0217					.0065	.03	2.11	1.42	1.55	.013	.00	.00	PIPE			
1731.415	3230.617	2.190	3232.807	80.50	9.73	1.47	3234.28	.00	2.54	4.96	5.000	.000	.00	0	.0		
3.284	.0217					.0057	.02	2.19	1.33	1.55	.013	.00	.00	PIPE			
1734.698	3230.688	2.271	3232.959	80.50	9.28	1.34	3234.30	.00	2.54	4.98	5.000	.000	.00	0	.0		
2.182	.0217					.0050	.01	2.27	1.24	1.55	.013	.00	.00	PIPE			
1736.880	3230.735	2.356	3233.092	80.50	8.84	1.21	3234.31	.00	2.54	4.99	5.000	.000	.00	0	.0		
1.237	.0217					.0044	.01	2.36	1.15	1.55	.013	.00	.00	PIPE			
1738.118	3230.762	2.445	3233.207	80.50	8.43	1.10	3234.31	.00	2.54	5.00	5.000	.000	.00	0	.0		
.362	.0217					.0039	.00	2.45	1.08	1.55	.013	.00	.00	PIPE			
1738.480	3230.770	2.540	3233.310	80.50	8.04	1.00	3234.31	.00	2.54	5.00	5.000	.000	.00	0	.0		
2116.180	3238.960	2.540	3241.500	80.50	8.04	1.00	3242.50	.00	2.54	5.00	5.000	.000	.00	0	.0		

STANDARD FORM 6 CALCULATIONS

100-YEAR INTERIM CONDITION MODELS

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN V21 CARRIAGE HILL DRIVE
CALCULATED BY: JYA **WO#** 7851-5.4
STORM DRAIN SEGMENT: Lateral SDMH #2 West
DESCRIPTION: 100-YEAR INTERIM CONDITION
DESIGN Q: INT3 + D.I. INTERCEPTION

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)
3224.82	3223.26	1.56	2.74	3.0	2.87128	3226.13	4.11	3230.24

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

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+19.70	3	3223.26	3224.62	19.7	7.07	0.00492	115	6.92	16.27	4.11	0.02967	0.02967	0.58						0.58	3230.83	3226.72	Yes	3231.73	3231.73	3227.62
2	DI	10+19.70	10+19.70	3	3224.62	3224.62	0.00	7.07	0.00492	115	N/A	16.27	4.11	0.02967	0.02967	0.00		0.56		2.06		2.62	3234.35	3230.24	Yes	3231.38	3234.35	3230.24
3	PIPE	10+19.70	10+83.85	3	3224.62	3229.06	64.2	7.07	0.00492	110	6.92	15.56	3.76	0.02715	0.02841	1.82						1.82	3236.17	3232.41	Yes	3235.82	3236.17	3232.41
4	INLET	10+83.85	10+83.85	3	3229.06	3229.06	0.00	7.07	0.00492	110	N/A	15.56	3.76	0.02715	0.02715	0.00						0.00	3236.17	3232.41				

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	23	0.137	4.110	0.563										0.5	4.110	2.055
3																
4														0.5		

HGL Criteria Check			
Segment Description	FG Elevation	Cover (ft)	Criteria Met?
PIPE			
DI	3235.6	5.358	Yes
PIPE			
INLET	3243.0	10.586	Yes

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

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)
3241.50	3238.96	2.54	2.29	2.5	2.392733	3241.50	3.72	3245.22

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

Phi Index

n Value	Phi
0.013	0.004925

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

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN V21 CARRIAGE HILL DRIVE
CALCULATED BY: JYA **WO#** 7851-5.4
STORM DRAIN SEGMENT: Lateral SDMH #4 West
DESCRIPTION: 100-YEAR INTERIM CONDITION
DESIGN Q: INT2 + D.I. INTERCEPTION

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+25.70	2.5	3238.96	3240.68	25.7	4.91	0.00492	76	6.71	15.48	3.72	0.03425	0.03425	0.88						0.88	3246.10	3242.38	Yes	3246.91	3246.91	3243.18
2	DI	10+25.70	10+25.70	2.5	3240.68	3240.68	0.00	4.91	0.00492	76	N/A	15.48	3.72	0.03425	0.03425	0.00		1.43		1.86		3.29	3250.20	3246.48	Yes	3246.43	3250.20	3246.48
3	PIPE	10+25.70	10+89.85	2.5	3240.68	3244.99	64.2	4.91	0.00492	71	6.71	14.46	3.25	0.02989	0.03207	2.06						2.06	3252.26	3249.01	Yes	3250.74	3252.26	3249.01
4	INLET	10+89.85	10+89.85	2.5	3244.99	3244.99	0.00	4.91	0.00492	71	N/A	14.46	3.25	0.02989	0.02989	0.00						0.00	3252.26	3249.01				

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	45	0.385	3.722	1.433										0.5	3.722	1.861
3																
4														0.5		

HGL Criteria Check			
Segment Description	FG Elevation	Cover (ft)	Criteria Met?
PIPE			
DI	3251.0	4.522	Yes
PIPE			
INLET	3258.0	8.991	Yes

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

100-YEAR ULTIMATE CONDITION MODELS

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)
3230.78	3223.26	7.52	1.83	2.0	1.914187	3230.78	0.04	3230.82

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

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN V21 CARRIAGE HILL DRIVE
CALCULATED BY: JYA **WO#** 7851-5.4
STORM DRAIN SEGMENT: Lateral SDMH #2 East
DESCRIPTION: 100-YEAR ULTIMATE CONDITION

Phi Index

n Value	Phi
0.013	0.004925

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

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq. ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+56.80	2	3223.26	3226.93	56.8	3.14	0.00492	4.75	6.47	1.51	0.04	0.00044	0.00044	0.02						0.02	3230.84	3230.80	Yes	3228.97	3230.84	3230.80
2	DI	10+56.80	10+56.80	2	3226.93	3226.93	0.00	3.14	0.00492	4.75	N/A	1.51	0.04	0.00044	0.00044	0.00				0.02		0.02	3230.86	3230.82				
3																												
4																												

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	0.035	0.018
3																
4																

HGL Criteria Check			
Segment Description	FG Elevation	Cover (ft)	Criteria Met?
PIPE			
DI	3235.8	4.977	Yes

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

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)
3230.78	3223.26	7.52	2.74	3.0	2.87128	3230.78	0.87	3231.65

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

Phi Index

n Value	Phi
0.013	0.004925

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

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN V21 CARRIAGE HILL DRIVE
CALCULATED BY: JYA **WO#** 7851-5.4
STORM DRAIN SEGMENT: Lateral SDMH #2 West
DESCRIPTION: 100-YEAR ULTIMATE CONDITION
DESIGN Q: A + D.I. INTERCEPTION

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+19.70	3	3223.26	3224.62	19.7	7.07	0.00492	53.0	6.92	7.50	0.87	0.00630	0.00630	0.12						0.12	3231.78	3230.90	Yes	3228.50	3231.78	3230.90
2	DI	10+19.70	10+19.70	3	3224.62	3224.62	0.00	7.07	0.00492	53.0	N/A	7.50	0.87	0.00630	0.00630	0.00		0.12		0.44		0.56	3232.33	3231.46	Yes	3228.34	3232.33	3231.46
3	PIPE	10+19.70	10+83.85	3	3224.62	3229.06	64.2	7.07	0.00492	48.0	6.92	6.79	0.72	0.00517	0.00574	0.37						0.37	3232.70	3231.99				
4																												

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	23	0.137	0.873	0.120										0.5	0.873	0.436
3																
4																

HGL Criteria Check			
Segment Description	FG Elevation	Cover (ft)	Criteria Met?
PIPE			
DI	3235.6	4.140	Yes
PIPE			

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

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)
3242.35	3238.96	3.39	1.83	2.0	1.914187	3242.35	0.04	3242.39

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

Phi Index

n Value	Phi
0.013	0.004925

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

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN V21 CARRIAGE HILL DRIVE
CALCULATED BY: JYA **WO#** 7851-5.4
STORM DRAIN SEGMENT: Lateral SDMH #4 East
DESCRIPTION: 100-YEAR ULTIMATE CONDITION

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+56.50	2	3238.96	3241.22	56.5	3.14	0.00492	4.75	4.00	1.51	0.04	0.00044	0.00044	0.02						0.02	3242.41	3242.37	Yes	3243.26	3243.26	3243.22
2	DI	10+56.50	10+56.50	2	3241.22	3241.22	0.00	3.14	0.00492	4.75	N/A	1.51	0.04	0.00044	0.00044	0.00				0.02		0.02	3243.27	3243.24				
3																												
4																												

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	0.035	0.018
3																
4																

HGL Criteria Check			
Segment Description	FG Elevation	Cover (ft)	Criteria Met?
PIPE			
DI	3251	7.762	Yes

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

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)
3242.35	3238.96	3.39	2.29	2.5	2.392733	3242.35	1.68	3244.03

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

Phi Index

n Value	Phi
0.013	0.004925

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

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN V21 CARRIAGE HILL DRIVE
CALCULATED BY: JYA **WO#** 7851-5.4
STORM DRAIN SEGMENT: Lateral SDMH #4 West
DESCRIPTION: 100-YEAR ULTIMATE CONDITION
DESIGN Q: B + D.I. INTERCEPTION

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+25.70	2.5	3238.96	3240.68	25.7	4.91	0.00492	51.0	6.71	10.39	1.68	0.01542	0.01542	0.40						0.40	3244.42	3242.75	Yes	3244.86	3244.86	3243.18
2	DI	10+25.70	10+25.70	2.5	3240.68	3240.68	0.00	4.91	0.00492	51.0	N/A	10.39	1.68	0.01542	0.01542	0.00		0.65		0.84		1.48	3246.34	3244.67	Yes	3244.55	3246.34	3244.67
3	PIPE	10+25.70	10+89.85	2.5	3240.68	3244.99	64.2	4.91	0.00492	46.0	6.71	9.37	1.36	0.01255	0.01399	0.90						0.90	3247.24	3245.88				
4																												

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	45	0.385	1.676	0.645										0.5	1.676	0.838
3																
4																

HGL Criteria Check			
Segment Description	FG Elevation	Cover (ft)	Criteria Met?
PIPE			
DI	3251	6.333	Yes
PIPE			

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

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)
3258.75	3251.53	7.22	2.29	2.5	2.392733	3258.75	2.81	3261.56

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

Phi Index

n Value	Phi
0.013	0.004925

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

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN V21 CARRIAGE HILL DRIVE
CALCULATED BY: JYA **WO#** 7851-5.4
STORM DRAIN SEGMENT: Lateral SDMH #9 West
DESCRIPTION: 100-YEAR ULTIMATE CONDITION

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+33.60	2.5	3251.53	3253.80	33.6	4.91	0.00492	66	6.76	13.45	2.81	0.02583	0.02583	0.87						0.87	3262.43	3259.62	Yes	3259.11	3262.43	3259.62
2	STUB	10+33.60	10+33.60	2.5	3253.80	3253.80	0.00	4.91	0.00492	66	N/A	13.45	2.81	0.02583	0.02583	0.00						0.00	3262.43	3259.62				
3																												
4																												

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																
3																
4																

HGL Criteria Check			
Segment Description	FG Elevation	Cover (ft)	Criteria Met?
PIPE			
STUB	3265.38	5.762	Yes

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

APPENDIX D
REFERENCE MATERIAL

2017 FLOOD CONTROL MPU
FOR
SUMMERLIN WEST PLANNING AREA

(CLV DS4926B)

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: January 11, 2018
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**			**COPIES TO:** VTN Nevada
Cross Streets:	West of I-215 between Lake Mead Boulevard and Charleston Boulevard			The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS4926B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017			CCRFCD
Zoning Action:				CCPW
FEMA Flood Zone	YES **X**		NO	
Proposed Storm Drain	YES **X**		NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	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	See Comments Below	$400.00	492005: $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.

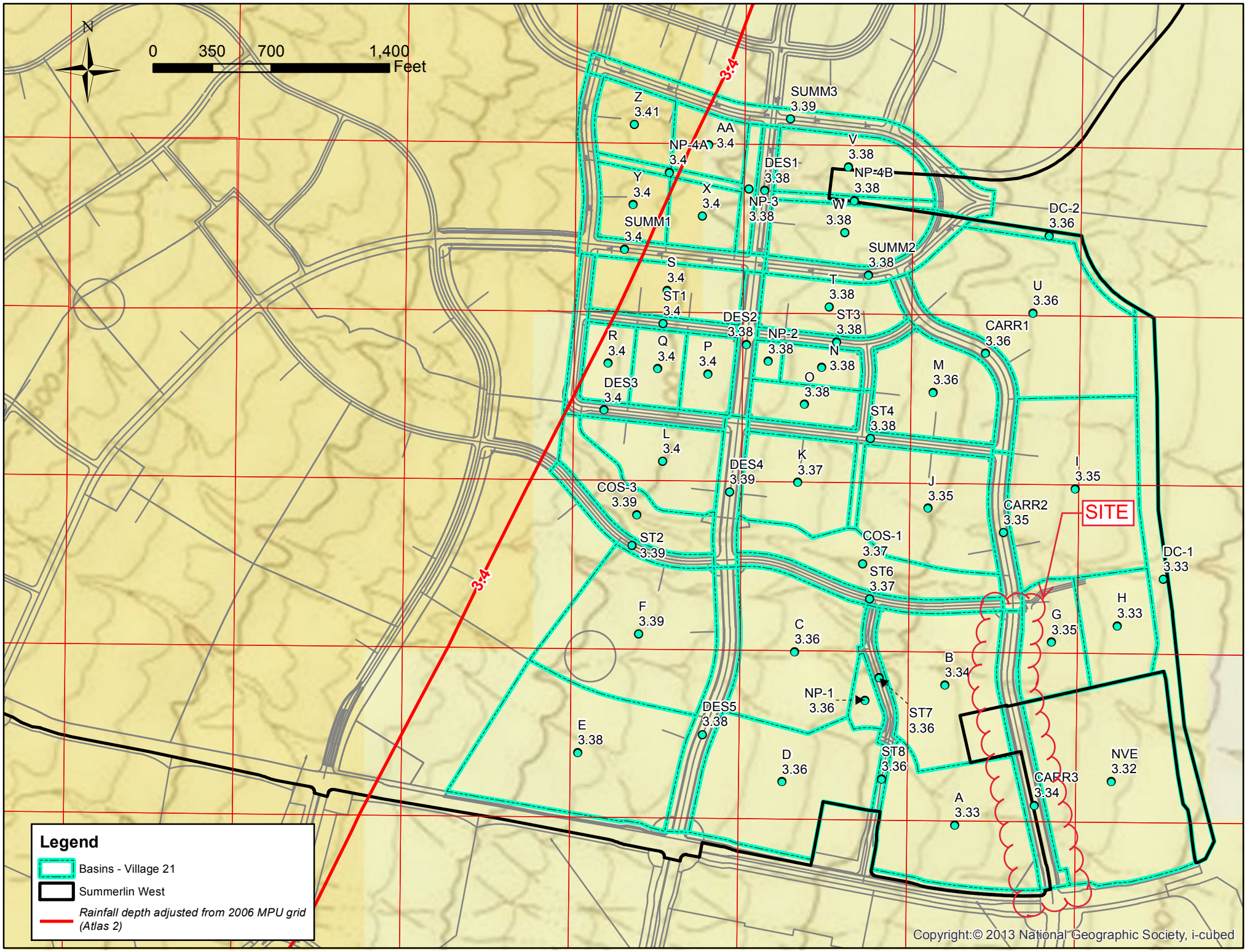
1. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District (CCRFCD)* master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.
2. The site is adjacent to Clark County. Clark County Public Works concurrence is required prior to final approval of the drainage study.
3. Atkins is working on the 2018 MPU. Coordinate and verify the proposed regional flood control facilities as shown in Sheet A.6.5 with Atkins for inclusion of the Summerlin West Master Plan facilities into the ongoing 2018 MPU.
4. On Exhibit A.6.3, provide flow arrows, a scale and a north arrow as was done on A.6.2 and A.6.4.
5. The sum of percentages for curve number calculations for Basin 3-2 add up to only 98%. Revise and reflect changes accordingly.
6. In Appendix B.5 Ultimate Condition HEC-1 Model Output, the provided Q_{100} value for Basin 2-C is 906 cfs, however on the A.6.2 Beltway Channel North / V26 Basin Tributary Exhibit the table shows 786 cfs. Verify and revise accordingly.

7. Per the HEC-1 for the Alta Tributary it is shown that a portion of Basin 3-N will go to CPDB3 and CP3.7. These combination points are not shown on the Alta Tributary Exhibit A.6.3, but seem to drain to CPDB5. Verify and reflect changes accordingly.
8. Exhibits A.6.6 and A.6.7 do not provide contours or flow direction arrows. Provide as such in the next submittal.
9. The Flow Master calculation reports for all proposed RCPs have diameters that do not reflect the designed pipe sizes. Review and revise accordingly.
10. The velocity calculated for SD-F5 in the Flow Master report is 27.74 ft/s, but it is shown to be 25.74 ft/s on Exhibit A.6.5. Review and revise accordingly.
11. All proposed RCPs and RCBs Flow Master reports are included in Appendix C except fo SD-J. Provide as such in the next submittal.

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

END OF REMARKS
WSP/AYS

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



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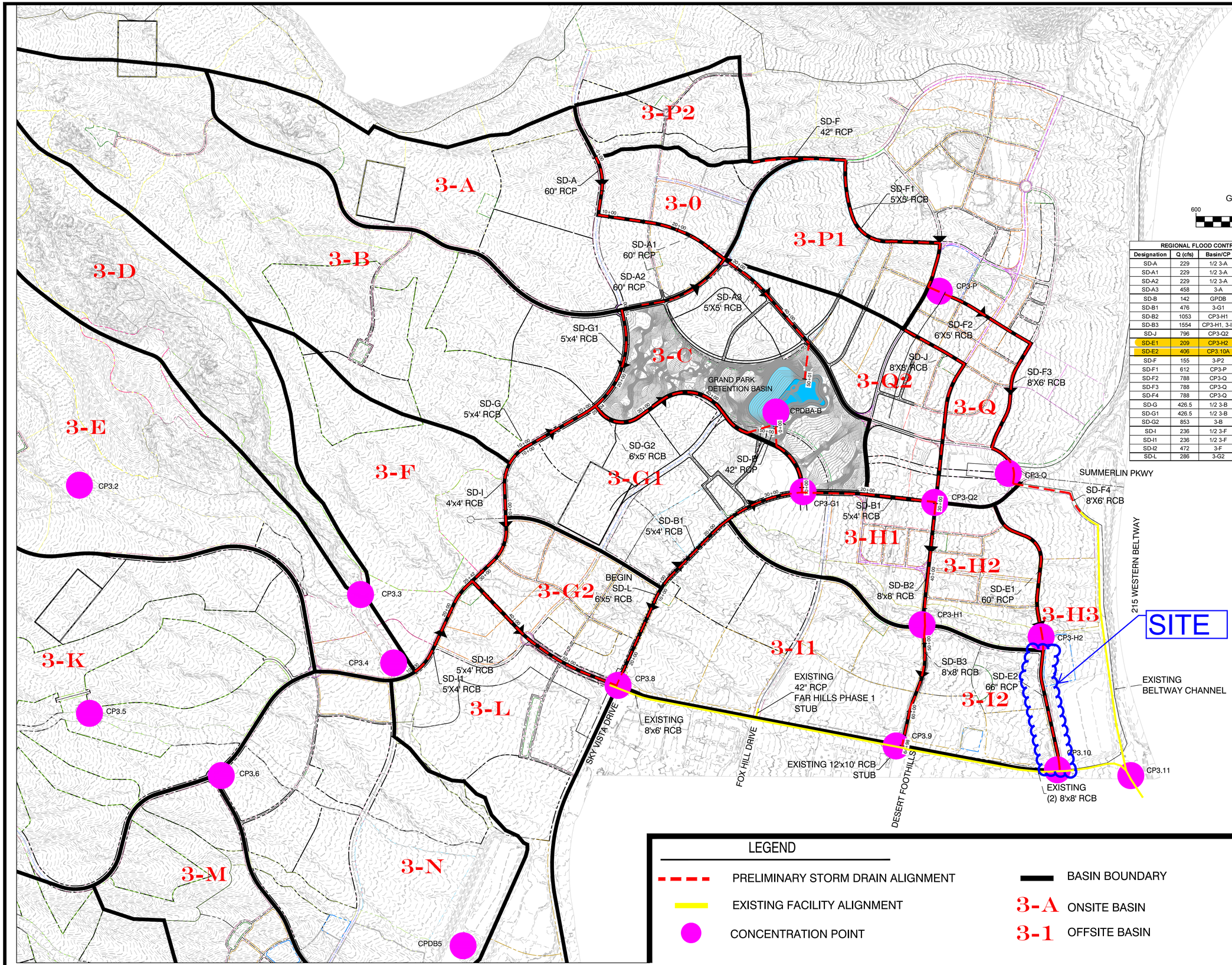

NORTH

GRAPHIC SCALE

600 0 300 600 1200

1" = 600'

REGIONAL FLOOD CONTROL FACILITY SUMMARY TABLE

Designation	Q (cfs)	Basin/CP	Size	Type	Velocity	Remarks
SD-A	229	1/2 3-A	60"	RCP	18.30	
SD-A1	229	1/2 3-A	60"	RCP	26.82	
SD-A2	229	1/2 3-A	60"	RCP	26.82	
SD-A3	458	3-A	5'x5'	RCB	32.81	
SD-B	142	GPDB	42"	RCP	26.52	
SD-B1	476	3-G1	5'x4'	RCB	29.51	
SD-B2	1053	CP3-H1	8'x8'	RCB	27.25	
SD-B3	1554	CP3-H1, 3-I1	8'x8'	RCB	37.16	
SD-J	796	CP3-Q2	8'x8'	RCB	14.90	
SD-E1	209	CP3-H2	60"	RCP	16.77	
SD-E2	406	CP3.10A	66"	RCP	22.46	
SD-F	155	3-P2	42"	RCP	28.27	
SD-F1	612	CP3-P	5'x5'	RCB	27.17	
SD-F2	788	CP3-Q	6'x5'	RCB	34.59	
SD-F3	788	CP3-Q	8'x6'	RCB	21.59	
SD-F4	788	CP3-Q	8'x6'	RCB	22.08	
SD-G	426.5	1/2 3-B	5'x4'	RCB	28.19	
SD-G1	426.5	1/2 3-B	5'x4'	RCB	25.05	
SD-G2	853	3-B	6'x5'	RCB	32.68	
SD-I	236	1/2 3-F	4'x4'	RCB	19.59	
SD-I1	236	1/2 3-F	5'x4'	RCB	14.42	
SD-I2	472	3-F	5'x4'	RCB	32.61	
SD-L	286	3-G2	6'x5'	RCB	11.65	

LEGEND

- PRELIMINARY STORM DRAIN ALIGNMENT
- EXISTING FACILITY ALIGNMENT
- CONCENTRATION POINT
- BASIN BOUNDARY
- 3-A ONSITE BASIN
- 3-1 OFFSITE BASIN

REVISION | BY | DATE | REV

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

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

2017 SUMMERLIN WEST PLANNING AREA

A.6.5
REGIONAL FLOOD CONTROL FACILITIES MAP

DRAWN BY: SVB/JYA JAN 2018
DESIGNED BY: SVB/JYA JAN 2018
CHECKED BY: WJM JAN 2018
PROJECT NO: 7809
SCALE: HORIZ: VERT:

SHEET
OF SHEETS
DRAWING NO.

H:\7809\Drainage\3_Add2\A Figures\A.6.5_Regional Flood Control Facility Map\Figure A.6.6 - Regional Flood Control Facility Map - jya.dwg

GRAPHIC SCALE

250 0 125 250 500

1" = 250'

NORTH

LEGEND

- BASIN BOUNDARY
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- FLOW ARROW

HEC-1 SUMMARY TABLE
VILLAGE 21
PROPOSED CONDITION

Basin / Concentration Point	Area (acre)	Q_{100} (cfs)	Basin / Concentration Point	Area (acre)	Q_{100} (cfs)
Z	4.50	17	CARR1	3.52	14
AA	3.71	14	M	9.11	32
CZAA	-	31	O	3.43	13
NP-4A	1.01	3	K	8.01	29
CNP-4A	-	35	ST4	3.64	14
DES1	1.83	7	CST4	-	56
SUMM1	5.00	19	J	11.83	42
Y	3.98	15	COS-1	7.78	22
X	3.63	14	CARR2	2.49	10
NP-3	1.49	4	C	14.03	44
R	3.10	11	NP-1	1.33	5
Q	3.16	11	ST7	1.64	7
CQR	-	23	CST7	-	56
S	6.56	25	ST6	3.01	12
ST1	1.62	6	CST6	-	66
CST1	-	54	B	13.76	46
P	3.17	11	A	14.65	48
DES2	2.27	9	CARR3	4.85	19
L	7.36	26	D	15.69	54
DES3	3.78	15	ST8	0.44	2
CDES3	-	41	CST8	-	56
COS-3	6.10	18	SUMM3	5.00	30
ST2	2.93	12	V	7.19	27
DES4	2.88	11	NP-4B	1.08	3
F	16.88	59	W	7.11	27
E	20.20	77	SUMM2	3.28	13
DES5	5.20	19	DC-2	1.40	5
NP-2	0.87	3	U	20.42	74
N	2.54	9	I	18.5	60
CN	-	12	G	5.71	21
T	5.99	23	H	6.26	22
ST3	2.09	8	DC-1	8.19	25
CST3	-	43	NVE	21.74	79

REVISION | BY | DATE | REV

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2017SUMMERLIN WEST PLANNING AREA

A.6.6 VILLAGE 21 DRAINAGE BASIN MAP

DRAWN BY: JYA — FEB 2018
DESIGNED BY: JYA — FEB 2018
CHECKED BY: VJM — FEB 2018
PROJECT NO: 7809 — SCALE: 1"=250' HORIZ. N/A VERT.

SHEET
OF SHEETS
DRAWING NO.

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STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 21

W.O. # 7809 **CALCULATED BY:** JYA

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

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

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

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

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
DEVELOPED CONDITION ONSITE																	
A	92.0	0.824	14.65	0.0229	100	1.0	4.96	1614	3.7	3.9	5.9	5.33	1714	19.52	10.29	0.103	
B	91.0	0.811	13.76	0.0215	100	1.0	5.20	1039	4.1	4.1	6.2	3.47	1139	16.33	8.67	0.087	
C	91.0	0.811	14.03	0.0219	100	1.0	5.20	1596	3.3	3.7	5.6	5.54	1696	19.42	10.74	0.107	
D	92.0	0.824	15.69	0.0245	100	1.0	4.96	1240	4.4	4.3	6.4	3.87	1340	17.44	8.83	0.088	
E	95.0	0.864	20.20	0.0316	100	1.0	4.25	1545	6.5	5.2	7.8	3.84	1645	19.14	8.09	0.081	TLAG = 0.083 PER HCDDM
F	92.0	0.824	16.88	0.0264	100	1.0	4.96	1350	5.8	4.9	7.4	3.64	1450	18.06	8.60	0.086	
G	95.0	0.864	5.71	0.0089	100	1.0	4.25	780	1.5	2.5	3.8	4.56	880	14.89	8.80	0.088	
H	95.0	0.864	6.26	0.0098	100	1.0	4.25	1599	3.2	3.6	5.5	5.66	1699	19.44	9.91	0.099	
I	92.0	0.824	18.50	0.0289	100	1.0	4.96	1599	3.2	3.6	5.5	5.66	1699	19.44	10.62	0.106	
J	92.0	0.824	11.83	0.0185	100	1.0	4.96	1010	4.8	4.4	6.7	3.17	1110	16.17	8.13	0.081	TLAG = 0.083 PER HCDDM
K	93.1	0.839	8.01	0.0125	100	1.0	4.70	867	5.1	4.6	6.9	2.72	967	15.37	7.42	0.074	TLAG = 0.083 PER HCDDM
L	92.0	0.824	7.36	0.0115	100	1.0	4.96	1027	5.5	4.7	7.1	3.00	1127	16.26	7.96	0.080	TLAG = 0.083 PER HCDDM
M	92.0	0.824	9.11	0.0142	100	1.0	4.96	1026	4.5	4.3	6.5	3.30	1126	16.26	8.26	0.083	
N	93.1	0.839	2.54	0.0040	100	1.0	4.70	558	4.1	4.1	6.2	2.19	658	13.66	6.89	0.069	TLAG = 0.083 PER HCDDM
O	93.1	0.839	3.43	0.0054	100	1.0	4.70	779	5.3	4.6	7.0	2.46	879	14.88	7.16	0.072	TLAG = 0.083 PER HCDDM
P	93.1	0.839	3.17	0.0049	100	1.0	4.70	644	2.8	3.4	5.1	2.94	744	14.13	7.64	0.076	TLAG = 0.083 PER HCDDM
Q	93.1	0.839	3.16	0.0049	100	1.0	4.70	587	3.2	3.6	5.5	2.56	687	13.82	7.26	0.073	TLAG = 0.083 PER HCDDM
R	93.1	0.839	3.10	0.0048	100	1.0	4.70	555	4.0	4.0	6.1	2.22	655	13.64	6.92	0.069	TLAG = 0.083 PER HCDDM
S	95.0	0.864	6.56	0.0103	100	1.0	4.25	1240	4.8	4.4	6.7	3.71	1340	17.44	7.96	0.080	TLAG = 0.083 PER HCDDM
T	95.0	0.864	5.99	0.0094	100	1.0	4.25	1100	4.3	4.2	6.3	3.58	1200	16.67	7.82	0.078	TLAG = 0.083 PER HCDDM
U	95.0	0.864	20.42	0.0319	100	1.0	4.25	1700	4.5	4.3	6.5	5.01	1800	20.00	9.26	0.093	
V	95.0	0.864	7.19	0.0112	100	1.0	4.25	1020	7.8	5.7	8.6	2.48	1120	16.22	6.73	0.067	TLAG = 0.083 PER HCDDM
W	95.0	0.864	7.11	0.0111	100	1.0	4.25	1290	5.0	4.5	6.8	3.78	1390	17.72	8.03	0.080	TLAG = 0.083 PER HCDDM
X	95.0	0.864	3.63	0.0057	100	1.0	4.25	636	4.1	4.1	6.2	2.41	736	14.09	6.65	0.067	TLAG = 0.083 PER HCDDM
Y	95.0	0.864	3.98	0.0062	100	1.0	4.25	721	6.1	5.0	7.6	2.16	821	14.56	6.41	0.064	TLAG = 0.083 PER HCDDM
Z	95.0	0.864	4.50	0.0070	100	1.0	4.25	785	7.6	5.6	8.5	2.05	885	14.92	6.30	0.063	TLAG = 0.083 PER HCDDM
AA	95.0	0.864	3.71	0.0058	100	1.0	4.25	462	6.3	5.1	7.7	1.52	562	13.12	5.77	0.058	TLAG = 0.083 PER HCDDM
COS-3	88.0	0.772	6.10	0.0095	100	1.0	5.91	1556	5.8	3.6	7.1	4.83	1656	19.20	10.74	0.107	
COS-1	88.0	0.772	7.78	0.0122	100	1.0	5.91	1604	5.5	3.5	6.9	5.05	1704	19.47	10.96	0.110	
NP-4A	88.0	0.772	1.01	0.0016	100	1.0	5.91	896	6.5	5.1	7.8	2.47	996	15.53	8.38	0.084	
NP-4B	88.0	0.772	1.08	0.0017	100	1.0	5.91	990	8.1	5.7	8.7	2.39	1090	16.06	8.30	0.083	
NP-3	88.0	0.772	1.49	0.0023	100	1.0	5.91	750	1.7	2.7	4.0	4.17	850	14.72	10.08	0.101	
NP-2	89.0	0.785	0.87	0.0014	100	1.0	5.67	389	3.9	4.0	6.0	1.63	489	12.72	7.31	0.073	TLAG = 0.083 PER HCDDM
NP-1	93.8	0.848	1.33	0.0021	100	1.0	4.53	218	4.1	4.1	6.2	0.89	318	11.77	5.42	0.054	TLAG = 0.083 PER HCDDM
SUMM1	98.0	0.904	5.00	0.0078	40	2.0	1.77	2080	2.9	3.4	5.2	7.50	2120	21.78	9.27	0.093	
SUMM2	98.0	0.904	3.28	0.0051	40	2.0	1.77	1370	6.2	5.0	7.6	3.56	1410	17.83	5.33	0.053	TLAG = 0.083 PER HCDDM
SUMM3	98.0	0.904	7.60	0.0119	40	2.0	1.77	775	1.3	2.3	3.5	4.95	815	14.53	6.72	0.067	TLAG = 0.083 PER HCDDM
DES1	98.0	0.904	1.83	0.0029	35	2.0	1.66	775	1.3	2.3	3.5	4.95	810	14.50	6.61	0.066	TLAG = 0.083 PER HCDDM
DES2	98.0	0.904	2.27	0.0035	35	2.0	1.66	855	1.8	2.7	4.1	4.57	890	14.94	6.23	0.062	TLAG = 0.083 PER HCDDM
DES3	98.0	0.904	3.78	0.0059	35	2.0	1.66	995	7.0	5.4	8.1	2.57	1030	15.72	4.23	0.042	TLAG = 0.083 PER HCDDM
DES4	98.0	0.904	2.88	0.0045	35	2.0	1.66	900	1.1	2.1	3.2	5.98	935	15.19	7.64	0.076	TLAG = 0.083 PER HCDDM
DES5	98.0	0.904	5.20	0.0081	32	2.0	1.59	1620	1.2	2.2	3.4	9.20	1652	19.18	10.79	0.108	
CARR1	98.0	0.904	3.52	0.0055	24	2.0	1.37	1315	3.4	3.7	5.7	4.63	1339	17.44	6.00	0.060	TLAG = 0.083 PER HCDDM
CARR2	98.0	0.904	2.49	0.0039	24	2.0	1.37	980	1.5	2.5	3.8	5.45	1004	15.58	6.82	0.068	TLAG = 0.083 PER HCDDM
CARR3	98.0	0.904	4.85	0.0076	30	2.0	1.54	1685	2.1	2.9	4.4	7.34	1715	19.53	8.88	0.089	TLAG = 0.083 PER HCDDM
ST1	98.0	0.904	1.62	0.0025	20	2.0	1.25	910	6.0	5.0	7.5	2.59	930	15.17	3.84	0.038	TLAG = 0.083 PER HCDDM

STANDARD FORM 4

DEVELOPMENT: Summerlin West Village 21

W.O. # 7809 **CALCULATED BY:** JYA

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

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

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

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

SUB-BASIN 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.	
ST2	98.0	0.904	2.93	0.0046	24	2.0	1.37	1555	5.8	4.9	7.4	4.10	1579	18.77	5.48	0.055	TLAG = 0.083 PER HCDDM
ST3	98.0	0.904	2.09	0.0033	20	2.0	1.25	985	6.1	5.0	7.6	2.74	1005	15.58	4.00	0.040	TLAG = 0.083 PER HCDDM
ST4	98.0	0.904	3.64	0.0057	20	2.0	1.25	1465	5.5	4.7	7.2	4.01	1485	18.25	5.27	0.053	TLAG = 0.083 PER HCDDM
ST6	98.0	0.904	3.01	0.0047	24	2.0	1.37	1615	5.3	4.6	7.0	4.45	1639	19.11	5.82	0.058	TLAG = 0.083 PER HCDDM
ST7	98.0	0.904	1.64	0.0026	40	2.0	1.77	832	1.8	2.7	4.1	4.42	872	14.84	6.19	0.062	TLAG = 0.083 PER HCDDM
ST8	98.0	0.904	0.44	0.0007	24	2.0	1.37	385	0.5	1.5	2.2	4.41	409	12.27	5.78	0.058	TLAG = 0.083 PER HCDDM
DC-1	95.0	0.864	8.19	0.0128	50	10.0	1.39	3243	1.2	2.2	3.4	17.39	3293	28.29	18.78	0.188	
DC-2	95.0	0.864	1.40	0.0022	25	1.0	2.12	1220	5.7	4.8	7.3	3.38	1245	16.92	5.51	0.055	TLAG = 0.083 PER HCDDM
NVE	95.0	0.864	21.74	0.0340	100	1.0	4.25	1480	3.8	3.9	6.0	4.86	1580	18.78	9.11	0.091	
															Tc Min (DEV)= 5 min		
															Tc Min (UNDEV)= 10 min		

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *          VERSION 4.1                  *
 *                                       *
 *  RUN DATE   23FEB18  TIME  11:46:54   *
 *                                       *
 *****************************************
```

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

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

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

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


```
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
                        *DIAGRAM
 *** FREE ***
             1          ID    INPUT FILE DATE = SEPTEMBER 12,2017
             2          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             3          ID    STORM DISTRIBUTION = SDN #3
             4          ID    MODELED BY VTN (JYA)
             5          ID
             6          ID    ********************************************************************
             7          ID    * VILLAGE 21 (PREVIOUSLY AREA 1) HEC-1 MODE                       *
             8          ID    * REFER TO LAND USE EXHIBIT BY VTN FOR LOCATION OF AREAS 1         *
             9          ID    *                                                                  *
            10          ID    ********************************************************************
            11          ID
            12          ID
            13          ID
            14          ID                          AREA    DARF
            15          ID                          SQ. MI.
            16          ID                          0-0.5   0.99
            17          ID                          0.5-1   0.975
            18          ID                          1-2     0.95
            19          ID                          2-3     0.925
            20          ID                          3-4     0.915
            21          ID                          4-5     0.908
            22          ID                          5-6     0.903
            23          ID                          6-7     0.895
            24          ID
            25          ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
            26          ID
            27          ID  100-YEAR,  6-HOUR STORM,  SDN3
            28          ID
            29          IT       5       0       0     100
            30          IO       5       0       0
            31          IN       5       0       0
            32          JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895
                        *
            33          KK       Z
            34          BA  0.0070
            35          PB    3.41
            36          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
            37          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            38          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            39          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            40          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            41          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            42          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            43          PC   0.998   0.999       1
            44          LS       0    95.0
            45          UD   0.083
                        *
```



```
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
            46          KK      AA
            47          BA  0.0058
            48          PB    3.40
            49          LS       0    95.0
            50          UD   0.083
                        *
            51          KK    CZAA
            52          KM   COMBINE BASINS AA AND Z
            53          HC       2
                        *
            54          KK   NP-4A
```

```
  55          BA  0.0016
  56          PB    3.40
  57          LS       0    88.0
  58          UD   0.084
              *

  59          KK  CNP4-A
  60          KM   COMBINE BASINS NP-4A, CZAA
  61          HC       2
              *

  62          KK    DES1
  63          BA  0.0029
  64          PB    3.38
  65          LS       0      98
  66          UD   0.083
              *

  67          KK  DUMMY1
  68          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
  69          HC       2
              *

  70          KK   SUMM1
  71          PB    3.40
  72          BA  0.0078
  73          LS       0      98
  74          UD   0.093
              *

  75          KK       Y
  76          PB    3.40
  77          BA  0.0062
  78          LS       0    95.0
  79          UD   0.083
              *
```



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

  80          KK       X
  81          PB    3.40
  82          BA  0.0057
  83          LS       0    95.0
  84          UD   0.083
              *

  85          KK    NP-3
  86          BA  0.0023
  87          PB    3.38
  88          LS       0    88.0
  89          UD   0.101
              *

  90          KK  DUMMY2
  91          KM   COMBINES WITH RFCD FACILITY DESERT FOOTHILLS DR
  92          HC       5
              *

  93          KK       R
  94          BA  0.0048
  95          PB    3.40
  96          LS       0    93.1
  97          UD   0.083
              *

  98          KK       Q
  99          BA  0.0049
 100          PB    3.40
 101          LS       0    93.1
 102          UD   0.083
              *

 103          KK     CQR
 104          KM   COMBINE Q AND R
 105          HC       2
              *

 106          KK    RCQR
 107          KM   ROUTE CQR TO CST1
 108          RD     330   0.055   0.013       0    CIRC       3
              *

 109          KK       S
 110          BA  0.0103
 111          PB    3.40
 112          LS       0      95
 113          UD   0.083
              *
```



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

 114          KK     ST1
 115          BA  0.0025
 116          PB    3.40
 117          LS       0      98
 118          UD   0.083
              *

 119          KK    CST1
 120          KM   COMBINES CQR, S, ST1
 121          HC       3
              *
```

```
 122          KK  DUMMY3
 123          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 124          HC       2
              *
 125          KK       P
 126          BA  0.0049
 127          PB    3.40
 128          LS       0    93.1
 129          UD   0.083
              *
 130          KK    DES2
 131          PB    3.38
 132          BA  0.0035
 133          LS       0      98
 134          UD   0.083
              *
 135          KK  DUMMY4
 136          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 137          HC       3
              *
 138          KK       L
 139          BA  0.0115
 140          PB    3.40
 141          LS       0    92.0
 142          UD   0.083
              *
 143          KK    DES3
 144          BA  0.0059
 145          PB    3.40
 146          LS       0      98
 147          UD   0.083
              *
1                                    HEC-1 INPUT                                    PAGE  5

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

 148          KK   CDES3
 149          KM   COMBINE L AND DES3
 150          HC       2
              *
 151          KK  DUMMY5
 152          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 153          HC       2
              *
 154          KK   COS-3
 155          BA  0.0095
 156          PB    3.39
 157          LS       0    88.0
 158          UD   0.107
              *
 159          KK     ST2
 160          BA  0.0046
 161          PB    3.39
 162          LS       0      98
 163          UD   0.083
              *
 164          KK    DES4
 165          BA  0.0045
 166          PB    3.39
 167          LS       0      98
 168          UD   0.083
              *
 169          KK       F
 170          BA  0.0264
 171          PB    3.39
 172          LS       0    92.0
 173          UD   0.086
              *
 174          KK       E
 175          BA  0.0316
 176          PB    3.38
 177          LS       0    95.0
 178          UD   0.083
              *
 179          KK    DES5
 180          BA  0.0081
 181          PB    3.38
 182          LS       0    98.0
 183          UD   0.108
              *
1                                    HEC-1 INPUT                                    PAGE  6

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

 184          KK  DUMMY6
 185          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 186          HC       7
              *
 187          KK    NP-2
 188          BA  0.0014
```

```
 189          PB    3.38
 190          LS       0    89.0
 191          UD   0.083
              *

 192          KK   RNP-2
 193          KM   ROUTE CNP-2 TO CN
 194          RD     470   0.050   0.013       0    CIRC       6
              *

 195          KK       N
 196          BA  0.0040
 197          PB    3.38
 198          LS       0    93.1
 199          UD   0.083
              *

 200          KK      CN
 201          KM   COMBINE CNP-2 AND N
 202          HC       2
              *

 203          KK     RCN
 204          KM   ROUTE CW53 TO CST3
 205          RD     300   0.050   0.013       0    CIRC       6
              *

 206          KK       T
 207          PB    3.38
 208          BA  0.0094
 209          LS       0    95.0
 210          UD   0.083
              *

 211          KK     ST3
 212          BA  0.0033
 213          PB    3.38
 214          LS       0    98.0
 215          UD   0.083
              *

 216          KK    CST3
 217          KM   COMBINE CN, T AND ST3
 218          HC       3
              *
1                                      HEC-1 INPUT                                          PAGE  7

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

 219          KK   CARR1
 220          BA  0.0055
 221          PB    3.36
 222          LS       0    98.0
 223          UD   0.083
              *

 224          KK       M
 225          BA  0.0142
 226          PB    3.36
 227          LS       0    92.0
 228          UD   0.083
              *

 229          KK  DUMMY8
 230          KM   RFCD FACILITY IN CARRIAGE HILL DR
 231          HC       3
              *

 232          KK       O
 233          BA  0.0054
 234          PB    3.38
 235          LS       0    93.1
 236          UD   0.083
              *

 237          KK       K
 238          BA  0.0125
 239          PB    3.37
 240          LS       0    93.1
 241          UD   0.083
              *

 242          KK     ST4
 243          BA  0.0057
 244          PB    3.38
 245          LS       0      98
 246          UD   0.083
              *

 247          KK    CST4
 248          KM   COMBINE O, K, AND CST4
 249          HC       3
              *

 250          KK  DUMMY9
 251          KM   RFCD FACILITY IN CARRIAGE HILL DR
 252          HC       2
              *
1                                      HEC-1 INPUT                                          PAGE  8

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

 253          KK       J
 254          BA  0.0185
```

```
 255           PB    3.35
 256           LS       0    92.0
 257           UD   0.083
               *

 258           KK DUMMY10
 259           KM   RFCD FACILITY IN CARRIAGE HILL DR
 260           HC       2
               *

 261           KK   COS-1
 262           BA  0.0122
 263           PB    3.37
 264           LS       0    88.0
 265           UD   0.110
               *

 266           KK   CARR2
 267           BA  0.0039
 268           PB    3.35
 269           LS       0    98.0
 270           UD   0.083
               *

 271           KK DUMMY11
 272           KM   RFCD FACILITY IN CARRIAGE HILL DR
 273           HC       3
               *

 274           KK       C
 275           BA  0.0219
 276           PB    3.36
 277           LS       0    91.0
 278           UD   0.107
               *

 279           KK    NP-1
 280           BA  0.0021
 281           PB    3.36
 282           LS       0    93.8
 283           UD   0.083
               *

 284           KK     ST7
 285           BA  0.0026
 286           PB    3.37
 287           LS       0      98
 288           UD   0.083
               *
```



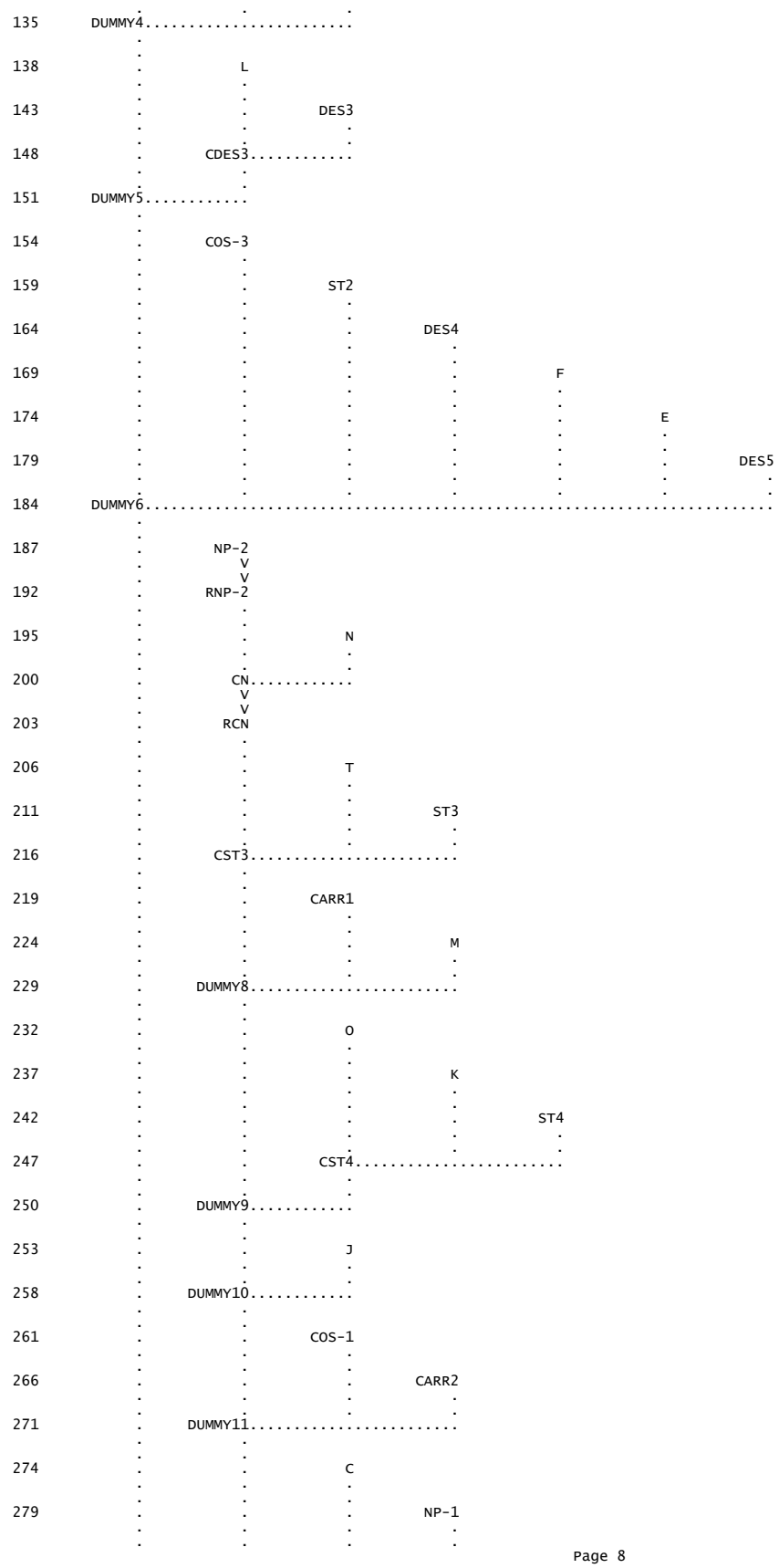
```
LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 289           KK    CST7
 290           HC       3
               *

 291           KK   RCST7
 292           KM   ROUTE CST7 TO CST6
 293           RD     930   0.050   0.013       0    CIRC       3
               *

 294           KK     ST6
 295           BA  0.0047
 296           PB    3.37
 297           LS       0      98
 298           UD   0.083
               *

 299           KK    CST6
 300           KM   COMBINE CST7 AND ST6
 301           HC       2
               *

 302           KK DUMMY12
 303           KM   RFCD FACILITY IN CARRIAGE HILL DR
 304           HC       2
               *

 305           KK       B
 306           BA  0.0215
 307           PB    3.34
 308           LS       0    91.0
 309           UD   0.087
               *

 310           KK DUMMY13
 311           KM   RFCD FACILITY IN CARRIAGE HILL DR
 312           HC       2
               *

 313           KK       A
 314           BA  0.0229
 315           PB    3.33
 316           LS       0      92
 317           UD   0.103
               *

 318           KK   CARR3
 319           BA  0.0076
 320           LS       0      98
 321           UD   0.089
               *
```

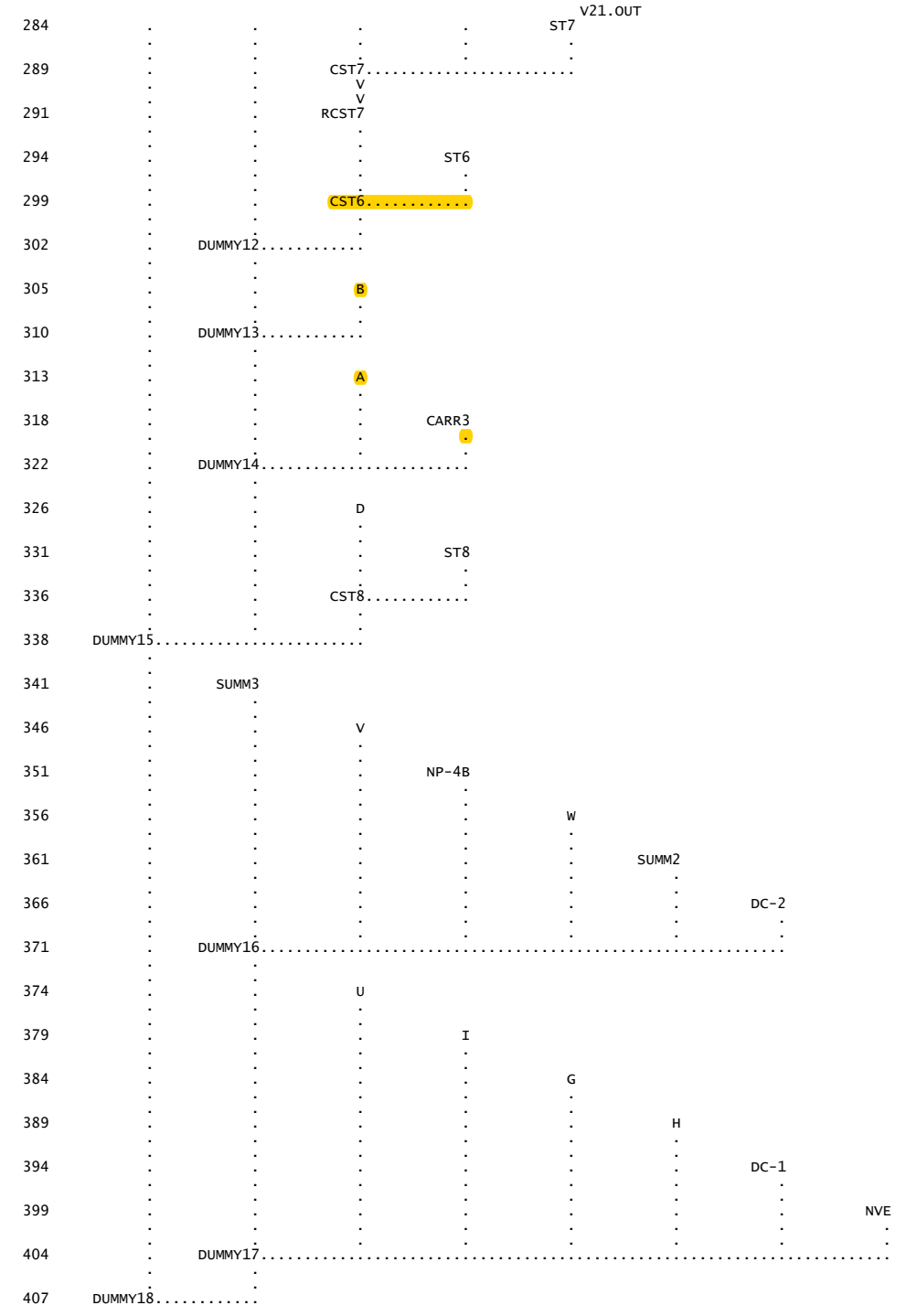
```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 322          KK DUMMY14
 323          KM   RFCD FACILITY IN CARRIAGE HILL DR
 324          KM   TO EX FAR HILLS AVENUE SD
 325          HC       3
              *
 326          KK       D
 327          BA  0.0245
 328          PB    3.36
 329          LS       0    92.0
 330          UD   0.088
              *
 331          KK     ST8
 332          BA  0.0007
 333          PB    3.37
 334          LS       0      98
 335          UD   0.083
              *
 336          KK    CST8
 337          HC       2
              *
 338          KK DUMMY15
 339          KM   EX FAR HILLS AVE SD
 340          HC       3
              *
 341          KK   SUMM3
 342          PB    3.39
 343          BA  0.0119
 344          LS       0      98
 345          UD   0.083
              *
 346          KK       V
 347          BA  0.0112
 348          PB    3.38
 349          LS       0    95.0
 350          UD   0.083
              *
 351          KK   NP-4B
 352          PB    3.38
 353          BA  0.0017
 354          LS       0    88.0
 355          UD   0.083
              *
```



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

 356          KK       W
 357          BA  0.0111
 358          PB    3.38
 359          LS       0    95.0
 360          UD   0.083
              *
 361          KK   SUMM2
 362          BA  0.0051
 363          PB    3.38
 364          LS       0      98
 365          UD   0.083
              *
 366          KK    DC-2
 367          BA  0.0022
 368          PB    3.36
 369          LS       0    95.0
 370          UD   0.083
              *
 371          KK DUMMY16
 372          KM   COMBINES IN EX BELTWAY CHANNEL
 373          HC       6
              *
 374          KK       U
 375          BA  0.0319
 376          PB    3.36
 377          LS       0    95.0
 378          UD   0.093
              *
 379          KK       I
 380          BA  0.0289
 381          PB    3.35
 382          LS       0    92.0
 383          UD   0.106
              *
 384          KK       G
 385          BA  0.0089
 386          PB    3.35
 387          LS       0    95.0
 388          UD   0.088
              *
 389          KK       H
 390          BA  0.0098
```

```
           391           PB    3.33
           392           LS       0    95.0
           393           UD   0.099
                         *
1                                                HEC-1 INPUT                                                    PAGE 12

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


           394           KK    DC-1
           395           BA  0.0128
           396           PB    3.33
           397           LS       0    95.0
           398           UD   0.188
                         *

           399           KK     NVE
           400           BA  0.0340
           401           PB    3.32
           402           LS       0    95.0
           403           UD   0.091
                         *

           404           KK DUMMY17
           405           KM   COMBINES IN EX BELTWAY CHANNEL
           406           HC       7
                         *

           407           KK DUMMY18
           408           KM   EX FAR HILLS AVE SD
           409           HC       2
                         *
                         *
           410           ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

    33           Z
                 .
                 .
    46           .          AA
                 .           .
                 .           .
    51         CZAA...........
                 .
                 .
    54           .       NP-4A
                 .           .
                 .           .
    59      CNP4-A...........
                 .
                 .
    62           .        DES1
                 .           .
                 .           .
    67      DUMMY1...........
                 .
                 .
    70           .       SUMM1
                 .           .
                 .           .
    75           .           .           Y
                 .           .           .
                 .           .           .
    80           .           .           .           X
                 .           .           .           .
                 .           .           .           .
    85           .           .           .           .        NP-3
                 .           .           .           .           .
                 .           .           .           .           .
    90      DUMMY2.............................................
                 .
                 .
    93           .           R
                 .           .
                 .           .
    98           .           .           Q
                 .           .           .
                 .           .           .
   103           .         CQR...........
                 .           V
                 .           V
   106           .        RCQR
                 .           .
                 .           .
   109           .           .           S
                 .           .           .
                 .           .           .
   114           .           .           .        ST1
                 .           .           .         .
                 .           .           .         .
   119           .        CST1.........................
                 .           .
                 .           .
   122      DUMMY3...........
                 .
                 .
   125           .           P
                 .           .
                 .           .
   130           .           .        DES2
                 .           .           .
```


DUMMY4
L
DES3
CDES3
DUMMY5
COS-3
ST2
DES4
F
E
DES5
DUMMY6
NP-2
RNP-2
N
CN
RCN
T
ST3
CST3
CARR1
M
DUMMY8
O
K
ST4
CST4
DUMMY9
J
DUMMY10
COS-1
CARR2
DUMMY11
C
NP-1



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**********

```
*                                        *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*             JUN   1998                 *
*           VERSION 4.1                  *
*                                        *
*  RUN DATE   23FEB18  TIME  11:46:54    *
*                                        *
******************************************
```

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

INPUT FILE DATE = SEPTEMBER 12,2017
DESIGN STORM = 100-YEAR 6-HR STORM

STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

```
**********************************************************************
* VILLAGE 21 (PREVIOUSLY AREA 1) HEC-1 MODE                          *
* REFER TO LAND USE EXHIBIT BY VTN FOR LOCATION OF AREAS 1           *
*                                                                    *
**********************************************************************
```

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

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

100-YEAR, 6-HOUR STORM, SDN3

```
   30 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
                      .99       .98       .95       .93       .92       .91       .90       .89
1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .89
HYDROGRAPH AT												
+	Z	.01	1	FLOW	17.	17.	16.	16.	16.	16.	16.	15.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	AA	.01	1	FLOW	14.	14.	14.	13.	13.	13.	13.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	CZAA	.01	1	FLOW	31.	31.	30.	29.	29.	28.	28.	28.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	NP-4A	.00	1	FLOW	3.	3.	3.	3.	3.	3.	3.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	CNP4-A	.01	1	FLOW	35.	34.	33.	32.	32.	31.	31.	31.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	DES1	.00	1	FLOW	7.	7.	7.	7.	7.	7.	7.	7.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	DUMMY1	.02	1	FLOW	42.	41.	40.	39.	38.	38.	38.	38.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	SUMM1	.01	1	FLOW	19.	19.	18.	18.	18.	18.	18.	17.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	Y	.01	1	FLOW	15.	15.	14.	14.	14.	14.	14.	14.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

HYDROGRAPH AT												
+	X	.01	1	FLOW	14.	14.	13.	13.	13.	13.	13.	12.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	NP-3	.00	1	FLOW	4.	4.	4.	4.	4.	4.	4.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
5 COMBINED AT												
+	DUMMY2	.04	1	FLOW	95.	93.	90.	88.	87.	86.	86.	85.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	R	.00	1	FLOW	11.	11.	11.	10.	10.	10.	10.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	Q	.00	1	FLOW	11.	11.	11.	11.	10.	10.	10.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	CQR	.01	1	FLOW	23.	22.	22.	21.	21.	21.	20.	20.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO												
+	RCQR	.01	1	FLOW	23.	22.	21.	21.	21.	20.	20.	20.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	S	.01	1	FLOW	25.	25.	24.	23.	23.	23.	23.	23.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	ST1	.00	1	FLOW	6.	6.	6.	6.	6.	6.	6.	6.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	CST1	.02	1	FLOW	54.	53.	52.	50.	50.	49.	49.	48.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	DUMMY3	.06	1	FLOW	149.	146.	142.	138.	136.	135.	134.	133.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	P	.00	1	FLOW	11.	11.	11.	11.	10.	10.	10.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	DES2	.00	1	FLOW	9.	9.	9.	8.	8.	8.	8.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	DUMMY4	.07	1	FLOW	169.	166.	162.	157.	155.	154.	153.	151.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	L	.01	1	FLOW	26.	26.	25.	24.	24.	24.	24.	23.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	DES3	.01	1	FLOW	15.	15.	14.	14.	14.	14.	14.	14.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	CDES3	.02	1	FLOW	41.	41.	39.	38.	38.	37.	37.	37.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	DUMMY5	.09	1	FLOW	210.	207.	201.	195.	193.	191.	190.	188.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	COS-3	.01	1	FLOW	18.	17.	17.	16.	16.	16.	15.	15.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	ST2	.00	1	FLOW	12.	12.	11.	11.	11.	11.	11.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	DES4	.00	1	FLOW	11.	11.	11.	11.	11.	10.	10.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	F	.03	1	FLOW	59.	58.	57.	55.	54.	54.	53.	53.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	E	.03	1	FLOW	77.	75.	73.	71.	70.	70.	69.	69.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	DES5	.01	1	FLOW	19.	19.	18.	18.	18.	17.	17.	17.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
7 COMBINED AT												
+	DUMMY6	.17	1	FLOW	406.	399.	388.	376.	372.	369.	366.	363.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	NP-2	.00	1	FLOW	3.	3.	3.	3.	3.	3.	3.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO												
+	RNP-2	.00	1	FLOW	3.	3.	3.	3.	3.	3.	3.	2.

				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	N	.00	1	FLOW	9.	9.	9.	9.	9.	8.	8.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	CN	.01	1	FLOW	12.	12.	12.	11.	11.	11.	11.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO												
+	RCN	.01	1	FLOW	12.	12.	11.	11.	11.	11.	11.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	T	.01	1	FLOW	23.	22.	22.	21.	21.	21.	21.	20.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	ST3	.00	1	FLOW	8.	8.	8.	8.	8.	8.	8.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	CST3	.02	1	FLOW	43.	43.	41.	40.	40.	39.	39.	39.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	CARR1	.01	1	FLOW	14.	14.	13.	13.	13.	13.	13.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	M	.01	1	FLOW	32.	31.	30.	29.	29.	29.	29.	28.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	DUMMY8	.04	1	FLOW	89.	88.	85.	83.	82.	81.	80.	79.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	O	.01	1	FLOW	13.	12.	12.	12.	11.	11.	11.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	K	.01	1	FLOW	29.	29.	28.	27.	26.	26.	26.	26.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	ST4	.01	1	FLOW	14.	14.	14.	13.	13.	13.	13.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	CST4	.02	1	FLOW	56.	55.	54.	52.	51.	51.	51.	50.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	DUMMY9	.06	1	FLOW	145.	143.	139.	134.	133.	132.	131.	130.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	J	.02	1	FLOW	42.	41.	40.	38.	38.	37.	37.	37.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	DUMMY10	.08	1	FLOW	187.	183.	178.	173.	171.	169.	168.	166.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	COS-1	.01	1	FLOW	22.	22.	21.	20.	20.	20.	19.	19.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	CARR2	.00	1	FLOW	10.	10.	9.	9.	9.	9.	9.	9.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	DUMMY11	.10	1	FLOW	219.	215.	208.	202.	200.	198.	196.	194.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	C	.02	1	FLOW	44.	43.	42.	40.	40.	40.	39.	39.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	NP-1	.00	1	FLOW	5.	5.	5.	5.	5.	4.	4.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	ST7	.00	1	FLOW	7.	6.	6.	6.	6.	6.	6.	6.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	CST7	.03	1	FLOW	56.	55.	53.	51.	50.	50.	50.	49.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO												
+	RCST7	.03	1	FLOW	54.	53.	51.	50.	49.	49.	48.	48.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	ST6	.00	1	FLOW	12.	12.	11.	11.	11.	11.	11.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	CST6	.03	1	FLOW	66.	65.	63.	61.	60.	60.	59.	59.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

2 COMBINED AT												
+	DUMMY12	.13	1	FLOW	285.	280.	271.	263.	260.	257.	256.	253.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	B	.02	1	FLOW	46.	45.	44.	42.	42.	41.	41.	41.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	DUMMY13	.15	1	FLOW	331.	325.	315.	305.	302.	299.	297.	294.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	A	.02	1	FLOW	48.	47.	45.	44.	43.	43.	43.	42.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	CARR3	.01	1	FLOW	19.	18.	18.	17.	17.	17.	17.	17.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	DUMMY14	.18	1	FLOW	397.	390.	378.	367.	362.	359.	356.	353.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	D	.02	1	FLOW	54.	53.	52.	50.	49.	49.	49.	48.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	ST8	.00	1	FLOW	2.	2.	2.	2.	2.	2.	2.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	CST8	.03	1	FLOW	56.	55.	53.	52.	51.	51.	50.	50.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT												
+	DUMMY15	.38	1	FLOW	859.	844.	820.	795.	785.	778.	773.	765.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	SUMM3	.01	1	FLOW	30.	30.	29.	28.	28.	28.	28.	27.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	V	.01	1	FLOW	27.	27.	26.	25.	25.	25.	25.	24.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	NP-4B	.00	1	FLOW	3.	3.	3.	3.	3.	3.	3.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	W	.01	1	FLOW	27.	26.	26.	25.	25.	24.	24.	24.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	SUMM2	.01	1	FLOW	13.	13.	12.	12.	12.	12.	12.	12.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	DC-2	.00	1	FLOW	5.	5.	5.	5.	5.	5.	5.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
6 COMBINED AT												
+	DUMMY16	.04	1	FLOW	106.	104.	101.	99.	97.	97.	96.	95.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	U	.03	1	FLOW	74.	73.	71.	69.	68.	68.	67.	67.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	I	.03	1	FLOW	60.	59.	57.	55.	54.	54.	53.	53.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	G	.01	1	FLOW	21.	21.	20.	20.	19.	19.	19.	19.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	H	.01	1	FLOW	22.	22.	21.	21.	20.	20.	20.	20.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	DC-1	.01	1	FLOW	25.	24.	24.	23.	23.	23.	22.	22.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT												
+	NVE	.03	1	FLOW	79.	78.	75.	73.	72.	72.	71.	71.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
7 COMBINED AT												
+	DUMMY17	.17	1	FLOW	384.	377.	366.	356.	351.	348.	346.	343.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	DUMMY18	.55	1	FLOW	1243.	1221.	1186.	1150.	1136.	1126.	1119.	1108.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

1

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

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

		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	22.65	210.41	2.62	5.00	22.52	210.00	2.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1353E+01 EXCESS= .0000E+00 OUTFLOW= .1353E+01 BASIN STORAGE= .1942E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	22.30	210.33	2.57	5.00	22.14	210.00	2.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1328E+01 EXCESS= .0000E+00 OUTFLOW= .1328E+01 BASIN STORAGE= .1937E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	21.62	210.20	2.48	5.00	21.48	210.00	2.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1285E+01 EXCESS= .0000E+00 OUTFLOW= .1285E+01 BASIN STORAGE= .1976E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	20.95	210.39	2.40	5.00	20.82	210.00	2.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1243E+01 EXCESS= .0000E+00 OUTFLOW= .1243E+01 BASIN STORAGE= .1990E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	20.70	210.36	2.37	5.00	20.56	210.00	2.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1226E+01 EXCESS= .0000E+00 OUTFLOW= .1226E+01 BASIN STORAGE= .2022E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	20.49	210.18	2.35	5.00	20.37	210.00	2.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1214E+01 EXCESS= .0000E+00 OUTFLOW= .1214E+01 BASIN STORAGE= .1973E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	20.35	210.17	2.33	5.00	20.24	210.00	2.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1206E+01 EXCESS= .0000E+00 OUTFLOW= .1206E+01 BASIN STORAGE= .1985E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RCQR	MANE	.28	20.19	210.32	2.30	5.00	20.04	210.00	2.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1192E+01 EXCESS= .0000E+00 OUTFLOW= .1192E+01 BASIN STORAGE= .1988E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RNP-2	MANE	.56	2.89	210.89	2.22	5.00	2.85	210.00	2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1654E+00 EXCESS= .0000E+00 OUTFLOW= .1654E+00 BASIN STORAGE= .2715E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RNP-2	MANE	.56	2.85	210.61	2.17	5.00	2.80	210.00	2.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1619E+00 EXCESS= .0000E+00 OUTFLOW= .1620E+00 BASIN STORAGE= .2796E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RNP-2	MANE	.57	2.74	210.91	2.09	5.00	2.70	210.00	2.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1562E+00 EXCESS= .0000E+00 OUTFLOW= .1562E+00 BASIN STORAGE= .2897E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RNP-2	MANE	.57	2.66	210.69	2.01	5.00	2.61	210.00	2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1504E+00 EXCESS= .0000E+00 OUTFLOW= .1504E+00 BASIN STORAGE= .2667E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RNP-2	MANE	.57	2.62	210.72	1.98	5.00	2.57	210.00	1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1481E+00 EXCESS= .0000E+00 OUTFLOW= .1481E+00 BASIN STORAGE= .2681E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RNP-2	MANE	.57	2.60	210.58	1.96	5.00	2.55	210.00	1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1465E+00 EXCESS= .0000E+00 OUTFLOW= .1465E+00 BASIN STORAGE= .2855E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00									
RNP-2	MANE	.57	2.56	210.89	1.95	5.00	2.53	210.00	1.95

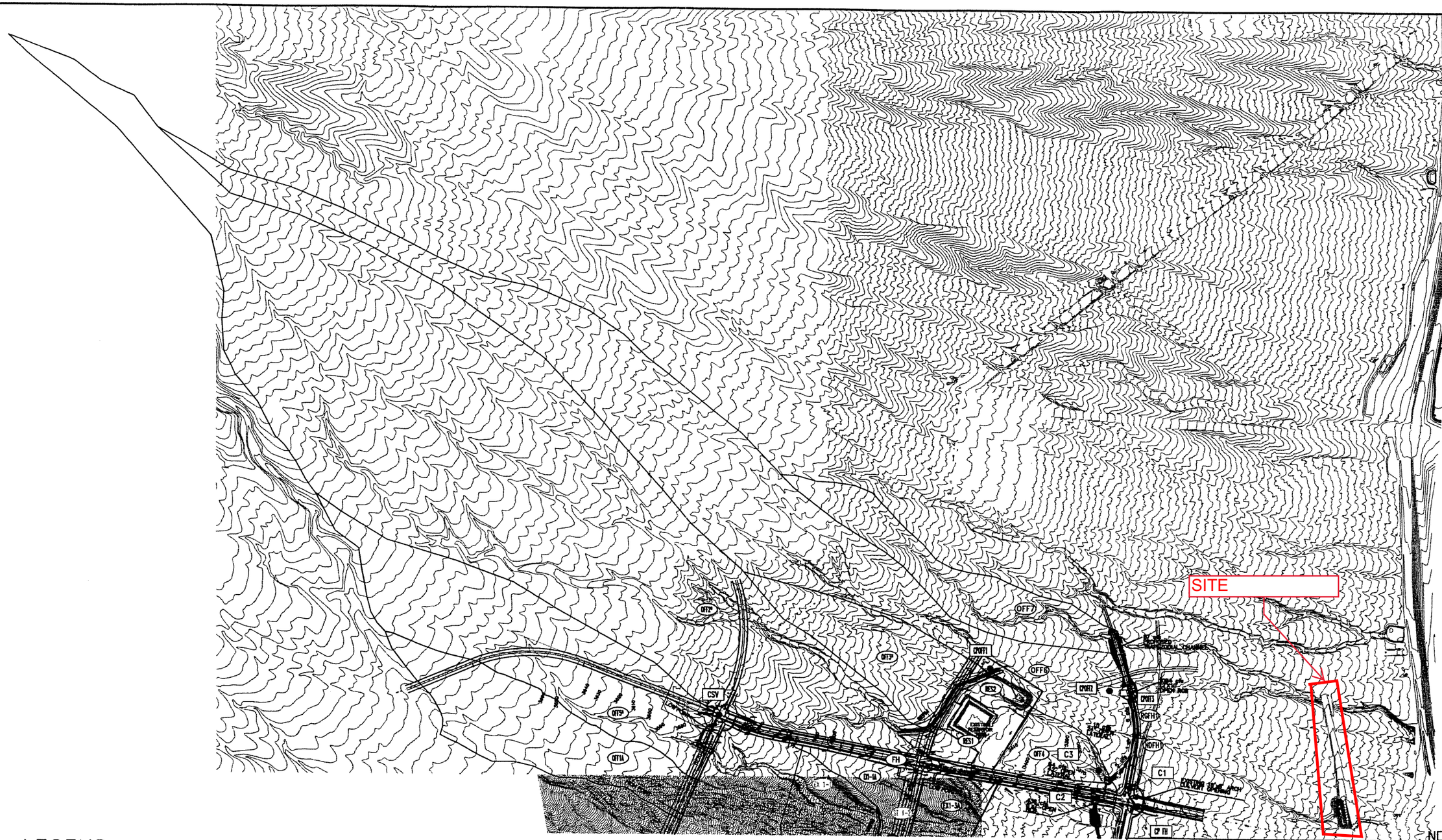
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1454E+00 EXCESS= .0000E+00 OUTFLOW= .1454E+00 BASIN STORAGE= .2856E-04 PERCENT ERROR= .0

```
          FOR PLAN = 1  RATIO=  .00
             RNP-2  MANE          .57      2.54    210.82      1.92      5.00      2.50    210.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1435E+00 EXCESS= .0000E+00 OUTFLOW= .1435E+00 BASIN STORAGE= .2688E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     12.12    210.42      2.50      5.00     12.05    210.00        2.50

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7195E+00 EXCESS= .0000E+00 OUTFLOW= .7195E+00 BASIN STORAGE= .1668E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     11.92    210.37      2.45      5.00     11.83    210.00        2.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7056E+00 EXCESS= .0000E+00 OUTFLOW= .7056E+00 BASIN STORAGE= .1738E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     11.56    210.33      2.37      5.00     11.47    210.00        2.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6824E+00 EXCESS= .0000E+00 OUTFLOW= .6824E+00 BASIN STORAGE= .1736E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     11.20    210.32      2.29      5.00     11.11    210.00        2.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6593E+00 EXCESS= .0000E+00 OUTFLOW= .6593E+00 BASIN STORAGE= .1721E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     11.05    210.32      2.26      5.00     10.97    210.00        2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6501E+00 EXCESS= .0000E+00 OUTFLOW= .6501E+00 BASIN STORAGE= .1751E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     10.93    210.42      2.24      5.00     10.86    210.00        2.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6437E+00 EXCESS= .0000E+00 OUTFLOW= .6437E+00 BASIN STORAGE= .1686E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     10.85    210.18      2.22      5.00     10.79    210.00        2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6391E+00 EXCESS= .0000E+00 OUTFLOW= .6391E+00 BASIN STORAGE= .1683E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCN  MANE          .27     10.75    210.35      2.19      5.00     10.67    210.00        2.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6317E+00 EXCESS= .0000E+00 OUTFLOW= .6317E+00 BASIN STORAGE= .1679E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .67     55.40    210.85      2.47      5.00     54.11    210.00        2.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3503E+01 EXCESS= .0000E+00 OUTFLOW= .3503E+01 BASIN STORAGE= .6202E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .68     54.38    210.95      2.42      5.00     53.10    210.00        2.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3435E+01 EXCESS= .0000E+00 OUTFLOW= .3435E+01 BASIN STORAGE= .6050E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .68     52.70    210.92      2.34      5.00     51.44    210.00        2.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3323E+01 EXCESS= .0000E+00 OUTFLOW= .3323E+01 BASIN STORAGE= .6210E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .68     51.02    210.92      2.26      5.00     49.78    210.00        2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3210E+01 EXCESS= .0000E+00 OUTFLOW= .3210E+01 BASIN STORAGE= .6339E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .69     50.36    210.80      2.23      5.00     49.15    210.00        2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3165E+01 EXCESS= .0000E+00 OUTFLOW= .3165E+01 BASIN STORAGE= .5904E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .69     49.83    211.20      2.21      5.00     48.67    210.00        2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3133E+01 EXCESS= .0000E+00 OUTFLOW= .3133E+01 BASIN STORAGE= .5840E-04 PERCENT ERROR=    .0
```

```
          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .69     49.55    210.79      2.19      5.00     48.35    210.00        2.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3111E+01 EXCESS= .0000E+00 OUTFLOW= .3111E+01 BASIN STORAGE= .5962E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCST7  MANE          .69     48.95    211.26      2.17      5.00     47.82    210.00        2.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3075E+01 EXCESS= .0000E+00 OUTFLOW= .3075E+01 BASIN STORAGE= .5781E-04 PERCENT ERROR=    .0



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

TECHNICAL DRAINAGE STUDY
FOR
VILLAGE 23B
DESERT FOOTHILLS DRIVE IMPROVEMENTS

(CLV DS3554)



NOTES:

LEGEND

- NDFH1 — **DRAINAGE SUBBASIN**
- CPOFF3 — **CONCENTRATION POINT**
- **SUBBASIN BOUNDARY**
- **FLOW DIRECTION**

GRAPHIC SCALE

1000 0 500 1000

(IN FEET)

1 inch = 1000 ft.

NORTH

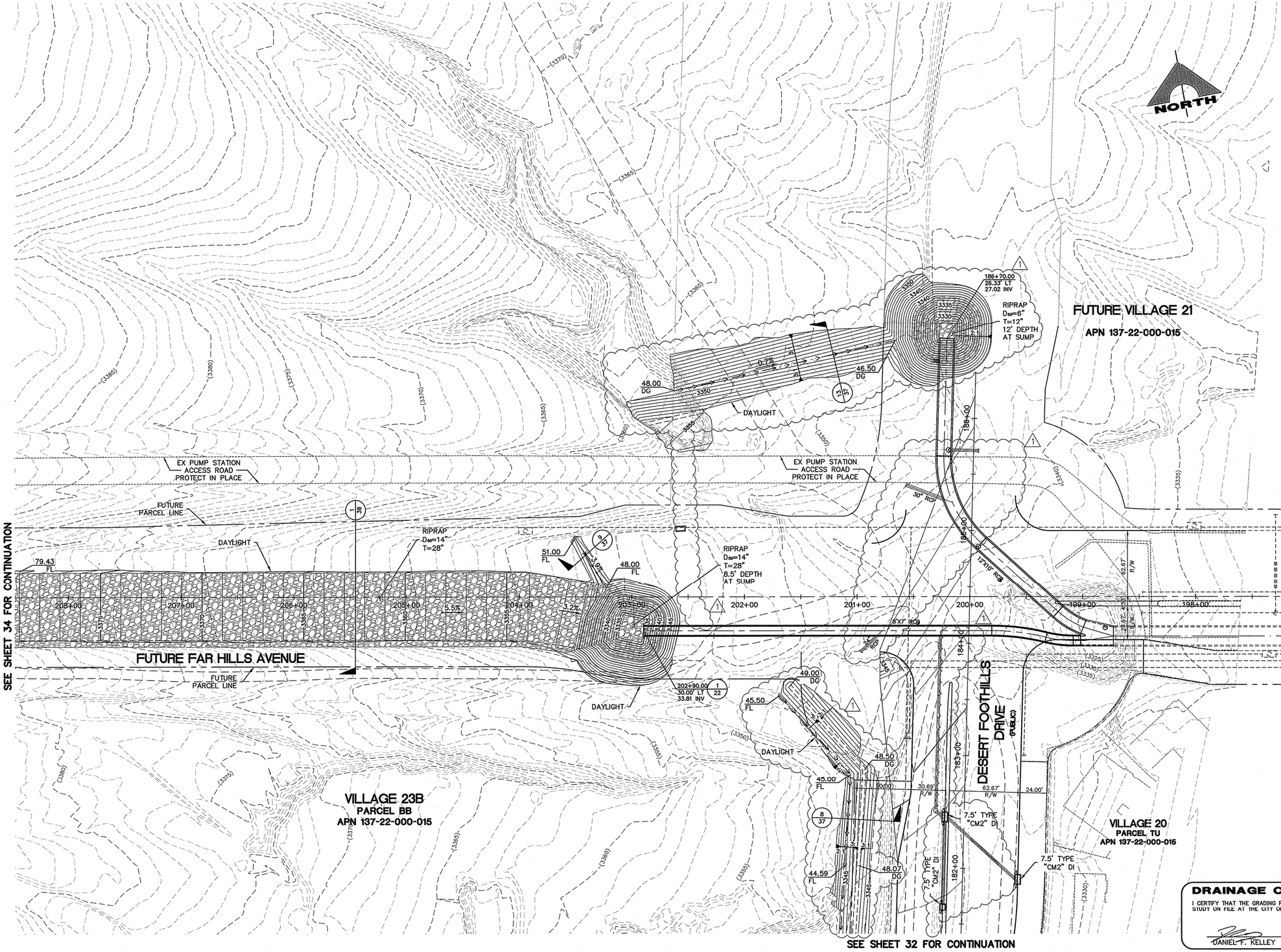
SCALE 1"=1000'

SUMMERLIN VILLAGE 23B

DESERT FOOTHILLS DRIVE

FIGURE 6A
OFFSITE SUBBASINS
INTERIM CONDITION

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2299 · GCWALLACE.COM



Call before you Dig
Avoid cutting underground utility lines. It's easy.
Call 811 or 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround.
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

SCALE 40 0 40 80 FEET
1" = 40'

BENCHMARK

DESC.	NAVD 88 DATUM	NAVD 88 DATUM
RIVET AND PLATE IN TOP OF CURB @ NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA DRIVE	3304.45 (FEET)	1007.197 (METERS)
CLV BM No. 5LV09 34NE6		

BASIS OF BEARINGS

NORTH 89°45'05" EAST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 78 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA

NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM, PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS.

DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DANIEL F. KELLEY P.E. 21134 — 5-2-13 DATE

CLV DRAWING NO. _____

ENGINEER - STATE OF NEVADA
DANIEL F. KELLEY
No. 09/30/2015
CIVIL
PROFESSIONAL

DATE 5-2-13

REV	DATE	DESCRIPTION	DATE	AGRL	APP	DATE	GCW	APP
1	5/30/13	REVISED STORM DRAIN AND INTERIM GRADING						

DESIGN: GTP
DRAWN: JL
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 05-02-13
PLOT TIME: 13:45:21

G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD - LAS VEGAS, NV 89146
T: 702.804.3000 - F: 702.804.2299 - GCWALLACE.COM
F:\Projects\600\62023B-201\DWG Production\201-Grading.dwg dkelley

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 23B DESERT FOOTHILLS DRIVE IMPROVEMENTS
INTERIM GRADING PLAN III

DRAWING 33
33 OF 51 SHTS

JOB NO. 62023B-201

grad-34.dwg 05/02/13 dkelley

TECHNICAL DRAINAGE STUDY
FOR
FIRE STATION #47

(CLV DS3842C)

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: October 5, 2005
TO: **Land Development Services** Department of Public Works				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Technical Drainage Study for: **Fire Station #47**			**COPIES TO:** BV Engineering Nevada
Cross Streets:	NWC of Far Hills Avenue & Street "A"			Howard Hughes Corporation
File Number:	F:\Depot\DSMEMOS\DS3842C.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-013			CCRFCD
Zoning Action:	TMP-6375 & CRG-6830			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES X	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Trn. No.
1st Submittal	6/16/2005	6/29/2005	Not Approved	$400.00	24000: $400
2nd Submittal	8/8/2005 & 8/25/2005	8/25/2005	Conditional Approval	$400.00	27277: $400
CCRFCD	9/29/2005	10/5/2005	Concurrence	N/C	N/C
			TOTAL FEES (LDDRS):	**$800.00**	----

REMARKS:

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

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

1. *All the improvements by others shown on Sheet C-6 and street improvements to Street "A" and Far Hills Avenue have to be in place first before occupancy certificate to the building can be issued.*

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 Amendment 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

B&H/ays

T/R/S: T20S/R59E/22

AREA K-22

C L A R K C O U N T Y
REGIONAL FLOOD CONTROL DISTRICT

RECEIVED
SEP 29 2005

Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

Larry Brown
Chairman
City of Las Vegas

Chip Maxfield
Vice-Chairman
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City of Las Vegas

Andy Hafen
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Mayor Bill Nicholes
City of Mesquite

Roger Tobler
City of Boulder City

Bruce L. Woodbury
Clark County

September 26, 2005

Mr. Randy Fultz, P.E.
City of Las Vegas Public Works
731 S. Fourth St
Las Vegas, NV 89101

DISTRICT CONCURRENCE: FIRE STATION #47
(DS3842) (RFCD NO. 05-6389)

Dear Mr. Fultz:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated June 16, 2005 and Addendum No. 1 dated July 20, 2005, for the above-mentioned project as submitted by TRC-BV Engineering. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Public Works dated August 25, 2005.

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

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

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

GALE WM. FRASER, II, P.E.
General Manager/Chief Engineer

BY: _____
Abigail Mayrena, E.I.
Associate Engineer

_____
Andrew R. Trelease, P.E.
Senior Civil Engineer

AM:ART:css

c: Allen E. Pavelka, P.E., TRC-BV Engineering

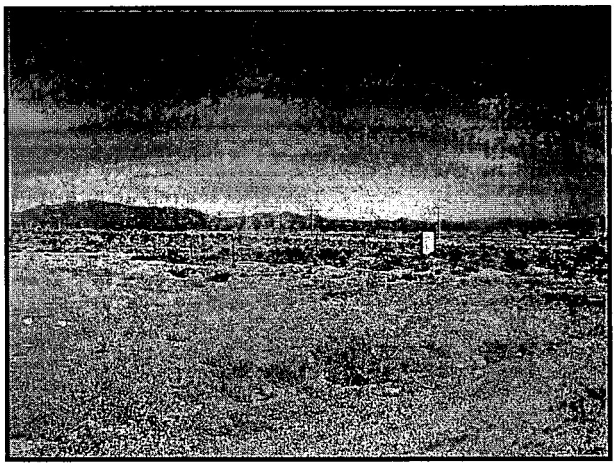
File: 20-59-22.TRC

600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 455-3139 • FAX: (702) 455-3870
Website: *http://www.ccrfcd.org*

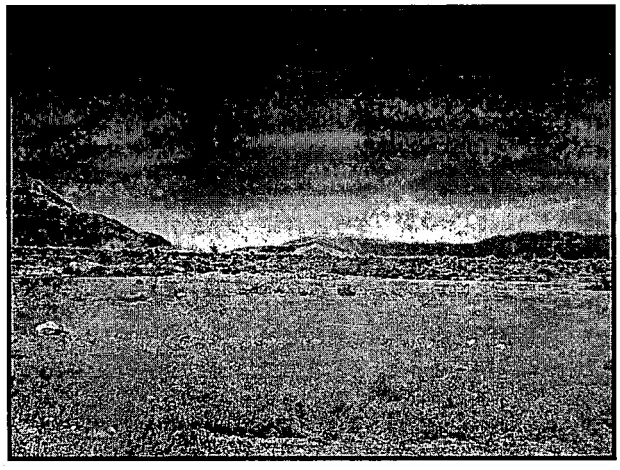
2.0 EXISTING SITE DESCRIPTION

2.1 EXISTING CONDITIONS AND DRAINAGE FACILITIES

The development is located within the City of Las Vegas approximately 1,100 feet west of the Carriage Hills Drive/ Far Hills Avenue intersection. The project site is approximately 2.0 acres in size and is undeveloped in its present condition. The site drains to the southeast with an average ground slope of 5.0%. Along the north and west property boundary, the project site is bordered by undeveloped land. Currently, the project site fronts Street "A", which is a paved public street with future plans to accommodate four lanes (two for each direction) with a continuous two-way left-turn lane prior to development of the fire station. In the existing condition, offsite runoff flows toward the project site via natural washes. Once diverted, the flow is conveyed to the Far Hills Avenue right-of-way (see Photos below).



EXISTING PROJECT SITE LOOKING NE



EXISTING PROJECT SITE LOOKING NW

2.2 EXISTING OFF-SITE DRAINAGE BASINS

The upstream offsite area that impacts the site was broken into three separate basins for analysis in the Technical Drainage Study for Summerlin Village 20/21 Fire Station 47 Access Road perfirmed by G.C. Wallace. The storm runoff from each basin sheet flows through the site and ultimately to Far Hills Avenue. Runoff is then intercepted by existing inlets and conveyed east. Please refer to appendix D of this report for an offsite basin map.

The Desert Foothills Drive Study is proposing to construct a 12-foot by 8-foot RCB for interim and ultimate flows. The proposed RCB will connect to the existing 16-foot by 8-foot arch culvert located in Far Hills Drive and extend north approximately 1,100 linear feet in Desert Foothills Drive. Figure 6 from the Summerlin Village 23B Desert Foothills Drive Improvements depicts the offsite diversion berms, graded channels, and improved inlets that are proposed by the Desert Foothills Drive Study (prior to the Street "A" Improvements) in order to divert the flow.

Storm runoff generated west of Desert Foothills Drive will be intercepted entirely by the Desert Foothills RCB. Therefore, the only offsite area impacting the Street "A" road improvements is located between Desert Foothills Drive and Street "A".

The proposed improvements with this project will maintain offsite storm flows in the existing drainage patterns. The primary purpose for the road improvements is to provide access to the future Fire Station #47 site. In addition to the road improvements, an interim berm is also proposed in order to divert offsite flow around the future fire station site.

The upstream offsite area that impacts Street "A" was broken up into three separate basins: EXOF1, EXOF2, and EXOF3. Basin EXOF1 and Basin EXOF2 generate a combined total of 16 cfs (Combination Point CP1) of storm runoff that drains in a natural wash located north of the future fire station and Street "A". A segment (approximately 250-feet in length) of the Fire Station #47 northern fill slope impacts the natural wash southern bank. This portion of the proposed fill slope will be lined with riprap (d_{50}=9-inches, T=18-inches) to prevent scour.

Basin EXOF3 generates 15 cfs of storm runoff that impacts the western fire station boundary. A proposed 2.5-foot high interim berm is designed to divert the water around the future fire station site. Since the flow velocities along the proposed berm are non-erosive, riprap will not be required. Storm runoff from EXOF3 will surface flow to Far Hills Avenue.

TABLE 2
CROSS-SECTION HYDRAULIC CALCULATIONS

Section*	Slope %	Discharge (cfs)	Depth (ft)	Velocity (fps)	Riprap Reqd.
CH1	6.8	16	0.7	6.8	YES
CH2	1.5	13	1.0	4.4	NO

*See Figure 5.

CROSS SECTIONS	DISCHARGE (cfs)	CHANNEL SLOPE (%)	ACTUAL DEPTH (ft)	VELOCITY (ft/s)	RIPRAP REQD
CH 1	16	6.8	0.7	6.8	YES
CH 2	13	1.5	1.0	4.4	NO

SUMMARY OF HEC-1 MODEL

BASIN/ CONCENTRATION POINT	AREA (ac)	Q100 (cfs)	Q10 (cfs)
EXOF1	4.50	13	5
EXOF2	0.96	3	1
CP1	–	16	6
EXOF3	5.30	15	6
FS1	2.07	8	4
ST1	0.26	1	1
CP2	–	10	5

EXOF1
Q_{100}=13CFS
PROPOSED SITE LOCATED DOWNSTREAM OF FIRE STATION #47
Q_{100}=16CFS
CP1
CH1
EXOF3
EXOF2
Q_{100}=3CFS
INTERIM BERM
HIGH POINT
Q_{100}=15CFS
FS1
42" SD
FUTURE FIRE STATION #47
Q_{100}=8CFS
STREET "A"
CH2
EX. 20" STUB
18" LATERAL STUB
ST1
2.5' TYPE CM MODIFIED DROP INLET (NUISANCE FLOW ONLY)
24" LATERAL STUB
FAR HILLS AVENUE
CP2
EX. 16'X8' ARCH CULVERT
EX. 42" STUB
DESERT FOOTHILLS DRIVE

LEGEND

- SUBBASIN BOUNDARY
- (ON1) SUBBASIN DESIGNATION
- FLOW DIRECTION
- CP1 CONCENTRATION POINT
- 1 — 1 CROSS SECTION

GRAPHIC SCALE

100 0 50 100

(IN FEET)

1 inch = 100 ft.

NORTH

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SUMMERLIN VILLAGE 20/21

FIRE STATION #47 ACCESS ROAD

FIGURE 5
PROPOSED CONDITIONS DRAINAGE MAP

SHEET
FIG 5
SHTOF 0 SHTS

05-02-05 09:35 ckinzer

TECHNICAL DRAINAGE STUDY
FOR
VILLAGE 20/21 FAR HILLS AVE
DRAINAGE AND GRADING IMPROVEMENTS

SUMMERLIN

SM

VILLAGE 20/21
FAR HILLS AVE DRAINAGE AND GRADING IMPROVEMENTS

SID #808 SUBPROJECT NUMBER: 21

2000

△ OCTOBER 25, 2001- REVISE PER CONT. ASBUILTS FOR RECORD DRAWINGS.
△ SEPTEMBER 29, 2000-RELOCATE SD MANHOLE
△ AUGUST 22, 2000
ARCH CULVERT REVISION

ISSUE AGENCY APPROVAL 100% COMPLETE

VILLAGE 20/21 FAR HILLS AVE DRAINAGE AND GRADING IMPROVEMENTS

JOB NO. 62020.227

RECORD DRAWINGS
THESE PLANS SHOW RECORD INFORMATION RECEIVED FROM:
CONTRACTOR: CONTI CONSTRUCTION COMPANY DATE:
THIS DATA MAY OR MAY NOT REFLECT THE ACTUAL FIELD LOCATIONS. ALL DATA SHOULD BE CONFIRMED PRIOR TO USE ON DEVELOPMENT OR ENGINEERING PLANS.

BERT A. HUGHES No. 10259 PROFESSIONAL ENGINEER - STATE OF NEVADA
6/8/00

DEVELOPER

The Howard Hughes Corporation SM
An Affiliate of THE ROUSE COMPANY

HOWARD HUGHES PROPERTIES, INC.
a Nevada corporation

10000 W. CHARLESTON, SUITE 200
LAS VEGAS, NEVADA 89135
OFFICE PHONE NO. (702) 791-4300
OFFICE FAX NO. (702) 791-4450

ENGINEER

G.C. WALLACE, INC.
Engineering/Architecture

1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
OFFICE: (702) 804-2000, FAX: (702) 804-2299
SUMMERLIN OFFICE 10000 CHARLESTON BLVD., STE. 130
OFFICE: (702) 804-2160, FAX: (702) 804-2295

APPROVALS

DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

Bert A. Hughes — 5/8/00
BERT A. HUGHES, R.P.E. 10259 — DATE

"APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND / OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND / OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD. THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA".

Charles Kajkowski V — 6-30-2000
CHARLES KAJKOWSKI, P.E. PE #4784 — DATE
~~CITY ENGINEER~~
CITY OF LAS VEGAS, NEVADA

THE HOWARD HUGHES CORPORATION,
a Delaware corporation

By: John T. Potts — 6-2-00
JOHN T. POTTS — DATE
Title: SENIOR VICE PRESIDENT, SUMMERLIN DEVELOPMENT

ACKNOWLEDGEMENTS

NEVADA POWER COMPANY DISCLAIMER

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

CALL BEFORE YOU DIG: 1(800)227-2600

NEVADA POWER Co. — 5-8-00
REVIEWED BY — DATE

Lonnie Clift (Unit 1,9,10,12) — 6-06-00
LAS VEGAS VALLEY WATER DISTRICT — DATE

5/11/00
CLV FIRE DEPARTMENT — DATE

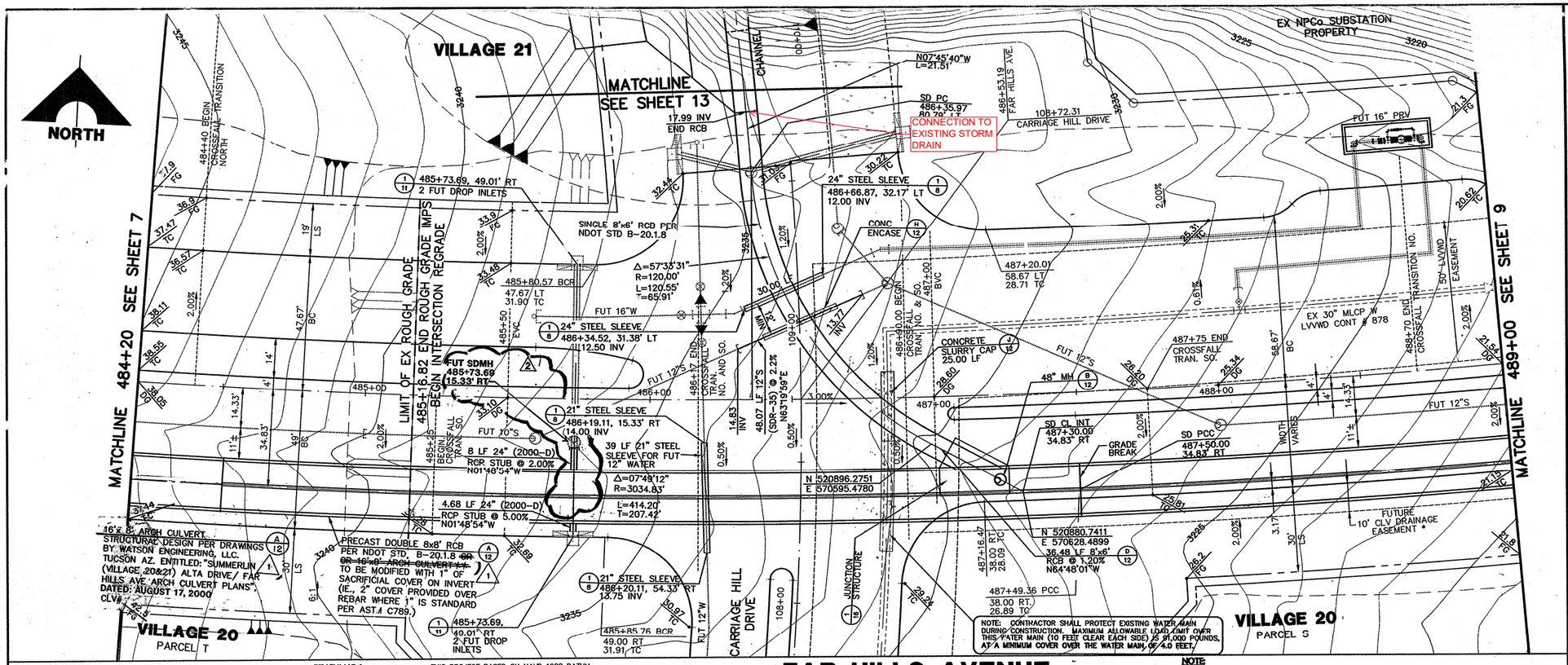
Richard M Hood — 5-8-00
SPRINT — DATE

5-8-00
SOUTHWEST GAS CORP. — DATE

SHEET 1 OF 16

107-V3296

23834 $ 38



BASIS OF BEARING

NORTH 89°45'05" EAST, BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 28 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

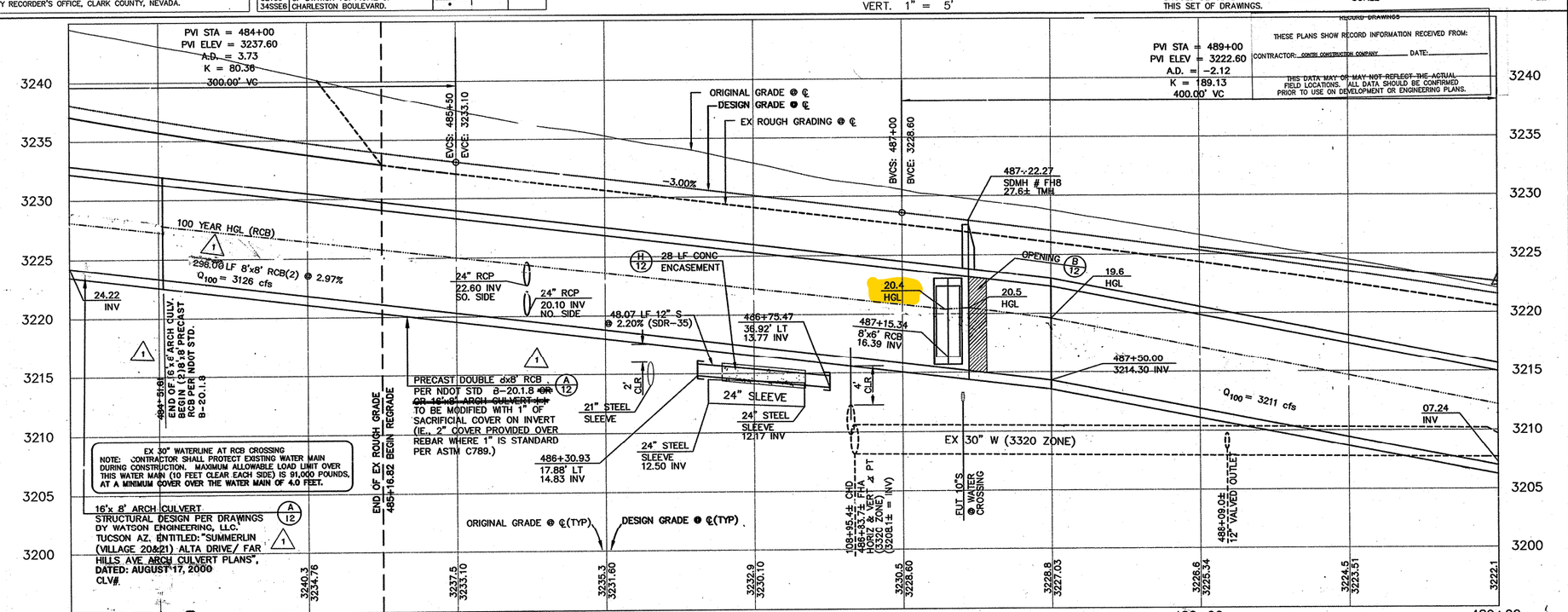
BENCHMARK • THIS PROJECT BASED ON NAVD 1988 DATUM

ID #	DESC.	NAVD 88 (FEET)	NAVD 88 (METERS)	SUMMERLIN DATUM
NO. OLV09-34SSE6	NDOT BRASS CAP, 50 FEET NORTH OF STATION 787+19.42 OF CHARLESTON BOULEVARD.	3209.81 •	978.351	3207.61'

NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM. PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS.

20 0 20 40
SCALE FEET



RECORD DRAWINGS

THESE PLANS SHOW RECORD INFORMATION RECEIVED FROM:

CONTRACTOR: CONTR CONSTRUCTION COMPANY DATE:

THIS DATA MAY OR MAY NOT REFLECT THE ACTUAL FIELD LOCATIONS. ALL DATA SHOULD BE CONFIRMED PRIOR TO USE ON DEVELOPMENT OR ENGINEERING PLANS.

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE ALERT (USA)

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
CALL 1-702-593-6111

STATE OF NEVADA — PROFESSIONAL ENGINEER — No. 07268 — BERT A. MUHLESTEIN — DATE: 4/21/00

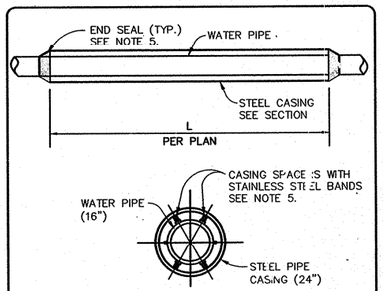
EXISTING IMPROVEMENTS

1. FOR EXISTING ROUGH GRADING SEE VILLAGE 20 – ROUGH GRADING BY G.C. WALLACE INC. JOB NO. 62020.201
2. FOR EXISTING WATER LINE SEE 3320 ZONE PIPELINE PHASE 1 BY G.C. WALLACE INC. LVVWD CONT 076

NO CURB OR PAVEMENT IS BEING CONSTRUCTED WITH THESE PLANS. THESE ELEVATIONS ARE BEING PROVIDED FOR ROUGH GRADING PURPOSES ONLY. REFER TO SHEET 12 FOR APPROXIMATE ROUGH GRADE ELEVATIONS BELOW GRADES SHOWN.

1

* RIGHT OF WAY AND DRAINAGE EASEMENTS WILL BE DEDICATED BY THE " VILLAGE 20 UNIT 2" FINAL MAP



TYPICAL CASING SECTION

NOTES:

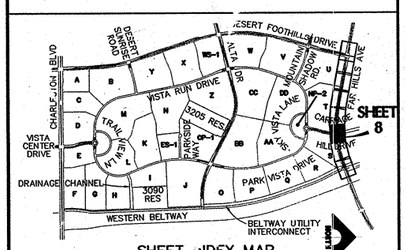
1. STEEL PIPE CASING SHALL BE FABRICATED FROM A MINIMUM OF 1/4" THICK STEEL PLATES, CONFORMING TO THE REQUIREMENTS OF ASTM A226, B, C, OR D. ALL JOINTS SHALL BE WELDED. INTERIOR JOINTS SHALL BE GROUND TO A SMOOTH FINISH. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWWA C201. COATINGS FOR STEEL CASING ARE NOT REQUIRED.
2. PIPE CASING SHALL BE LAID TRUE TO LINE AND GRADE WITH NO BENDS OR CHANGES IN GRADE FOR THE FULL LENGTH OF THE CASING.
3. THE PIPE SHALL BE SUPPORTED AT EACH END JOINT WITH SPACERS. AFTER INSTALLATION OF THE PIPE, THE CASING SHALL BE SEALED AT BOTH ENDS WITH CASING END SEALS. DUCTILE IRON PIPE JOINTS INSIDE CASING ARE TO BE RESTRAINED.
4. STEEL PIPE CASING SHALL BE SYMMETRICAL ABOUT WATER PIPE CENTERLINE.
5. INSTALL CASING SPACERS AND END SEALS PER MANUFACTURER'S SPECIFICATIONS. (REDWOOD SKIDS NOT ALLOWED. UDACS SECTION 3.26 NOT APPLICABLE). USE A "CENTERED" CONFIGURATION AND PROVIDE THE MANUFACTURER WITH THE FOLLOWING: (1)PIPE OD; (2)CASING ID; (3)CASING LENGTH.

WATER SLEEVE DETAIL 1/8

NOT TO SCALE

NOTE TO CONTRACTOR:

1. ALL EXISTING UTILITY CROSSINGS MUST BE VERIFIED PRIOR TO CONSTRUCTION OF ANY MAIN LINES OR LATERALS THAT MAY BE ADVERSELY EFFECTED. ANY DISCREPANCIES IN LOCATION AND/OR ELEVATION MUST BE PROVIDED TO THE ENGINEER FOR ACCEPTANCE PRIOR TO CONSTRUCTION.
2. TOPOGRAPHY SHOWN HEREIN REFLECTS ORIGINAL EXISTING TOPOGRAPHY. ACTUAL FIELD CONDITIONS INCLUDE SITE ROUGH GRADING.
3. ALL COMMON LOTS AS SHOWN HEREIN TO BE PRIVATELY MAINTAINED BY THE H.O.A.



SHEET INDEX MAP

APPROVAL: 1st Approval 6-06-00

LAS VEGAS VALLEY WATER DISTRICT — DATE 6-21-00

DESIGN:	JJJ
DRAWN:	
CHECK:	
ISSUE DATE:	BAH
ISSUE EDITOR:	
PLOT DATE:	05-20-00
PLOT TIME:	14:48:11

REV	DATE	DESCRIPTION
1	5/20/00	RELOCATE SD MANHOLE
2	6/21/00	AS-BUILT PER CONT. RESULTS FOR RECORD DRAWINGS

JUNE 02, 2000 ISSUE FOR AGENCY APPROVAL

G. C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000• FAX: (702) 804-2299
F:\v20\FHA-RCB\dwg\img\FHCHC008.dwg

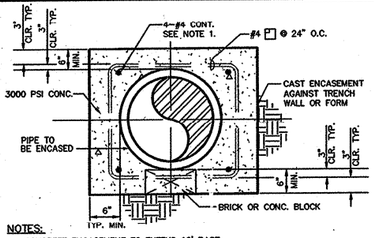
SUMMERLIN
VILLAGE 20/21 FAR HILLS AVE
DRAINAGE AND GRADING IMPROVEMENTS
PLAN AND PROFILE

SHEET 8
8 OF 16 SHTS

JOB NO. 62020.227

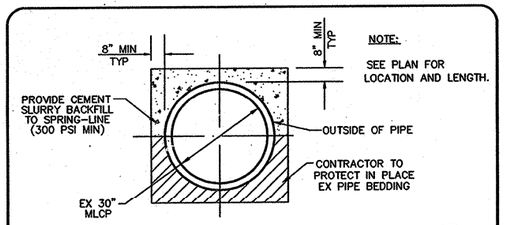
107-V3296

23 84 25670

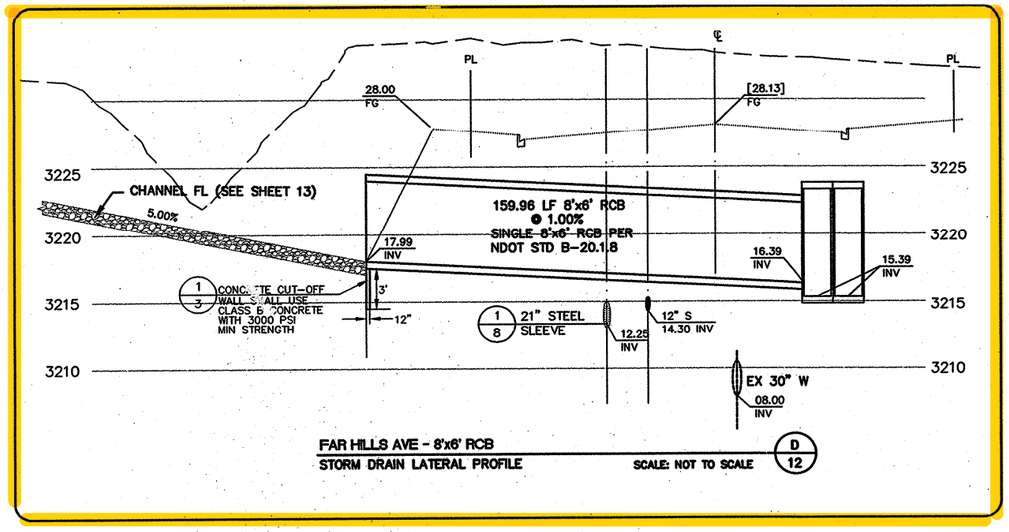


NOTES:
1. CONCRETE ENCASEMENT TO EXTEND 10' PAST OUTSIDE OF WATER PIPE WHERE APPLICABLE
2. FOR ADDITIONAL DETAIL INFORMATION, REFER TO C.C.S.D. "PIPE BEDDING METHODS," STANDARD NO. SD-11.

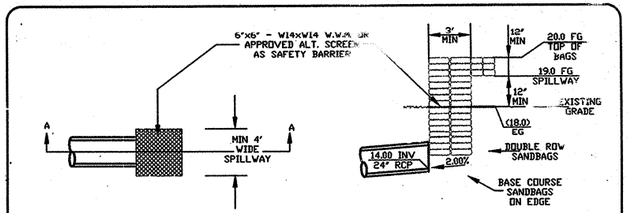
REINFORCED CONCRETE ENCASEMENT — NOT TO SCALE — H/12



CONCRETE SLURRY CAP — NOT TO SCALE — J/12



FAR HILLS AVE - 8'x6' RCB
STORM DRAIN LATERAL PROFILE — SCALE: NOT TO SCALE — D/12

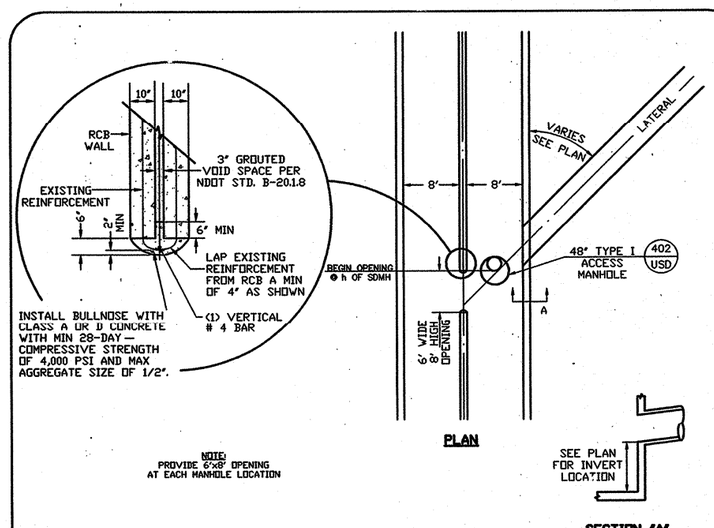


* GRAVEL BAGS ARE AN ACCEPTABLE SUBSTITUTE FOR SANDBAGS

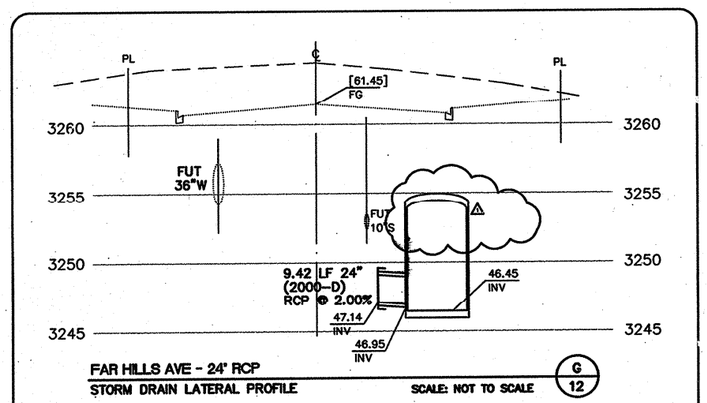
PLAN — SECTION A-A

TEMPORARY INLET STRUCTURE — NOT TO SCALE — C/12

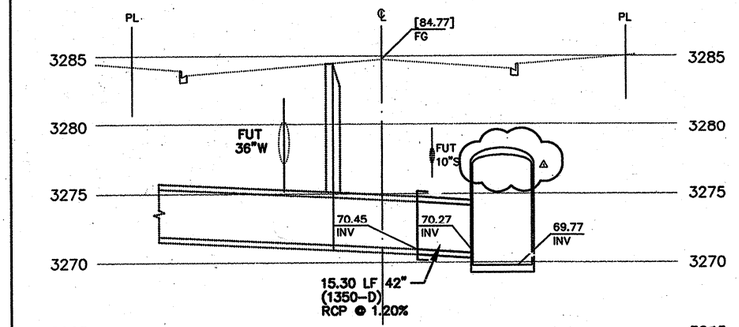
(MAINTAINED BY SUMMERLIN UNTIL PERMANENT FACILITY)



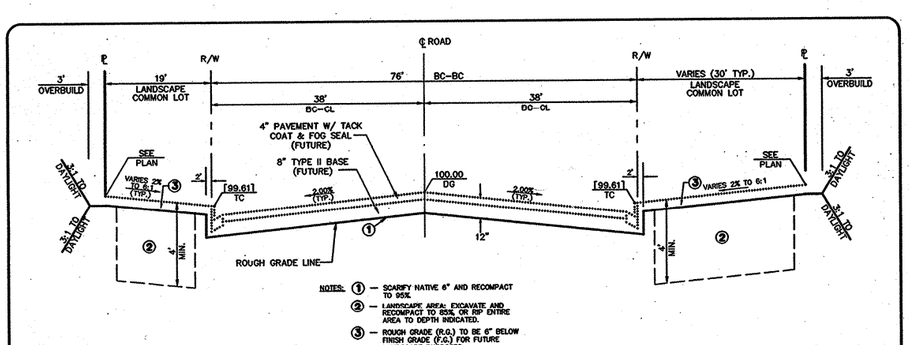
MANHOLE AND FLOW EQUALIZER DETAIL
8'x8' (2) RCB — NOT TO SCALE — B/12



FAR HILLS AVE - 24" RCP
STORM DRAIN LATERAL PROFILE — SCALE: NOT TO SCALE — G/12

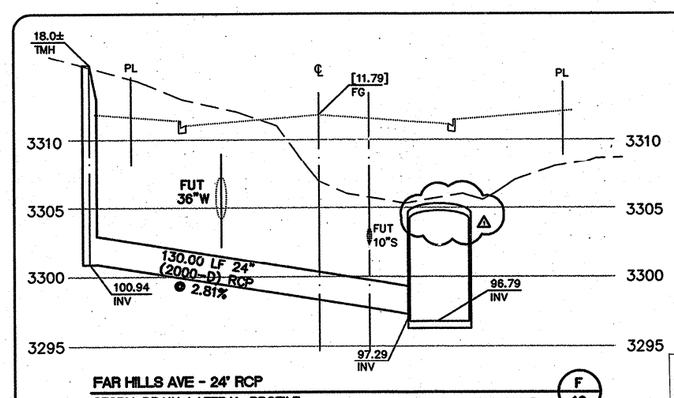


FAR HILLS AVE - 42" RCP
STORM DRAIN LATERAL PROFILE — SCALE: NOT TO SCALE — E/12

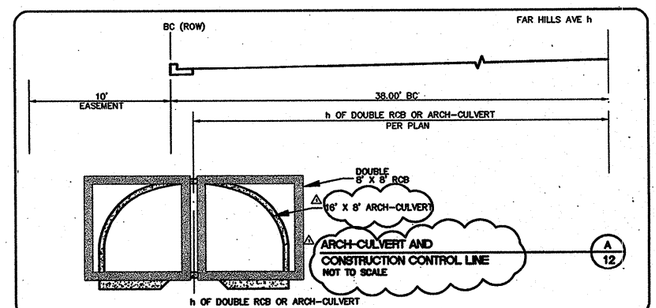


NOTES: ① — SCARIFY NATIVE 6" AND RECOMPACT TO 95%
② — LANDSCAPE AREA: EXCAVATE AND RECOMPACT TO 85%, OR RIP ENTIRE AREA TO DEPTH INDICATED.
③ — ROUGH GRADE (R.G.) TO BE 6" BELOW FINISH GRADE (F.G.) FOR FUTURE LANDSCAPE PURPOSES.

FAR HILLS AVENUE - TYPICAL SECTION — SCALE: N.T.S. — 1/12



FAR HILLS AVE - 24" RCP
STORM DRAIN LATERAL PROFILE — SCALE: NOT TO SCALE — F/12



ARCH-CULVERT AND CONSTRUCTION CONTROL LINE
NOT TO SCALE — A/12

RECORD DRAWINGS

THESE PLANS SHOW RECORD INFORMATION RECEIVED FROM:

CONTRACTOR: COMTH CONSTRUCTION COMPANY DATE:

THIS DATA MAY OR MAY NOT REFLECT THE ACTUAL FIELD LOCATIONS. ALL DATA SHOULD BE CONFIRMED PRIOR TO USE ON DEVELOPMENT OR ENGINEERING PLANS.

NOTE TO CONTRACTOR
1. ALL EXISTING UTILITY CROSSINGS MUST BE VERIFIED PRIOR TO CONSTRUCTION OF ANY MAIN LINES OR LATERALS THAT MAY BE ADVERSELY EFFECTED. ANY DISCREPANCIES IN LOCATION AND/OR ELEVATION MUST BE PROVIDED TO THE ENGINEER FOR ACCEPTANCE PRIOR TO CONSTRUCTION.
2. TOPOGRAPHY SHOWN HEREIN REFLECTS ORIGINAL EXISTING TOPOGRAPHY. ACTUAL FIELD CONDITIONS INCLUDE SITE ROUGH GRADING.
3. ALL COMMON LOTS AS SHOWN HEREIN TO BE PRIVATELY MAINTAINED BY THE H.O.A.

BERT J. HUGHES — STATE OF NEVADA — No. 10256 — JUNE 30, 2000 — DATE: 8/2/00

REV	DATE	DESCRIPTION	BY	APP
1	10/20/00	REVISIONS PER CONT. COMMENTS FOR RECORD DRAWINGS	JRH	
2	12/21/00	REVISIONS TO UNIT SIZES	JRH	
3	7/24/01	REPLACE 8'x8' RCB W/16'x8' ARCH CULVERT STA. 485+08.37 - 484+51.8	JRH	

DESIGN: JRH
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 08-17-00
PLOT TIME: 11:14:05
bradst

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD.,LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 FAX (702) 804-2299

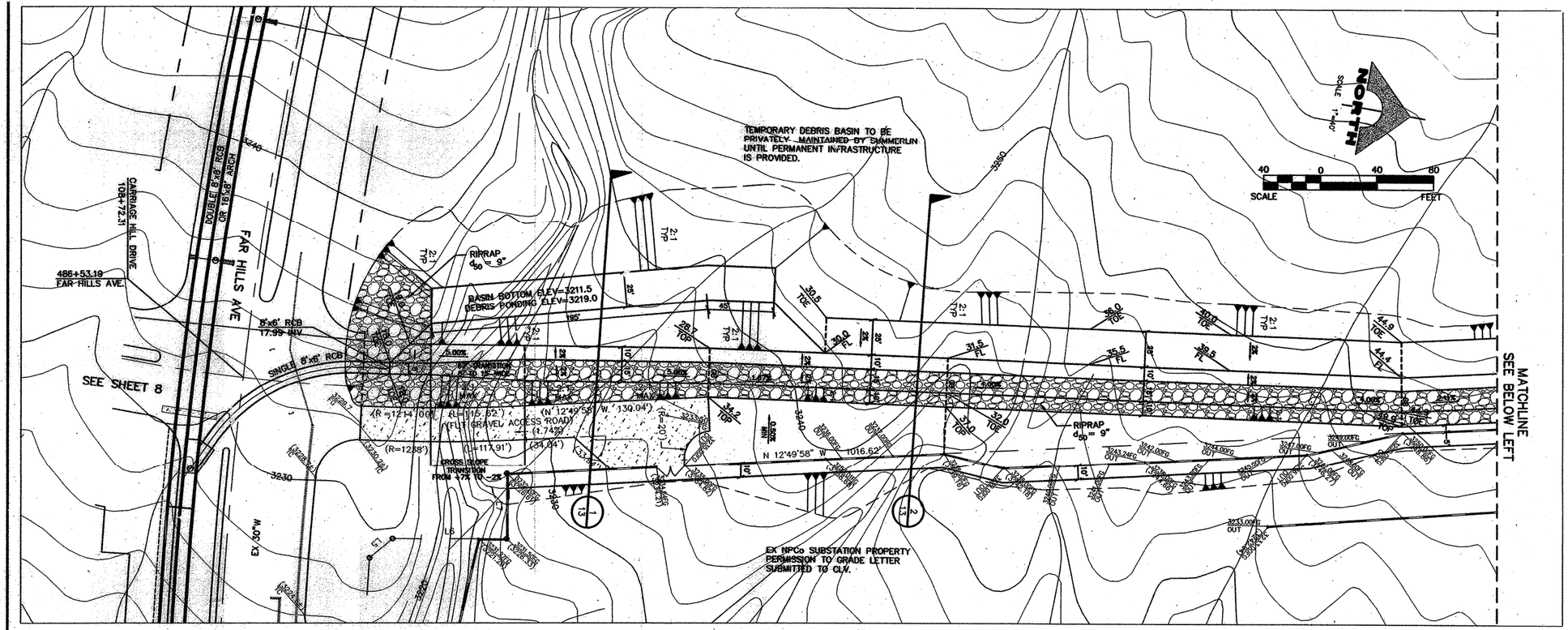
F:\V20\FHA-RCB\dwg\img\RHCH012.dwg

AUGUST 02, 2000 ISSUE - JR AGENCY APPROVAL

SUMMERLIN
VILLAGE 20/21 FAR HILLS AVE
DRAINAGE AND GRADING IMPROVEMENTS
MISCELLANEOUS DETAIL SHEET

SHEET 12
12 OF 16 SHTS

JOB NO. 62020.227

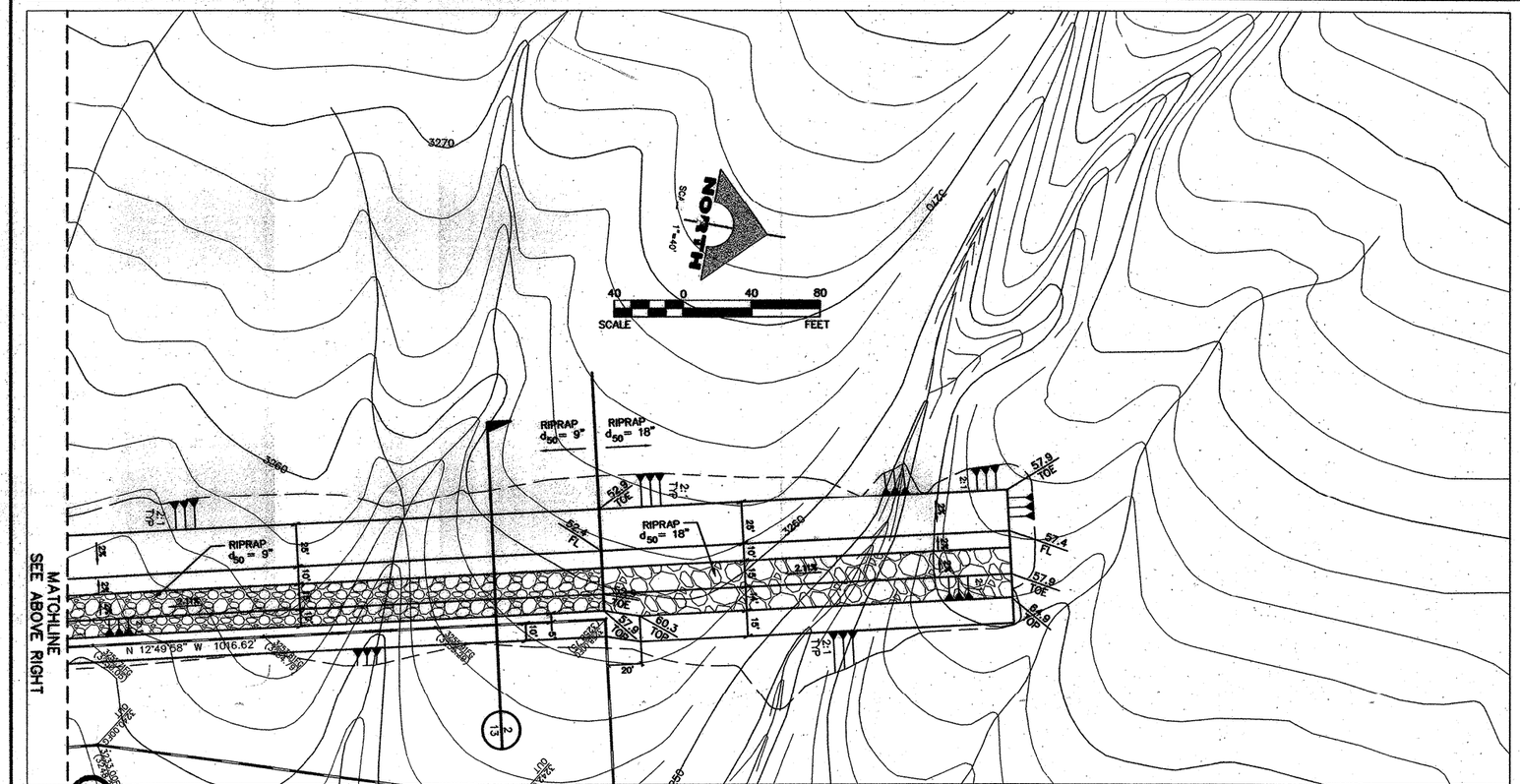


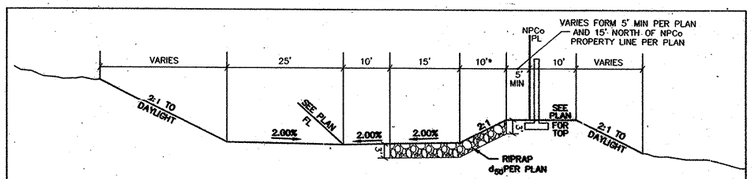
EXISTING IMPROVEMENTS

1. FOR EXISTING ROUGH GRADING SEE VILLAGE 20 – ROUGH GRADING BY G.C. WALLACE INC. JOB NO. 62020.201
2. FOR EXISTING DIVERSION BERMS SEE VILLAGE 20 INTERIM DRAINAGE DIVERSIONS BY G.C. WALLACE INC. JOB NO. 62020.2012
3. FOR EXISTING WATER LINE SEE 3320 ZONE PIPELINE PHASE 1 BY G.C. WALLACE INC. LVVWD CONT 878
4. FOR EX WESTERN BELTWAY SEE WESTERN SEGMENT LAS VEGAS BELTWAY CHARLESTON BOULEVARD TO SUMMERLIN PARKWAY PER LOUIS BERGER AND ASSOCIATES

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
CALL 1-702-593-6111

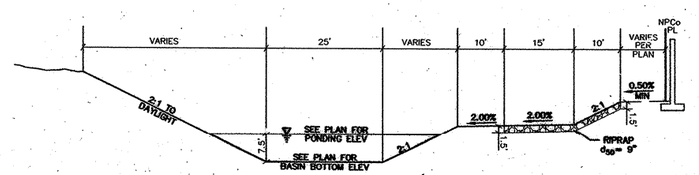
Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600





DIVERSION CHANNEL CROSS SECTION (2)
SCALE: N.T.S.

* 14' (7' HIGH BERM) NORTH OF NEVADA POWER COMPANY SWITCH STATION PROPERTY LINE



DEBRIS BASIN CROSS SECTION (1)
SCALE: N.T.S.

RECORD DRAWINGS
THESE PLANS SHOW RECORD INFORMATION RECEIVED FROM:
CONTRACTOR: CONTH CONSTRUCTION COMPANY DATE:
THIS DATA MAY OR MAY NOT REFLECT THE ACTUAL FIELD LOCATIONS. ALL DATA SHOULD BE CONFIRMED PRIOR TO USE ON DEVELOPMENT OR ENGINEERING PLANS.

BERT A. HUGHES — NEVADA — PROFESSIONAL ENGINEER-STATE OF NEVADA — No. 10259 — DATE: 6/14/01

NO.	DESCRIPTION	DATE	APP'D
1	10/5/01 REVISE PER CONT. ASBUILTS FOR RECORD DRAWINGS		
2	9/7/01 REVISE PLATE 30 MANHOLE		

DESIGN: JJJ
DRAWN:
CHECK: BAH
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 09-20-00
PLOT TIME: 11:19:02

JUNE 02, 2000 ISSUE FOR AGENCY APPROVAL

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
F:\LV20\CIVIL-PCS\Cad Files\LV20CD13.dwg Johnson

SUMMERLIN
VILLAGE 20/21 FAR HILLS AVE
DRAINAGE AND GRADING IMPROVEMENTS
DEBRIS BASIN

SHEET 13
13 OF 16 SHTS

JOB NO. 62020.227

23846 (S)
107-V3296

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
FAR HILLS TO EAST WEST COLLECTOR
APN: 137-22-000-017
CITY OF LAS VEGAS
STATE OF NEVADA

DEVELOPED BY:

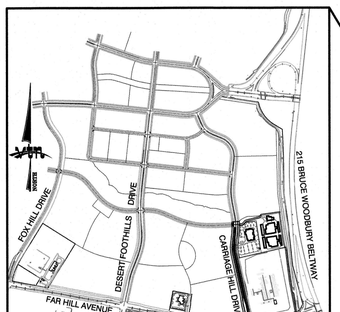
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY

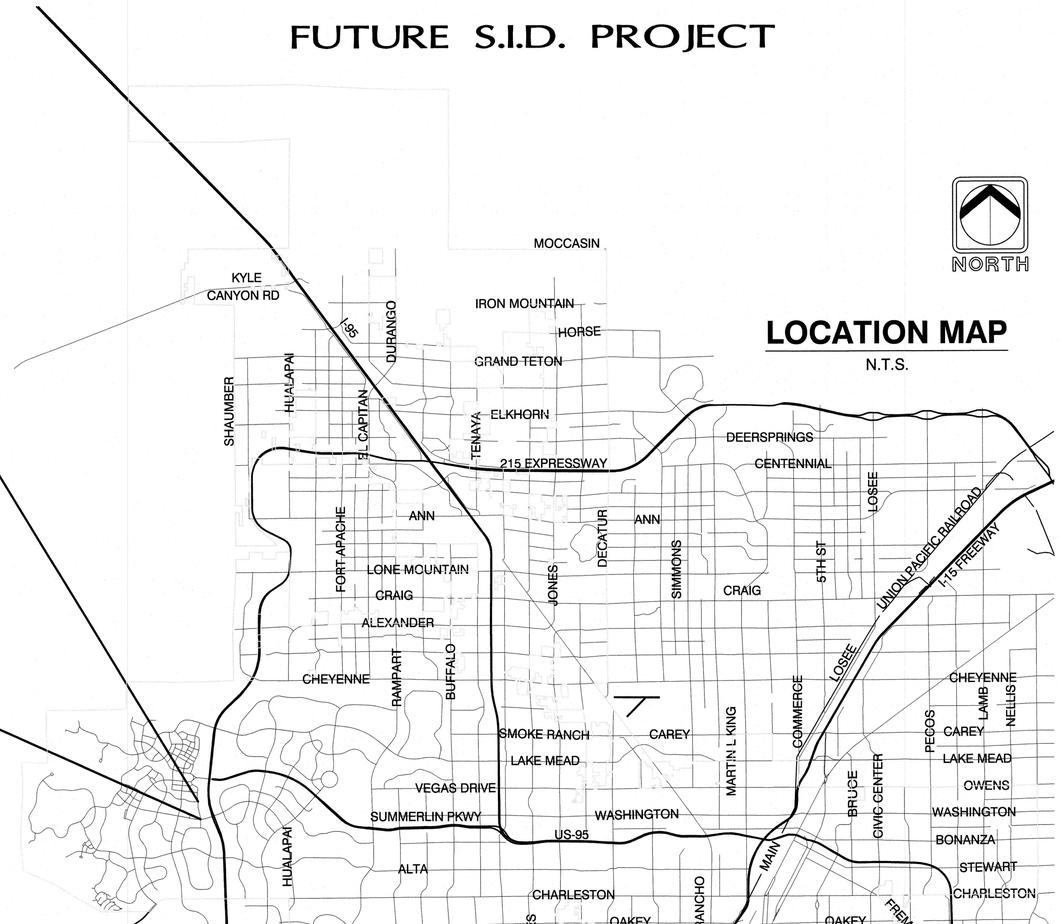
10801 W CHARLESTON BLVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

FUTURE S.I.D. PROJECT

SHEET INDEX

SHEET #	SHEET	DESCRIPTION	STATION RANGE
1	CV	COVER SHEET	
2	NT	NOTE SHEET	
3	HC	HORIZONTAL CONTROL PLAN	
4	MUTW	MASTER WATER UTILITY	
5	MUTSD	MASTER STORM DRAIN UTILITY	
6	MUTSS	MASTER SANITATION SEWER UTILITY	
7	MGRD	MASTER GRADING PLAN	
8	GR1	GRADING DRAINAGE PLAN 1	
9	GR2	GRADING DRAINAGE PLAN 2	
10	GR3	GRADING DRAINAGE PLAN 3	
11	GR4	GRADING DRAINAGE PLAN 4	
12	GR5	GRADING DRAINAGE PLAN 5	
13	DT1	DETAIL SHEET	
14	UT1	UTILITY PLAN & PROFILE 1	10+00 TO 13+50
15	UT2	UTILITY PLAN & PROFILE 2	13+50 TO 17+00
16	UT3	UTILITY PLAN & PROFILE 3	17+00 TO 21+00
17	UT4	UTILITY PLAN & PROFILE 4	21+00 TO 25+00
18	UT5	UTILITY PLAN & PROFILE 5	25+00 TO 28+70.63
19	UT6	UTILITY PLAN & PROFILE 6	
20	UT7	UTILITY PLAN & PROFILE 7	
21	UT8	UTILITY PLAN & PROFILE 8	
22	UT9	UTILITY PLAN & PROFILE 9	
23	UT10	UTILITY PLAN & PROFILE 10	
24	ST1	STREET PLAN & PROFILE 1	10+00 TO 14+00
25	ST2	STREET PLAN & PROFILE 2	14+00 TO 18+00
26	ST3	STREET PLAN & PROFILE 3	18+00 TO 22+50
27	ST4	STREET PLAN & PROFILE 4	22+50 TO 26+00
28	ST5	STREET PLAN & PROFILE 5	26+00 TO 28+60.32
29	TR1	SIGNING AND STRIPING PLAN 1	
30	TR2	SIGNING AND STRIPING PLAN 2	
31	TR3	SIGNING AND STRIPING PLAN 3	
32	TR4	SIGNING AND STRIPING PLAN 4	
33	SL1	STREET LIGHTING PLAN 1	
34	SL2	STREET LIGHTING PLAN 2	
35	SL3	STREET LIGHTING PLAN 3	
36	SL4	STREET LIGHTING PLAN 4	
37	TS1	TRAFFIC SIGNAL PLAN 1	
38	TS2	TRAFFIC SIGNAL PLAN 2	
39	TS3	TRAFFIC SIGNAL PLAN 3	
40	TS4	TRAFFIC SIGNAL PLAN 4	
41	SI1	STRUCTURAL DETAILS	





LOCATION MAP
N.T.S.

NORTH

OWNER
HOWARD HUGHES COMPANY, LLC
10801 W CHARLESTON BLVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVE SUITE 300
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

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

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY
Call before you Dig Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-9611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

FIRE DEPARTMENT APPROVAL

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

90%
NOT FOR CONSTRUCTION
03/05/2018

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

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE. NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

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

CITY ENGINEER ALLEN PAVELKA, P.E. # 9029

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

DIRECTOR OF BUILDING & SAFETY DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

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 MANAGER

PROJECT:---- DATE:_____

SHEETS:

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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

COVER SHEET

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE FAR HILLS TO EAST WEST COLLECTOR

DRAWN BY: DEH	10/23/2017
DESIGNED BY: DEH	10/23/2017
CHECKED BY: WJM	02/07/2018
PROJECT NO: 7351	SCALE: 1"=20' HORZ. N/A VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
3/6/18

SHEET
CV
1 OF 41 SHEETS
DRAWING NO.

H:\7351\Carriage Hill Drive-South\Sheet Set\7351-CV.dwg

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 INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: ----, PROJECT NO. ----, DATED ----, 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 02/03/15

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)

ABBREVIATIONS

FF	FINISH FLOOR	PT	POINT OF TANGENCY	O/C	OFFSET CROWN
FG	FINISH GRADE	PRC	POINT OF REVERSE CURVATURE	BC	BACK OF CURB
FL	FLOW LINE	PCC	POINT OF COMPOUND CURVATURE	BCR	BEGIN CURB RETURN
TC	TOP OF CURB	BVC	BEGIN VERTICAL CURVE	BCL	BACK OF CURB LENGTH
TRC	TOP OF ROLL CURB	MVC	MID-POINT OF VERTICAL CURVE	TF	TOP OF FOOTING
EOP	EDGE OF ASPHALT PAVEMENT	EVC	END VERTICAL CURVE	GB	GRADE BREAK
FUT.	FUTURE	PRVC	POINT OF REVERSE VERTICAL CURVE	PC	POINT OF CURVATURE
EX	EXISTING	R/W	RIGHT-OF-WAY	TPW	TOP OF PLANTER WALL
VG	VALLEY GUTTER	DI	DROP INLET	TRW	TOP OF RETAINMENT WALL
NG	NATURAL GROUND	BFE	BASE FLOOD ELEVATION	TOP	TOP OF CHANNEL/SCARP
H.P.	HIGH POINT	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS	TOE	TOE OF CHANNEL/SCARP
L.P.	LOW POINT	SW	SIDEWALK	TOB	TOP OF BOX
SSMH	SEWER MANHOLE	TSW	TOP OF SIDEWALK	PP	POWER POLE
WTR	WATER LINE	INT.	INTERSECTION	TRANS.	TRANSITION
SD	STORM DRAIN	D.G.	DESIGN GRADE	RET.	RETAINMENT
RCP	REINFORCED CONCRETE PIPE	C/L	CENTER LINE		

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 #6325 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 § 105.7.12]
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 § C102.12]
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. SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN. [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 40 FT FLOW LINE TO FLOW LINE WITH PARALLEL PARKING PERMITTED ON BOTH SIDES. NOT LESS THAN 32 FT WIDE, FLOW-LINE TO FLOW-LINE, WHERE PARKING IS PERMITTED ONLY ON ONE SIDE OF THE FIRE APPARATUS ACCESS ROAD. NOT LESS THAN 24 FT WIDE, FLOW-LINE TO FLOW-LINE, WHERE NO PARKING IS PERMITTED ON EITHER SIDE. 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. THIS DISTANCE COULD BE INCREASED TO 250 FT IF THE BUILDING IS SPRINKLERED. [IFC § 503.1.1
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT, COMMERCIAL AND INDUSTRIAL DEVELOPMENTS WHERE BUILDINGS EXCEED 2 STORIES OR 30 FEET IN HEIGHT, OR EXCEEDING 62,000 SQUARE FEET IN AREA. [IFC § 503.1.2]
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. [IFC § 503.2.5]
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. SAID SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE IFC § 503.6 AND IFC APPENDIX M.

EFFECTIVE DATE: MARCH 1st, 2016

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 CCAUSS 627 AND 716 AND SHALL HAVE AN ANTI-GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.
10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK 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.

REVISED 7/3/13

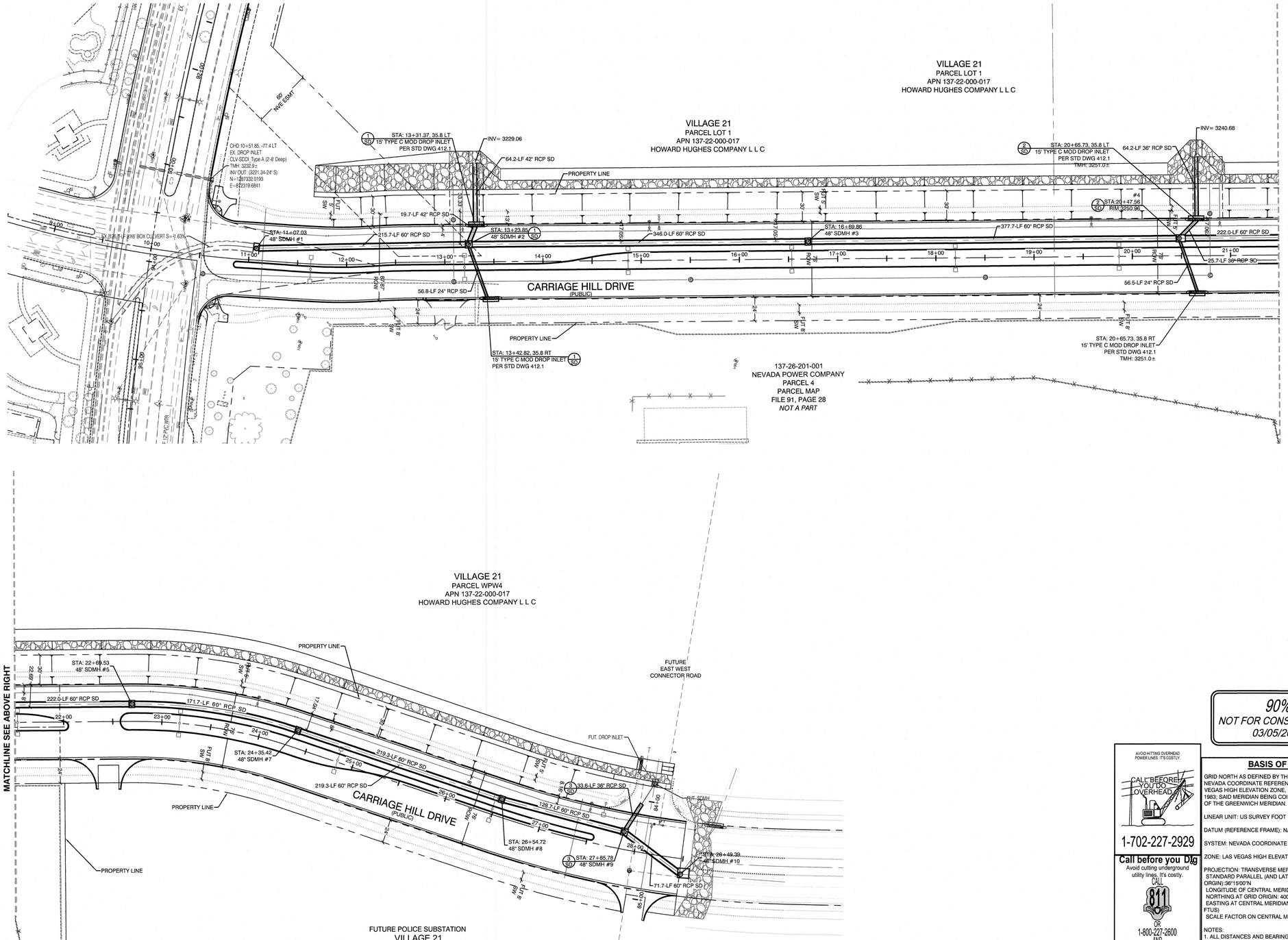
LAS VEGAS VALLEY WATER DISTRICT STANDARD NOTES

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 3:00 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 SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802, TWO (2) WORKING DAYS PRIOR TO METER PICKUP.
11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01, AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600.
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDE THE PLACEMENT OF AN APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

    ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTEN



STORM DRAIN LATERAL NOTES

1 SD — SEE SHEET UT6 FOR PROFILE

2 SD — SEE SHEET UT8 FOR PROFILE

3 SD — SEE SHEET UT10 FOR PROFILE

90%
NOT FOR CONSTRUCTION
03/05/2018

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
IT'S COSTLY
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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 ORGIIN):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: D968 (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

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.23 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.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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

MASTER STORM DRAIN UTILITY

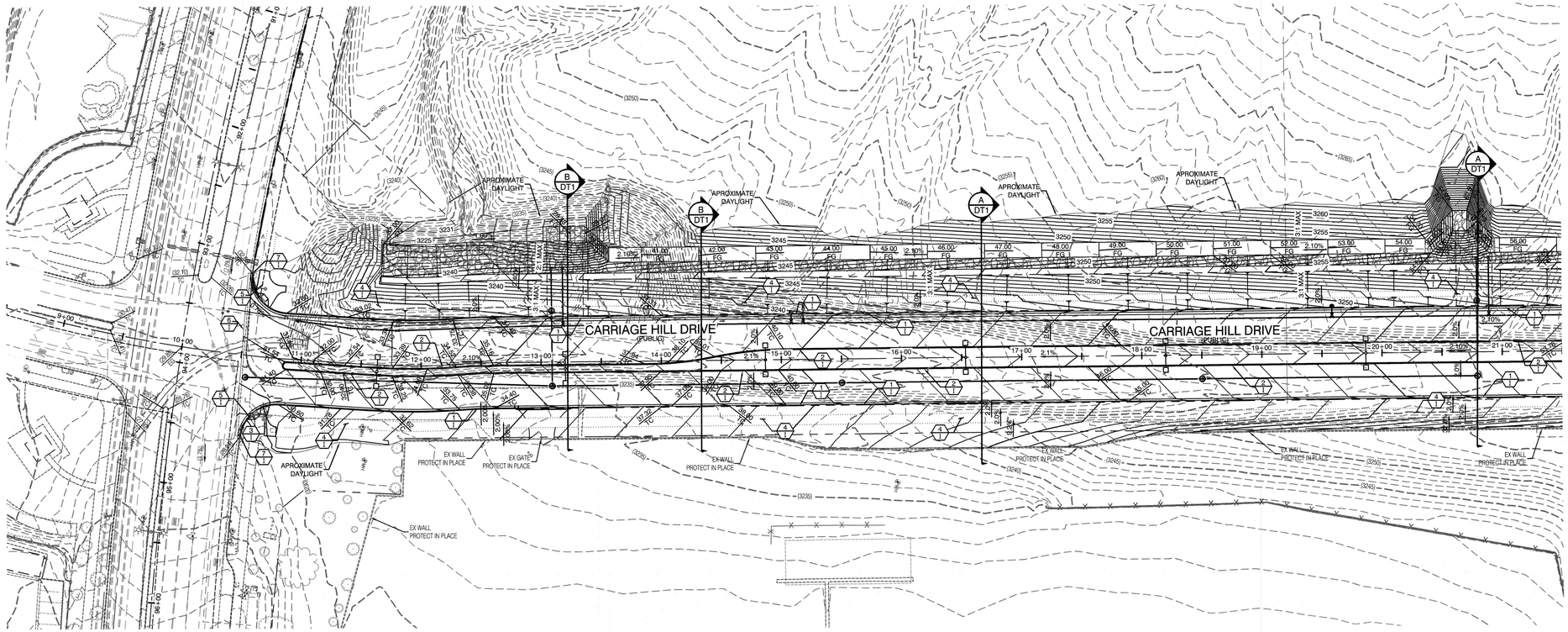
SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

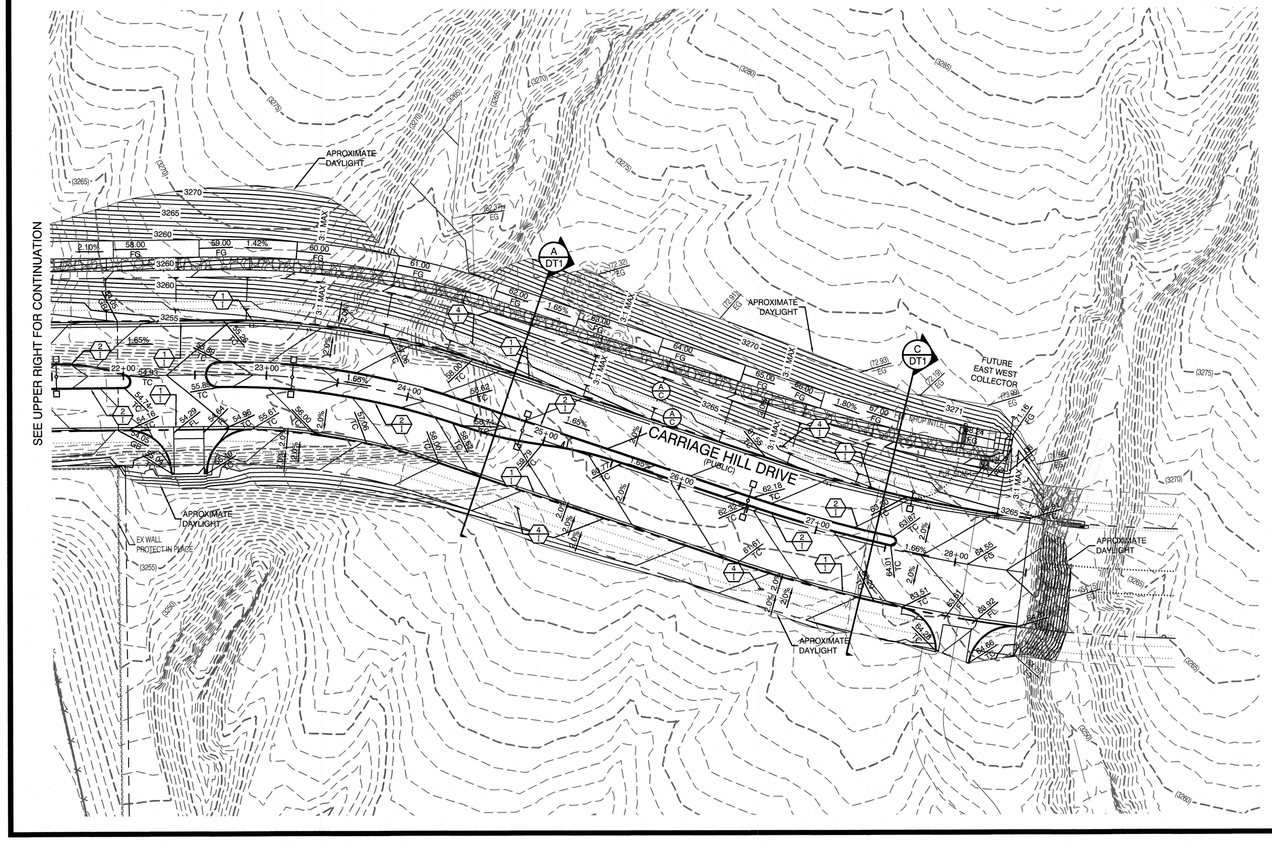
DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
DEH	DEH	WJM	7851	1"=50'	VERT.
10/23/2017	10/23/2017	02/07/2018		N/A	

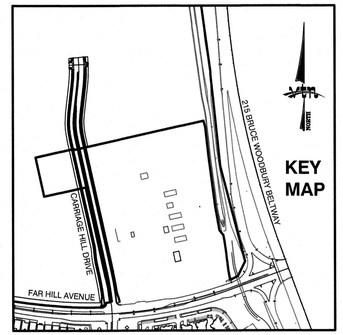
PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15745
WILLIAM J. METER
EXP: 12/31/19
CIVIL
2/6/18

SHEET
MUTSD
5 OF 41 SHEETS
DRAWING NO.

H:\7851\Carriage Hill Drive-South\Sheet Set\7851-MUTSD.dwg







GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

NORTH

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. RELOCATE STREET LIGHT SEE SL SHEETS
4. FUTURE SIDEWALK
5. CONSTRUCT HANDICAP RAMP PER STD. DWG. 235 CASE II
6. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
7. FIELD VERIFY AND MATCH EXISTING
8. CONSTRUCT COMMERCIAL DRIVEWAY PER STD DWG #224

AVOID HITTING OVERHEAD TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY.

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6811
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

SIDEWALK RAMPS TABLE

(PER CCAUSD No. 235, CASE I)

NO.	DIM "A"	DIM "B"	CASE
1	4.5'	12'	I
2	4.5'	9.5'	I
3	8'	8'	I
4	9.5'	4.5'	I
5	12'	4.5'	I

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

90%
NOT FOR CONSTRUCTION
03/05/2018

CLARK COUNTY TRAFFIC EXISTING FACILITIES LOCATION NOTE

CONTRACTOR SHALL CONTACT CLARK COUNTY TRAFFIC OPERATIONS DIRECTLY AT 455-6000 TO SCHEDULE COUNTY STAFF TO LOCATE UNDERGROUND STREETLIGHTING AND SIGNAL FACILITIES IN THE PROJECT AREA. A MINIMUM OF 48 HOURS NOTICE IS REQUIRED PRIOR TO LOCATES. HOURS OF OPERATION: 6:30 AM - 3:00 PM, MONDAY THROUGH FRIDAY EXCLUDING HOLIDAYS.

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, #----

WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
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

MASTER GRADING PLAN

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: BCC
10/23/2017

DESIGNED BY: ---

CHECKED BY: W.J.M

PROJECT NO: 7951

02/07/2018

SCALE: 1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
5/7/18

SHEET
MGRD
7 OF 41 SHEETS

DRAWING NO.

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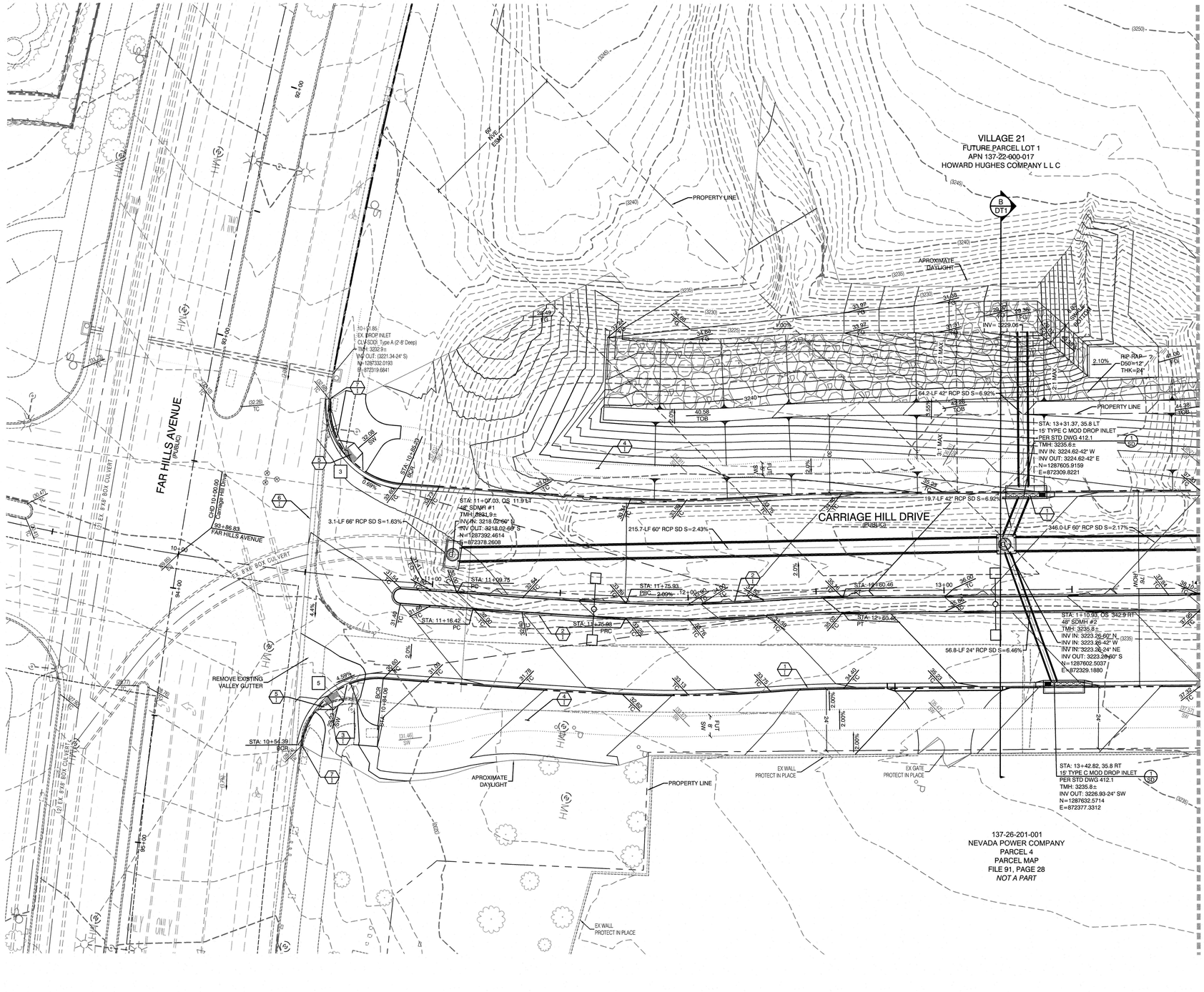

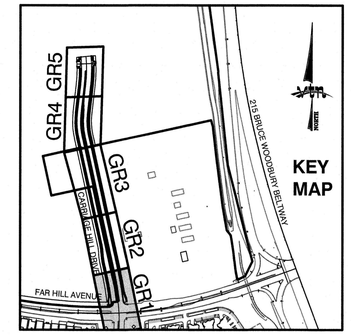

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

NORTH

CONSTRUCTION NOTES

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STORM DRAIN LATERAL NOTES

1. SEE SHEET UT6 FOR PROFILE
2. SEE SHEET UT8 FOR PROFILE
3. SEE SHEET UT10 FOR PROFILE

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CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

SIDEWALK RAMPS TABLE

(PER CCAUSD No. 235, CASE II)

NO.	DIM "A"	DIM "B"	CASE
1	4.5'	12'	II
2	4.5'	9.5'	II
3	8'	8'	II
4	9.5'	4.5'	II
5	15'	4.5'	II

BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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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

90%
NOT FOR CONSTRUCTION
03/05/2018

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WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD. SUITE 300
LAS VEGAS, NEVADA 89135
(702) 214-5000

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 DRAINAGE PLAN 1

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
DEH	DEH	WJM	1"=20'	N/A
02/05/2018	02/05/2018	02/07/2018		VERT.

PROJECT NO: 2851

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
STATE OF NEVADA
PROFESSIONAL ENGINEER

3/6/18

SHEET
GR1
8 OF 41 SHEETS

DRAWING NO.

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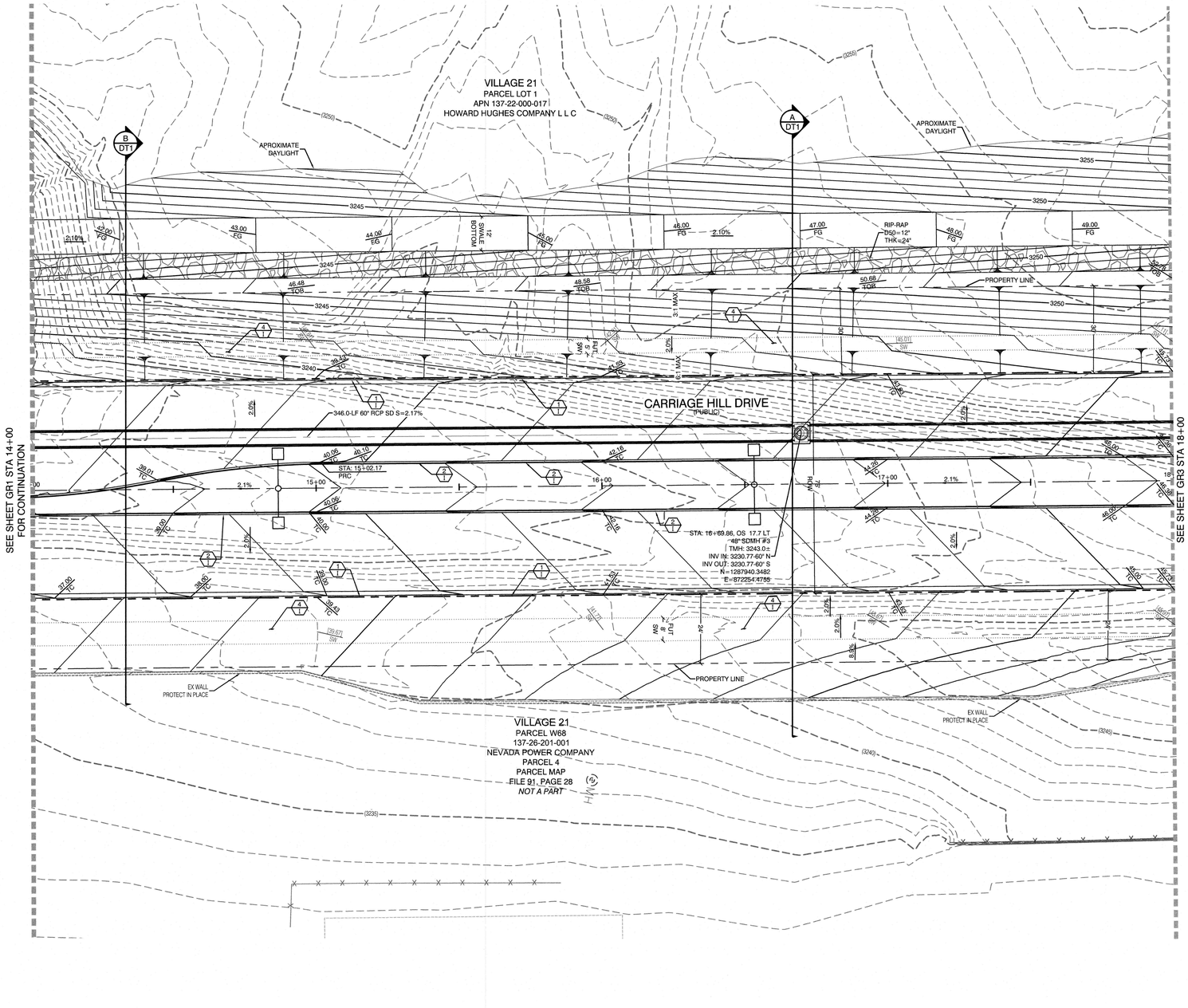

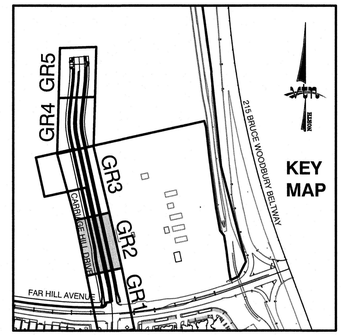

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
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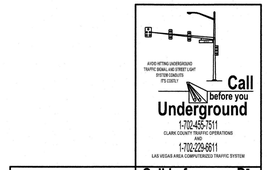
7. FIELD VERIFY AND MATCH EXISTING
8. CONSTRUCT COMMERCIAL DRIVEWAY PER STD DWG #224

STORM DRAIN LATERAL NOTES

1. SEE SHEET UT6 FOR PROFILE
2. SEE SHEET UT8 FOR PROFILE
3. SEE SHEET UT10 FOR PROFILE



SIDEWALK RAMPS TABLE

(PER CCAUSD No. 235, CASE II)

NO.	DIM "A"	DIM "B"	CASE
1	4.5'	12'	II
2	4.5'	9.5'	II
3	8'	8'	II
4	9.5'	4.5'	II
5	15'	4.5'	II

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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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

90%
NOT FOR CONSTRUCTION
03/05/2018

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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
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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

GRADING DRAINAGE PLAN 2

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ
DEH 02/05/2018	DEH 02/05/2018	WJM 02/07/2018	7851	1"=20'	VERT: N/A

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
2/6/18

SHEET
GR2
9 OF **41** SHEETS

DRAWING NO.

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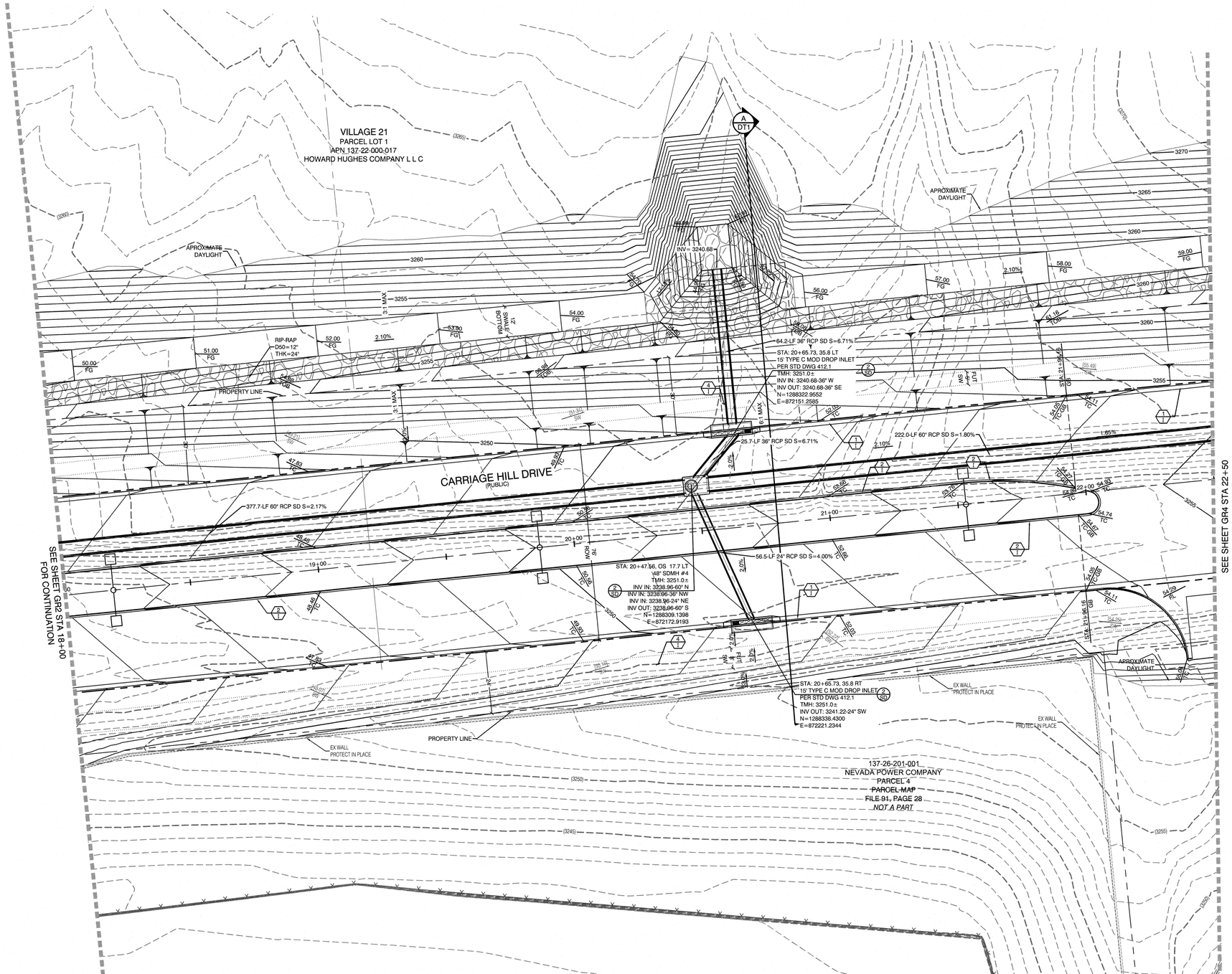

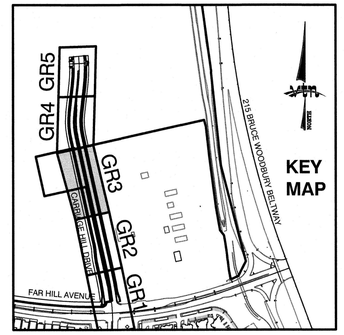

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

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Call before you Underground
1-702-455-7511 CLARK COUNTY TRAFFIC OPERATIONS
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DIAL 811 OR 1-800-227-2600 AND 1-702-455-6000 CLARK COUNTY TRAFFIC OPERATIONS

1-702-227-2929

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(PER CCAUSD No. 235, CASE II)

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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.

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, #----

WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 500
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

GRADING DRAINAGE PLAN 3

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DEH	02/05/2018	SCALE:	1"= 20' HORIZ.
DESIGNED BY: DEH	02/05/2018		N/A VERT.
CHECKED BY: WJM	02/07/2018	PROJECT NO:	7851

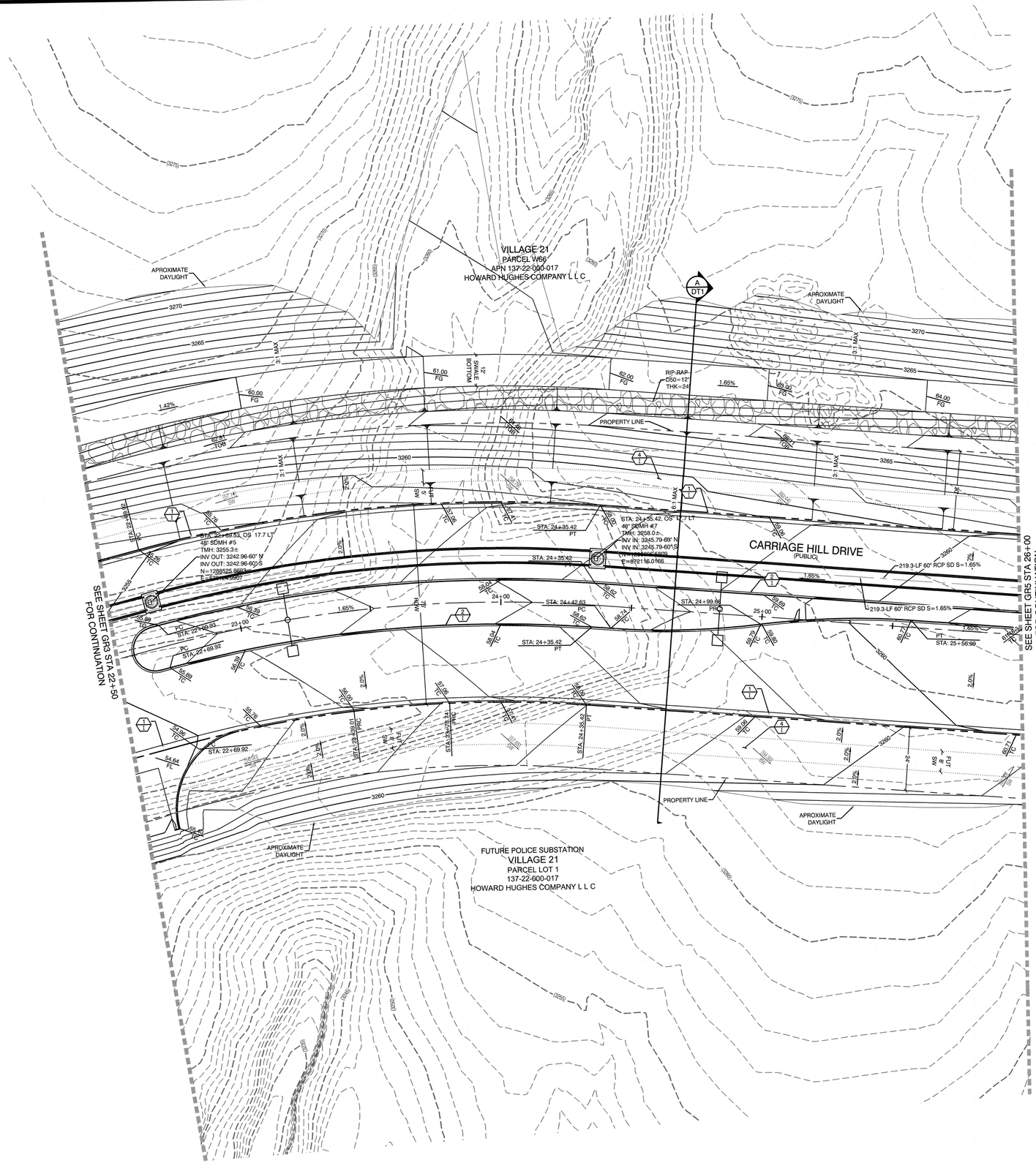
PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745

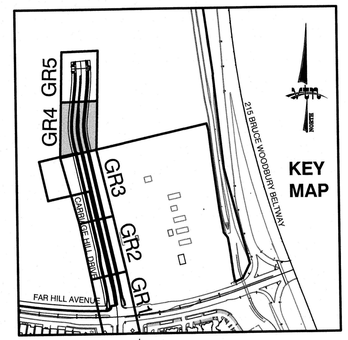
3/6/18

SHEET
GR3
10 OF 41 SHEETS

DRAWING NO.

H:\7851\Carriage Hill Drive-South\Sheet Set\7851-GRD.dwg





NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. RELOCATE STREET LIGHT SEE SL SHEETS
4. FUTURE SIDEWALK
5. CONSTRUCT HANDICAP RAMP PER STD. DWG. 235 CASE II
6. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
7. FIELD VERIFY AND MATCH EXISTING
8. CONSTRUCT COMMERCIAL DRIVEWAY PER STD DWG #224

STORM DRAIN LATERAL NOTES

- SDLT — SEE SHEET UT6 FOR PROFILE
- SDLT — SEE SHEET UT8 FOR PROFILE
- SDLT — SEE SHEET UT10 FOR PROFILE

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 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

SIDEWALK RAMPS TABLE

(PER CCAUSD No. 235, CASE II)

NO.	DIM "A"	DIM "B"	CASE
1	4.5'	12'	II
2	4.5'	9.5'	II
3	8'	8'	II
4	9.5'	4.5'	II
5	15'	4.5'	II

90%
NOT FOR CONSTRUCTION
03/05/2018

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°19'00"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

CLARK COUNTY TRAFFIC EXISTING FACILITIES LOCATION NOTE

CONTRACTOR SHALL CONTACT CLARK COUNTY TRAFFIC OPERATIONS DIRECTLY AT 455-6000 TO SCHEDULE COUNTY STAFF TO LOCATE UNDERGROUND STREETLIGHTING AND SIGNAL FACILITIES IN THE PROJECT AREA. A MINIMUM OF 48 HOURS NOTICE IS REQUIRED PRIOR TO LOCATES. HOURS OF OPERATION: 6:30 AM - 3:00 PM, MONDAY THROUGH FRIDAY EXCLUDING HOLIDAYS.

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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
1980 FESTIVAL PLAZA DRIVE, SUITE 300
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.UTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

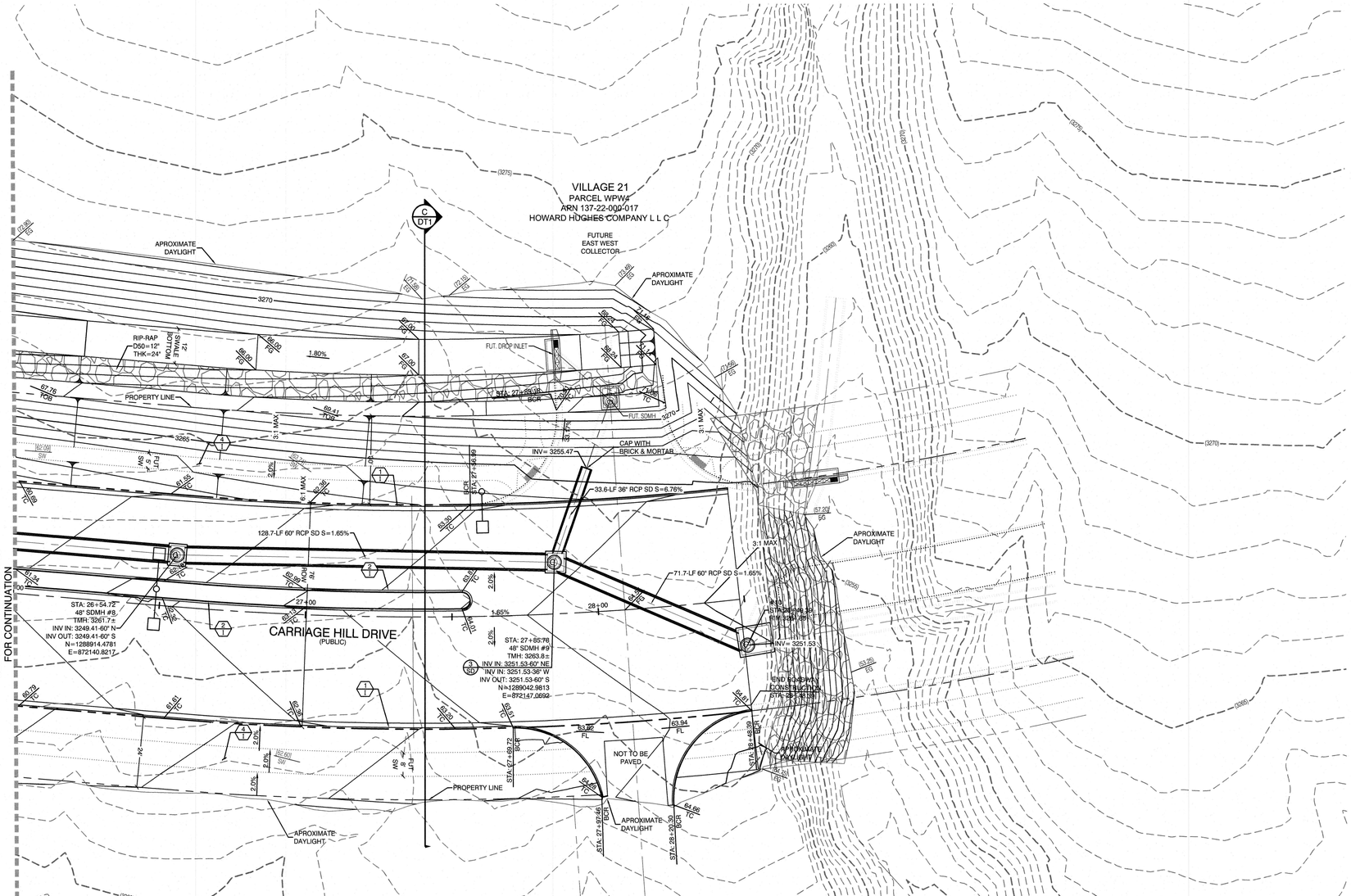
GRADING DRAINAGE PLAN 4

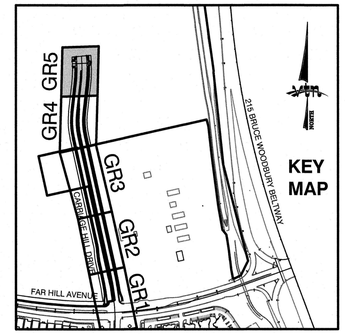
SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
DEH	DEH	WJM	7851	1"=20'	VERT: N/A
02/05/2018	02/05/2018	02/07/2018			

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
PROFESSIONAL ENGINEER STATE OF NEVADA

SHEET
GR4
11 OF 41 SHEETS
DRAWING NO.





NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

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2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
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STORM DRAIN LATERAL NOTES

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2. SEE SHEET UT8 FOR PROFILE
3. SEE SHEET UT10 FOR PROFILE

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OR
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AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

SIDEWALK RAMPS TABLE

(PER CCAUSD No. 235, CASE II)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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BENCHMARK

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

CITY OF LAS VEGAS BENCHMARK: D069 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

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T21S,R59E,S03

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WILLIAM J MEYER , P.E. No. 15745 DATE

90%
NOT FOR CONSTRUCTION
03/05/2018

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
(702) 291-6000

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

GRADING DRAINAGE PLAN 5

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

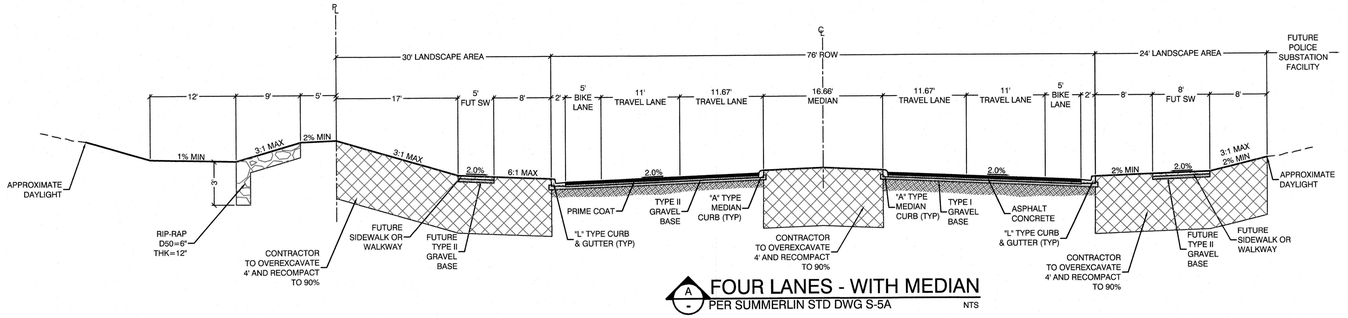
DRAWN BY: DEH — 02/05/2018
DESIGNED BY: DEH — 02/05/2018
CHECKED BY: WJM — 02/07/2018
PROJECT NO: 7801
SCALE: HORIZ. 1"=20' VERT. N/A

PROFESSIONAL ENGINEER · STATE OF NEVADA
WILLIAM J. MEYER
No. 15745
EXP: 12/31/19
CIVIL
3/6/19

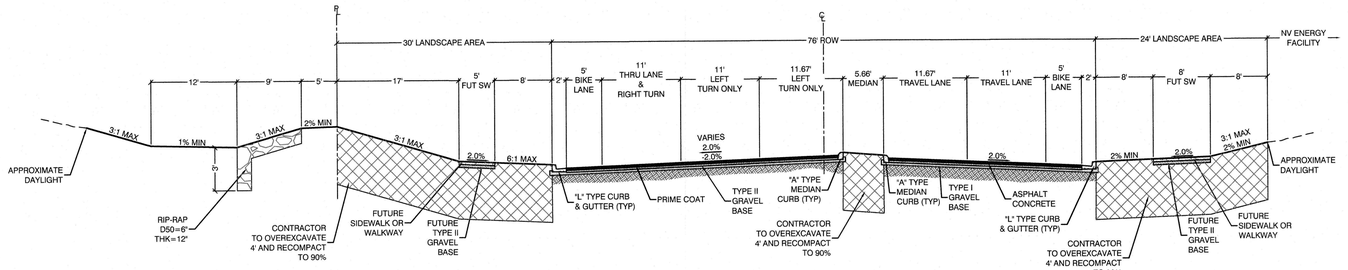
SHEET
GR5
12 OF 41 SHEETS

DRAWING NO.

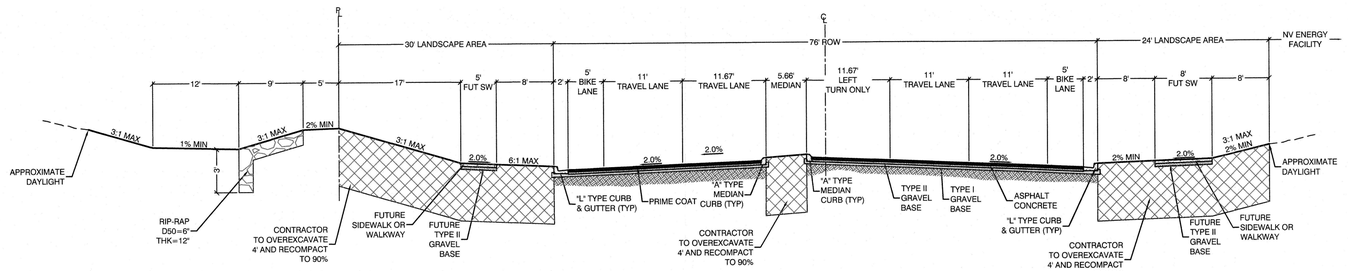
H:\7801\Carriage Hill Drive-South\Sheet Set\7801-GRD.dwg



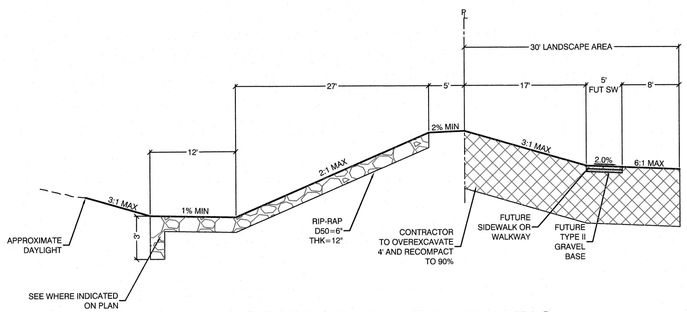
A - FOUR LANES - WITH MEDIAN
PER SUMMERLIN STD DWG S-5A NTS



B - CARRIAGE HILL & FAR HILLS INTERSECTION
SUMMERLIN WEST CUSTOM STREET SECTION NTS



C - CARRIAGE HILL & EAST WEST CONNECTOR INTERSECTION
SUMMERLIN WEST CUSTOM STREET SECTION NTS



RIP RAP SECTION AT INLET AREAS
NTS

90%
NOT FOR CONSTRUCTION
03/05/2018

REVISION	DATE	BY

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
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

DETAIL SHEET

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE: HORIZ. / VERT.
DEH 10/23/2017	DEH 10/23/2017	WJM 02/07/2018	7951	N/A / N/A

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
2/7/18

SHEET
DT1
13 OF 41 SHEETS

DRAWING NO.

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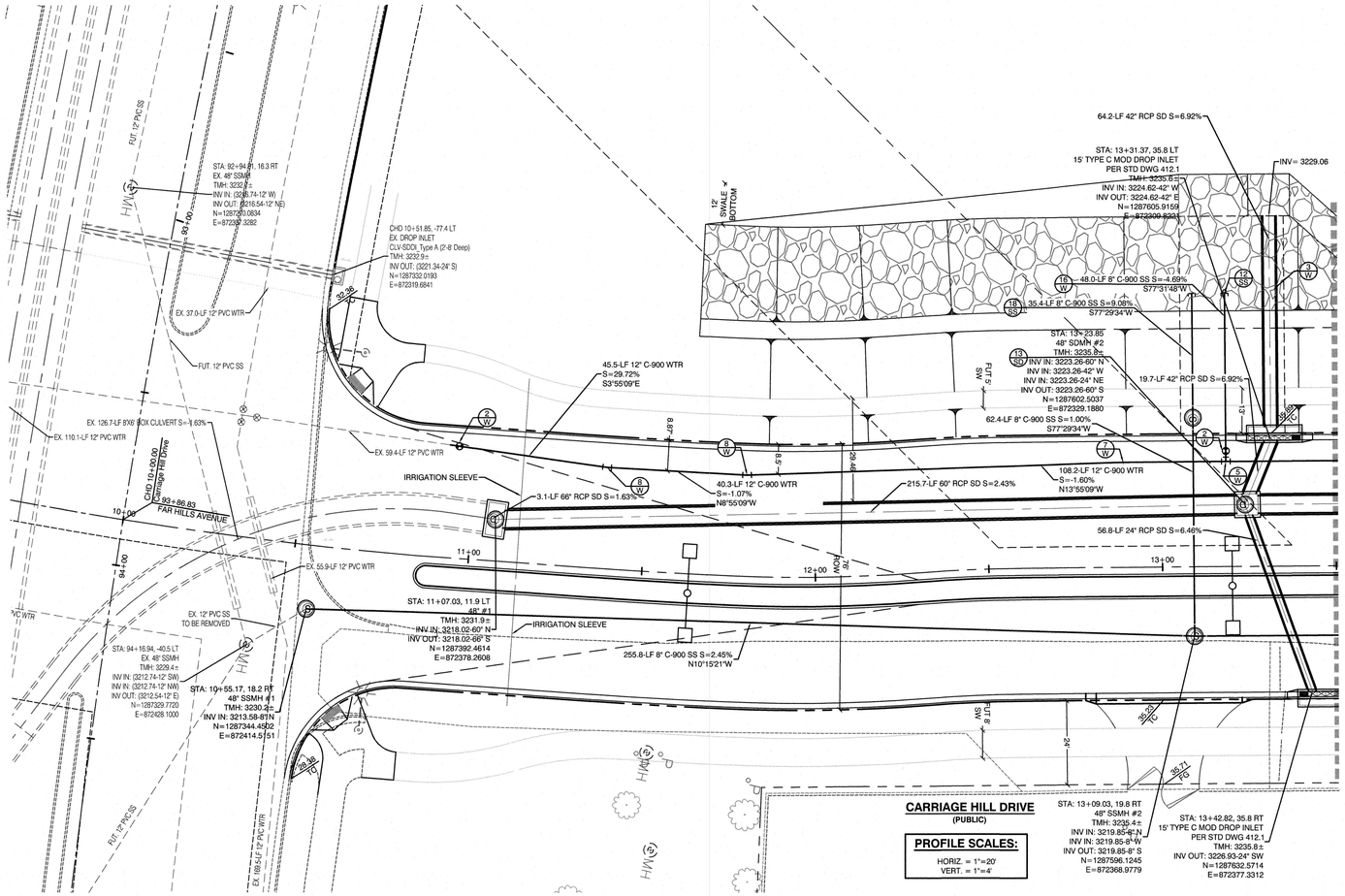

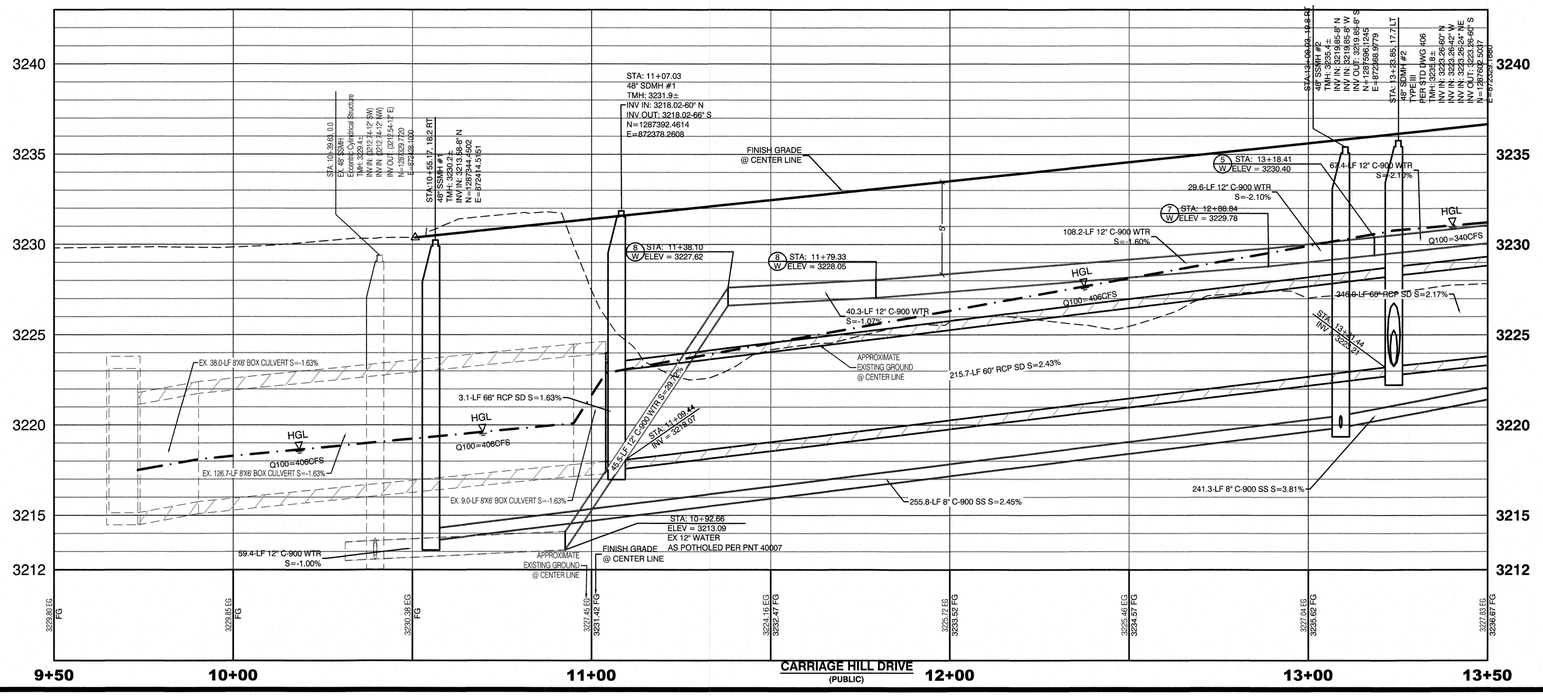

STORM DRAIN LATERAL NOTES

- SEE SHEET UT6 FOR PROFILE
- SEE SHEET UT8 FOR PROFILE
- SEE SHEET UT10 FOR PROFILE

WATER LATERAL NOTES

- SEE SHEET UT7 FOR PROFILE
- SEE SHEET UT9 FOR PROFILE

SEWER LATERAL NOTES

- SEE SHEET UT7 FOR PROFILE
- SEE SHEET UT9 FOR PROFILE

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

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

WATERLINE TRENCH NOTE:

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

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.

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 ---- GPM AT 20 P.S.I. RESIDUAL.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

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 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

	WATER	PUBLIC
W	FIRE HYDRANT ASSEMBLY: INCLUDING 12"X6" TEE WITH 6" G.V. (PER UDACS PLATE 39 & 40)	4 EA.
W	12" GATE VALVE (PER UDACS PLATE 39)	4 EA.
W	8" CAP & BLOW OFF (PER UDACS PLATE 36)	2 EA.
W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
W	12"X8" TEE (PER UDACS PLATE 31)	2 EA.
W	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
W	12" 1° BEND (PER UDACS PLATE 31)	1 EA.
W	12" 5° BEND (PER UDACS PLATE 31)	11 EA.
W	12" 11° BEND (PER UDACS PLATE 31)	2 EA.
W	12" 45° VERTICAL BEND (PER UDACS PLATE 31)	1 EA.
W	12"X1" REDUCER (PER UDACS PLATE 30)	1 EA.
W	1" LATERAL-COPPER WATER SERVICE WITH 1" METER PER UDACS PLATE 3 (IRRIGATION) AND 1" RPPA PER UDACS PLATE 8	1 EA.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,869 LF.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	39 LF.
	1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
POC	SEWER POINT OF CONNECTION		

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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90%
NOT FOR CONSTRUCTION
03/05/2018

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD. SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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

UTILITY PLAN & PROFILE 1
CARRIAGE HILL DRIVE
10+00 TO 13+50

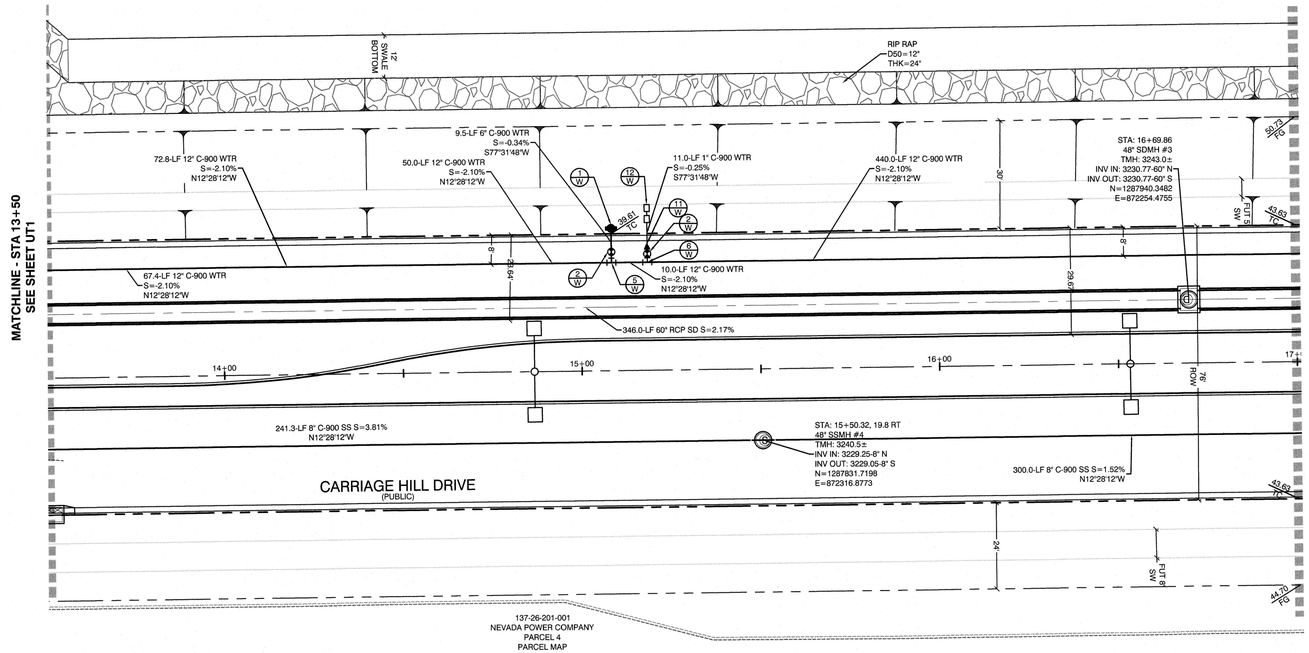
SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

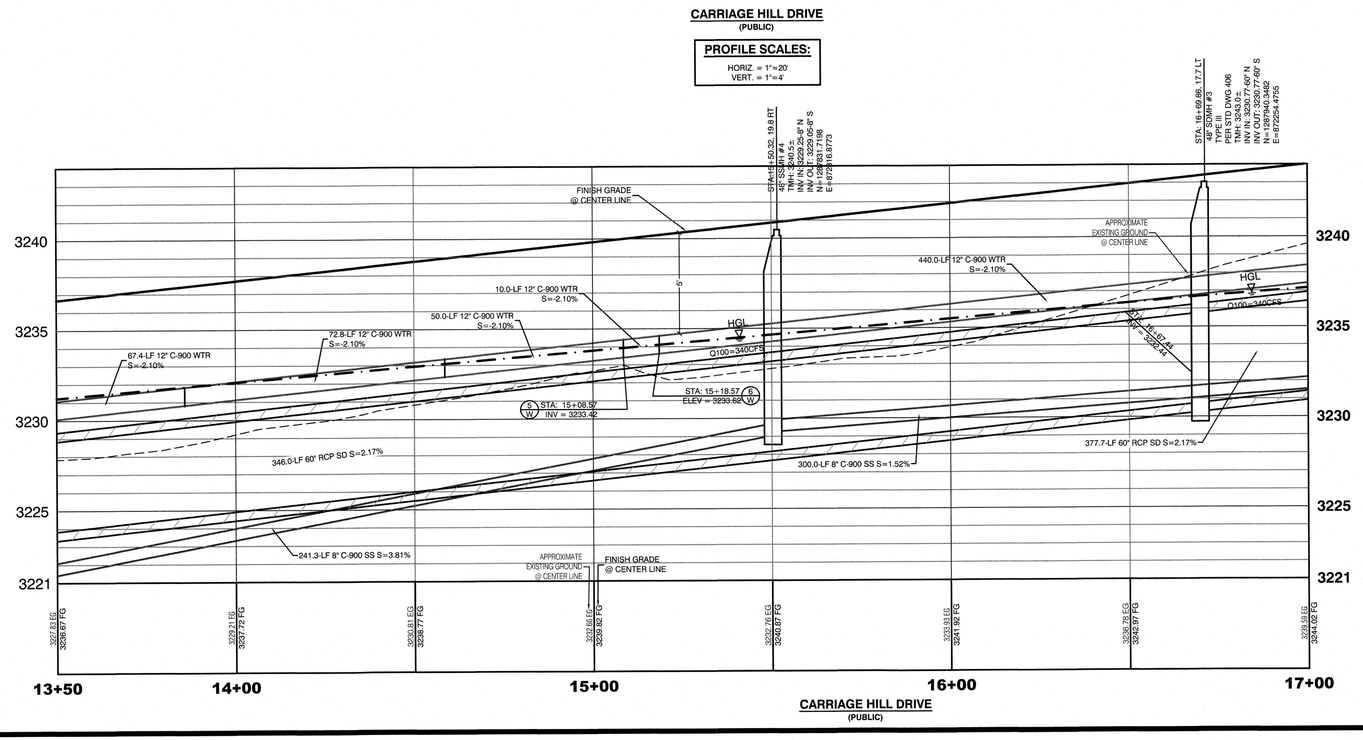
DRAWN BY: DEH 10/23/2017
DESIGNED BY: DEH 10/23/2017
CHECKED BY: WJM 02/07/2018
SCALE: HORZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7851

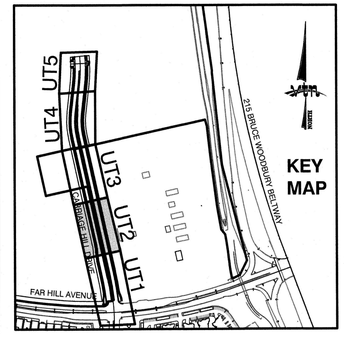
PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15748
6/18

SHEET
UT1
14 OF 41 SHEETS
DRAWING NO.

H:\7851\Carriage Hill Drive South\Sheet Set\7851-UT.dwg







GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

STORM DRAIN LATERAL NOTES

- (15/SD) SEE SHEET UT6 FOR PROFILE
- (16/SD) SEE SHEET UT8 FOR PROFILE
- (17/SD) SEE SHEET UT10 FOR PROFILE

WATER LATERAL NOTES

- (16/W) SEE SHEET UT7 FOR PROFILE
- (17/W) SEE SHEET UT9 FOR PROFILE

SEWER LATERAL NOTES

- (18/SS) SEE SHEET UT7 FOR PROFILE
- (19/SS) SEE SHEET UT9 FOR PROFILE

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

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

WATERLINE TRENCH NOTE:

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

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.

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 ---- GPM AT 20 P.S.I. RESIDUAL.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

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,S33

CONSTRUCTION NOTES

	WATER	PUBLIC
(1/W)	FIRE HYDRANT ASSEMBLY: INCLUDING 12"X6" TEE WITH 6" G.V. (PER UDACS PLATE 39 & 40)	4 EA.
(2/W)	12" GATE VALVE (PER UDACS PLATE 39)	4 EA.
(3/W)	8" CAP & BLOW OFF (PER UDACS PLATE 36)	2 EA.
(4/W)	12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
(5/W)	12"X8" TEE (PER UDACS PLATE 31)	2 EA.
(6/W)	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
(7/W)	12" 1° BEND (PER UDACS PLATE 31)	1 EA.
(8/W)	12" 5° BEND (PER UDACS PLATE 31)	11 EA.
(9/W)	12" 11° BEND (PER UDACS PLATE 31)	2 EA.
(10/W)	12" 45° VERTICAL BEND (PER UDACS PLATE 31)	1 EA.
(11/W)	12"X1" REDUCER (PER UDACS PLATE 30)	1 EA.
(12/W)	1" LATERAL-COPPER WATER SERVICE WITH 1" METER PER UDACS PLATE 3 (IRRIGATION) AND 1" RPPA PER UDACS PLATE 8	1 EA.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,869 LF.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	39 LF.
	1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
(S)	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
C	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
POC	SEWER POINT OF CONNECTION		

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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UTILITY CROSSING NOTE:

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90%
NOT FOR CONSTRUCTION
03/05/2018

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVE SUITE 300
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) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 2
CARRIAGE HILL DRIVE
13+50 TO 17+00

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DEH — 10/23/2017
DESIGNED BY: DEH — 10/23/2017
CHECKED BY: WJM — 02/07/2018
PROJECT NO: 7351 — SCALE: 1"=20' HORIZ, 1"=4' VERT.

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
PROFESSIONAL ENGINEER - STATE OF NEVADA

3/6/18

SHEET
UT2
15 OF 41 SHEETS
DRAWING NO.

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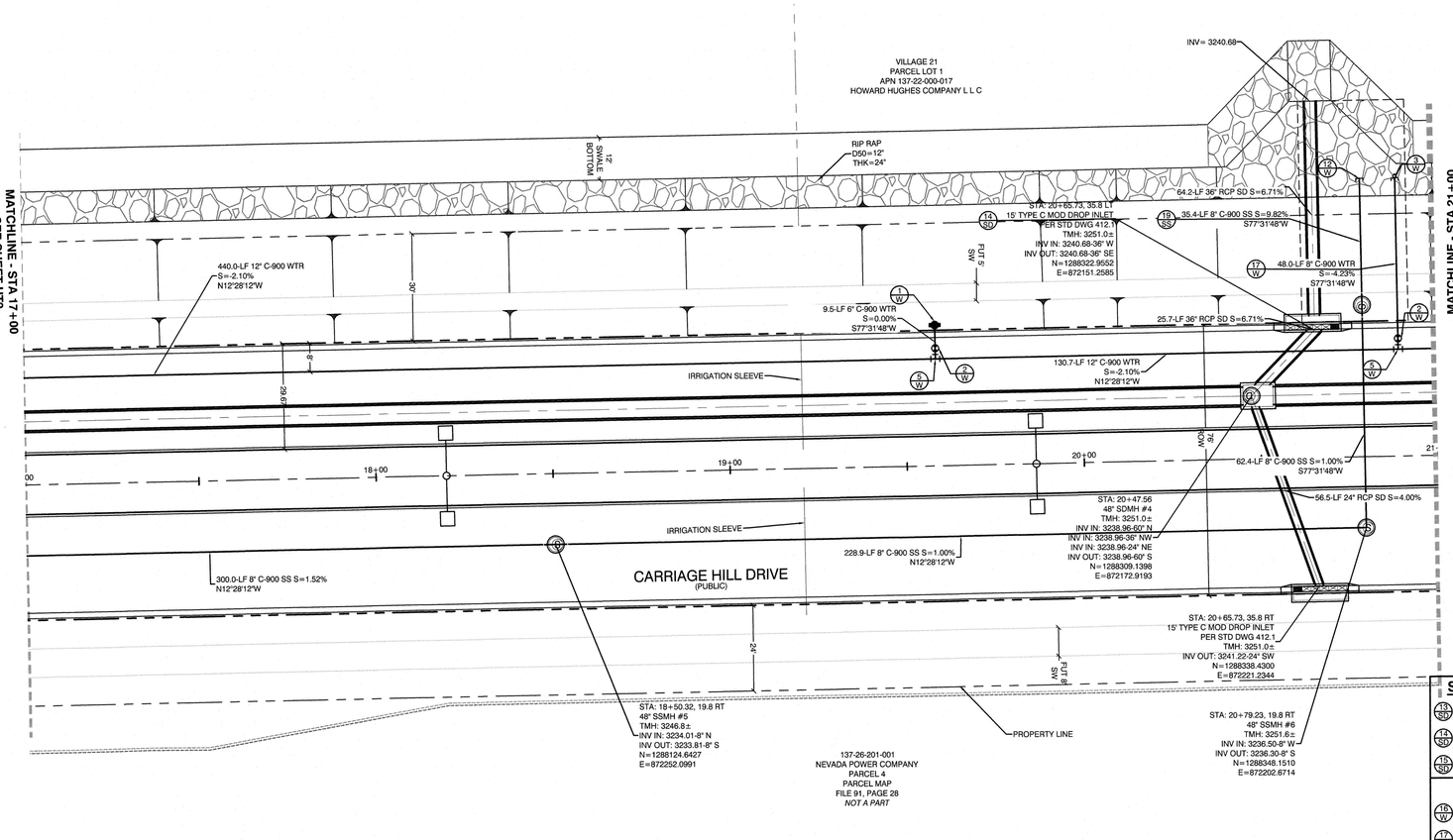
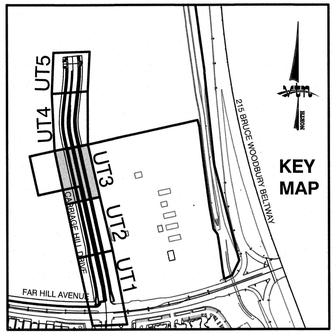


Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS



GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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

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

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BASIS OF BEARING
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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

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

STORM DRAIN LATERAL NOTES
13 SD — SEE SHEET UT6 FOR PROFILE
14 SD — SEE SHEET UT8 FOR PROFILE
15 SD — SEE SHEET UT10 FOR PROFILE

WATER LATERAL NOTES
16 W — SEE SHEET UT7 FOR PROFILE
17 W — SEE SHEET UT9 FOR PROFILE

SEWER LATERAL NOTES
18 SS — SEE SHEET UT7 FOR PROFILE
19 SS — SEE SHEET UT9 FOR PROFILE

CONSTRUCTION NOTES

	WATER	PUBLIC
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12 W	1" LATERAL-COPPER WATER SERVICE WITH 1" METER PER UDACS PLATE 3 (IRRIGATION) AND 1" RPPA PER UDACS PLATE 8	1 EA.
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	1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
PC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
C	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
PC	SEWER POINT OF CONNECTION		

90%
NOT FOR CONSTRUCTION
03/05/2018

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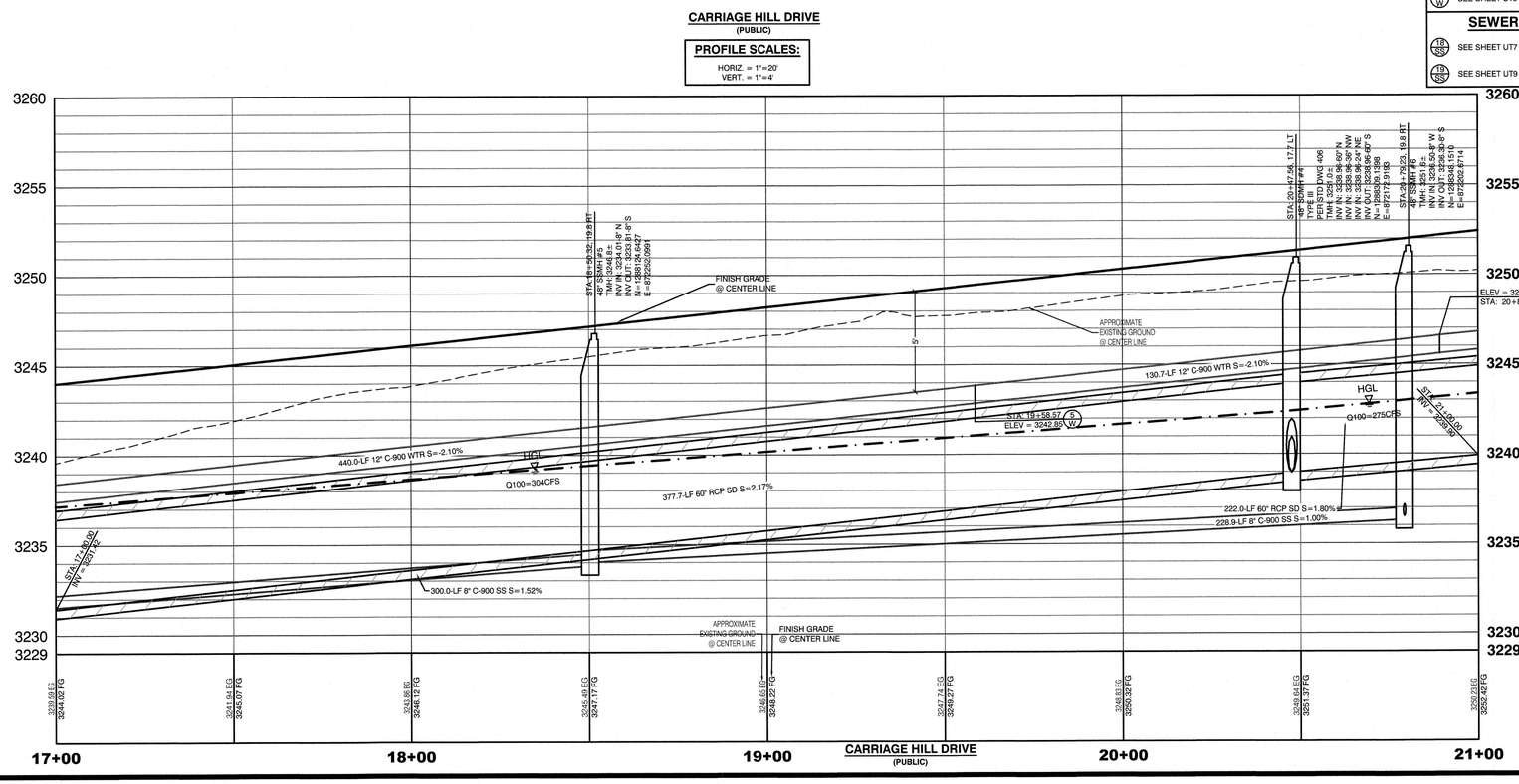

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CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 3
CARRIAGE HILL DRIVE
17+00 TO 21+00

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DB1
DESIGNED BY: DEH
CHECKED BY: WJM
10/23/2017
10/23/2017
02/07/2018
SCALE: 1"=20' HORIZ. 1"=4' VERT.
PROJECT NO: 7851

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
3/6/18

SHEET
UT3
16 OF 41 SHEETS
DRAWING NO.

H:\7851\Carriage Hill Drive-South\Sheet Set\7851-UT.dwg

STORM DRAIN LATERAL NOTES

- (13 SD) SEE SHEET UT6 FOR PROFILE
- (14 SD) SEE SHEET UT8 FOR PROFILE
- (15 SD) SEE SHEET UT10 FOR PROFILE

WATER LATERAL NOTES

- (16 W) SEE SHEET UT7 FOR PROFILE
- (17 W) SEE SHEET UT9 FOR PROFILE

SEWER LATERAL NOTES

- (18 SS) SEE SHEET UT7 FOR PROFILE
- (19 SS) SEE SHEET UT9 FOR PROFILE

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
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AND
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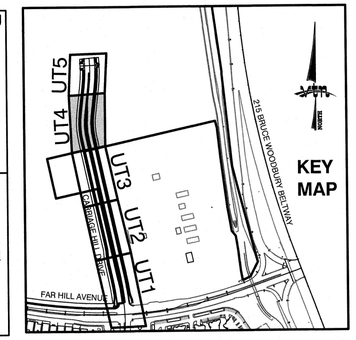
CLARK COUNTY TRAFFIC OPERATIONS



NORTH

GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
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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.

CONSTRUCTION NOTES

	WATER	PUBLIC
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(6 W)	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
(7 W)	12" 1° BEND (PER UDACS PLATE 31)	1 EA.
(8 W)	12" 5° BEND (PER UDACS PLATE 31)	11 EA.
(9 W)	12" 11° BEND (PER UDACS PLATE 31)	2 EA.
(10 W)	12" 45° VERTICAL BEND (PER UDACS PLATE 31)	1 EA.
(11 W)	12"X1" REDUCER (PER UDACS PLATE 30)	1 EA.
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	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	39 LF.
	1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
PC	WATER POINT OF CONNECTION	

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 ---- GPM AT 20 P.S.I. RESIDUAL.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

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

	SEWER	PUBLIC	PRIVATE
(S)	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
PC	SEWER POINT OF CONNECTION		

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:

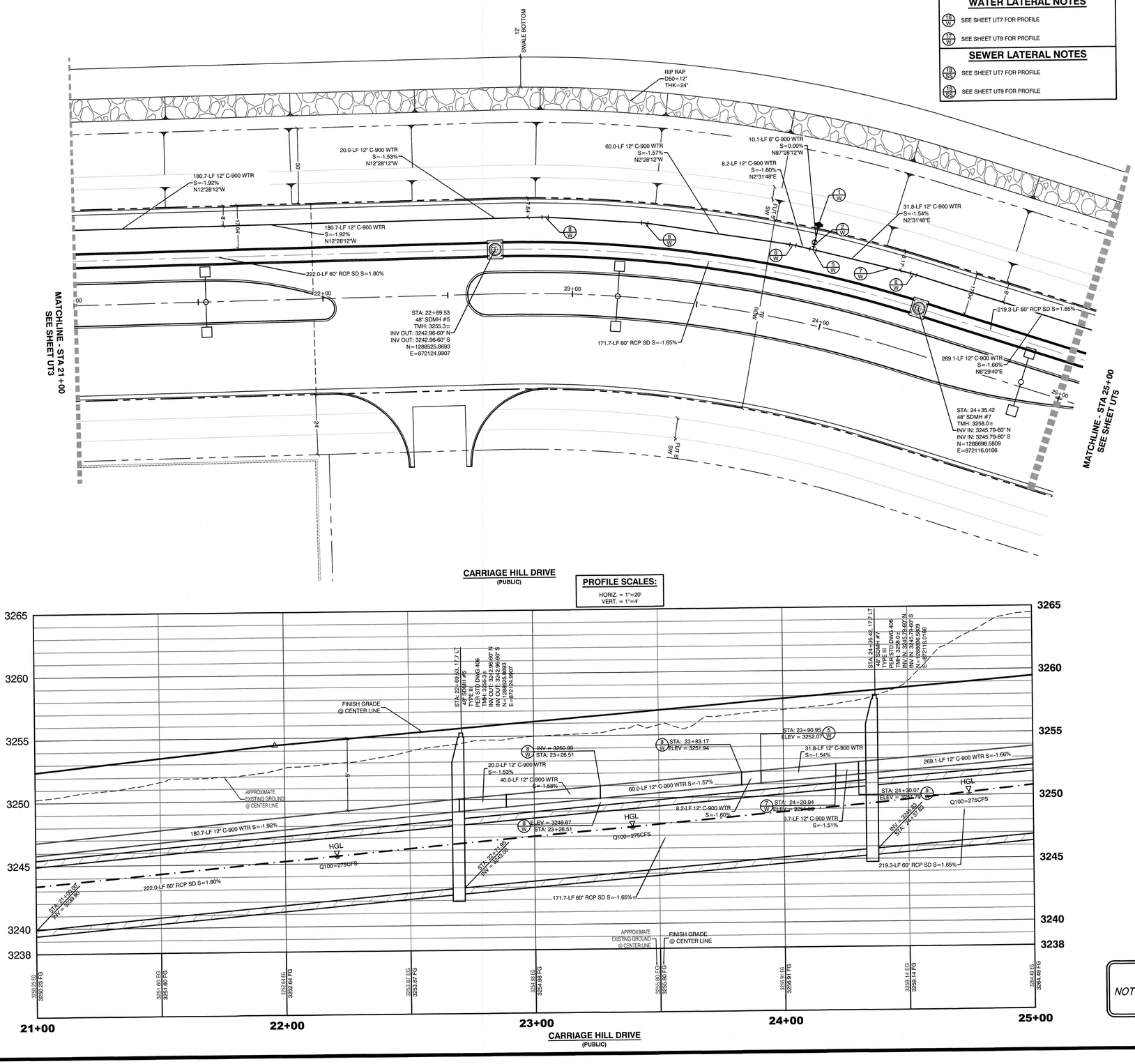
UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. 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.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

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

90%
NOT FOR CONSTRUCTION
03/05/2018



CARRIAGE HILL DRIVE
(PUBLIC)

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

CARRIAGE HILL DRIVE
(PUBLIC)

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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

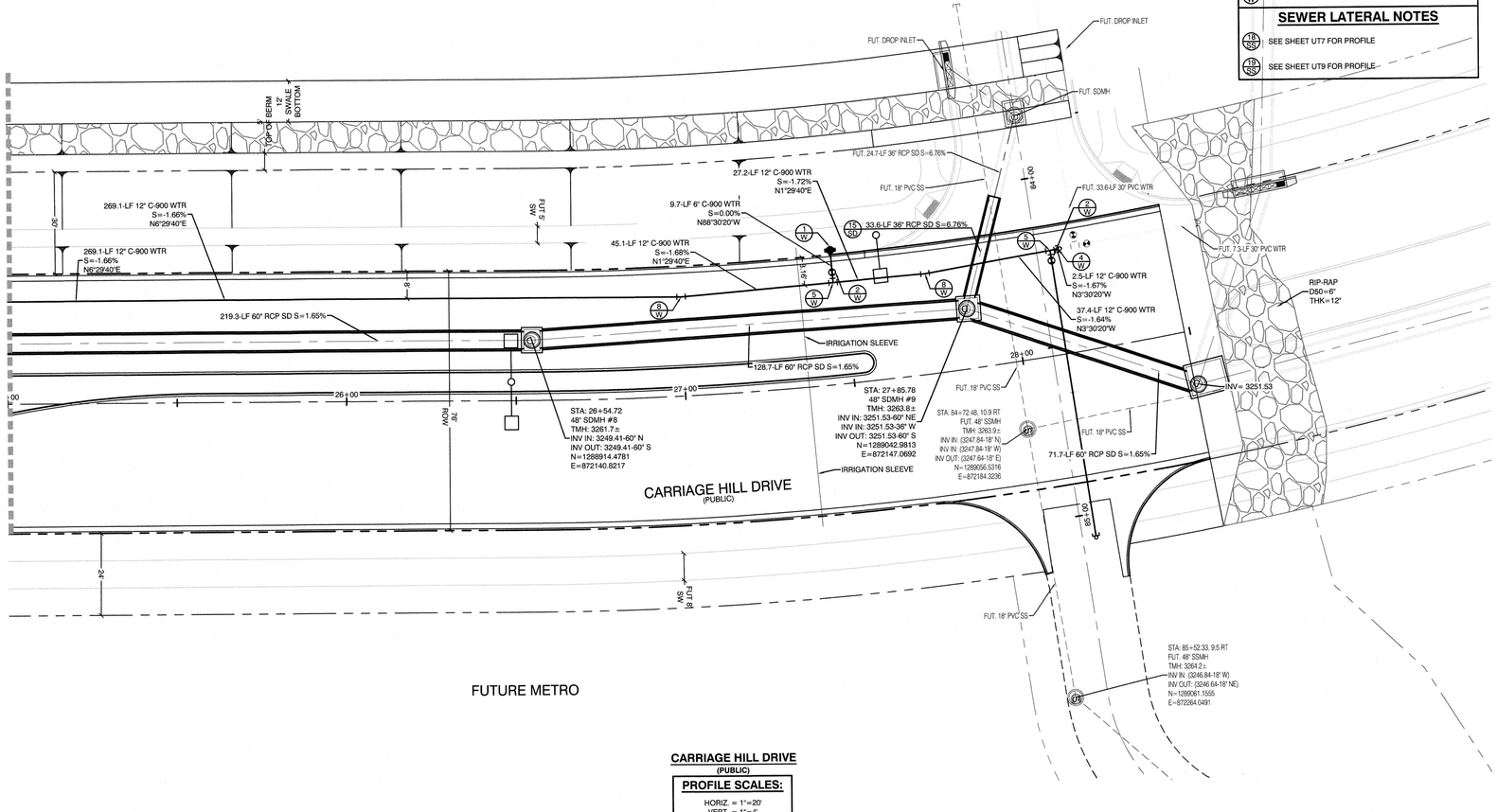
UTILITY PLAN & PROFILE 4
CARRIAGE HILL DRIVE
21+00 TO 25+00

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DEH
DESIGNED BY: DEH
CHECKED BY: WJM
10/23/2017
10/32/2017
02/07/2018
SCALE: 1"=20' HORIZ. 1"=4' VERT.
PROJECT NO: 7851

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
3/6/18

SHEET
UT4
17 OF 41 SHEETS
DRAWING NO.



STORM DRAIN LATERAL NOTES

- (18 SD) SEE SHEET UT6 FOR PROFILE
- (14 SD) SEE SHEET UT8 FOR PROFILE
- (15 SD) SEE SHEET UT10 FOR PROFILE

WATER LATERAL NOTES

- (16 W) SEE SHEET UT7 FOR PROFILE
- (17 W) SEE SHEET UT9 FOR PROFILE

SEWER LATERAL NOTES

- (18 SS) SEE SHEET UT7 FOR PROFILE
- (19 SS) SEE SHEET UT9 FOR PROFILE

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

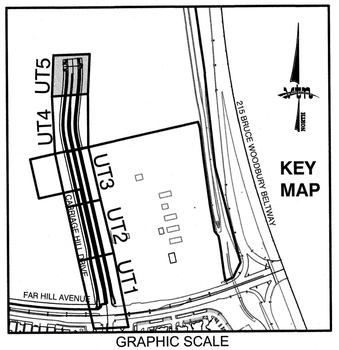
CALL BEFORE YOU DIG OVERHEAD

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

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CABLES! IT'S COSTLY.

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM



NORTH

GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

90%
NOT FOR CONSTRUCTION
03/05/2018

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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

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

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.

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 ---- GPM AT 20 P.S.I. RESIDUAL

BASIS OF BEARING
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE. NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

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:
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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

		WATER	PUBLIC
(1 W)		FIRE HYDRANT ASSEMBLY; INCLUDING 12"X6" TEE WITH 6" G.V. (PER UDACS PLATE 39 & 40)	4 EA.
(2 W)		12" GATE VALVE (PER UDACS PLATE 39)	4 EA.
(3 W)		8" CAP & BLOW OFF (PER UDACS PLATE 36)	2 EA.
(4 W)		12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
(5 W)		12"X8" TEE (PER UDACS PLATE 31)	2 EA.
(6 W)		12"X12" TEE (PER UDACS PLATE 31)	1 EA.
(7 W)		12" 1° BEND (PER UDACS PLATE 31)	1 EA.
(8 W)		12" 5° BEND (PER UDACS PLATE 31)	11 EA.
(9 W)		12" 11° BEND (PER UDACS PLATE 31)	2 EA.
(10 W)		12" 45° VERTICAL BEND (PER UDACS PLATE 31)	1 EA.
(11 W)		12"X1" REDUCER (PER UDACS PLATE 30)	1 EA.
(12 W)		1" LATERAL-COPPER WATER SERVICE WITH 1" METER PER UDACS PLATE 3 (IRRIGATION) AND 1" RPPA PER UDACS PLATE 8	1 EA.
		12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,869 LF.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	39 LF.
		1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
	PPC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC	PRIVATE
(S)		STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
		12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
		8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
		8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
	PPC	SEWER POINT OF CONNECTION		

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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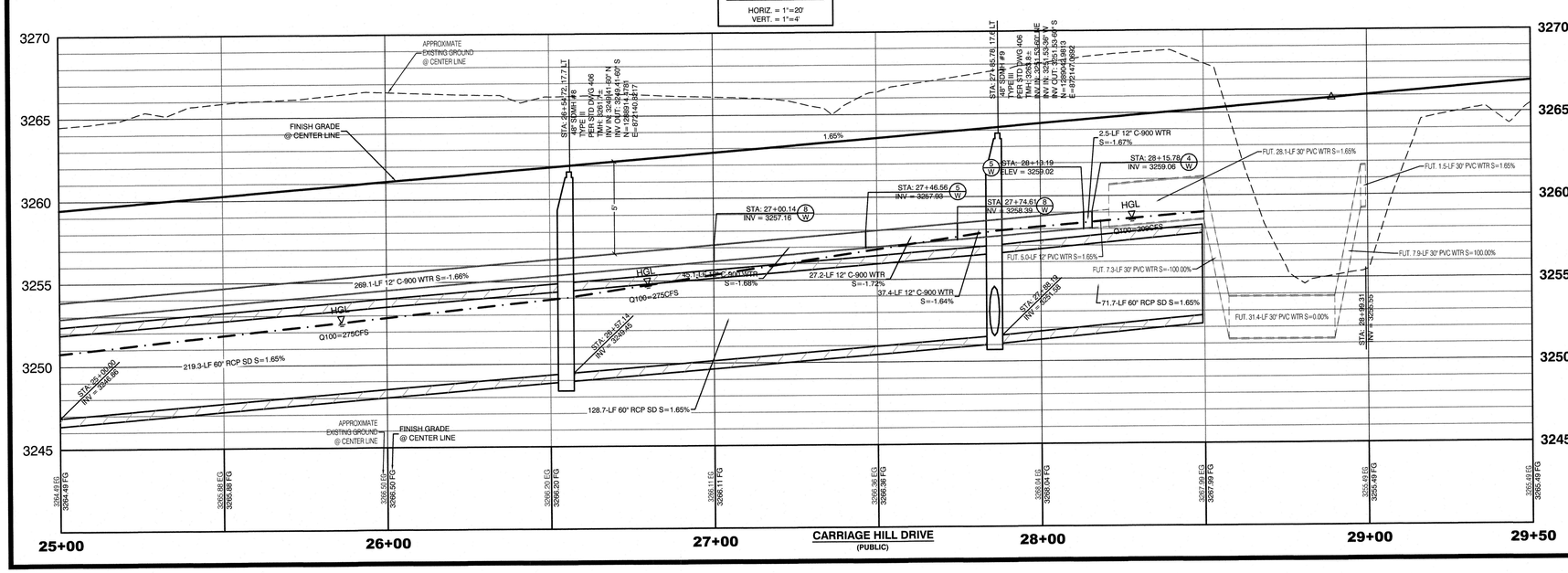
LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

CARRIAGE HILL DRIVE
(PUBLIC)

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



HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10001 PARK RUN DRIVE SUITE 500
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

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 5
CARRIAGE HILL DRIVE
25+00 TO 28+70.63

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
DEH	DEH	WJM	7951

10/23/2017
10/23/2017
02/07/2018

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

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745

SHEET
UT5
18 OF **41** SHEETS

DRAWING NO.

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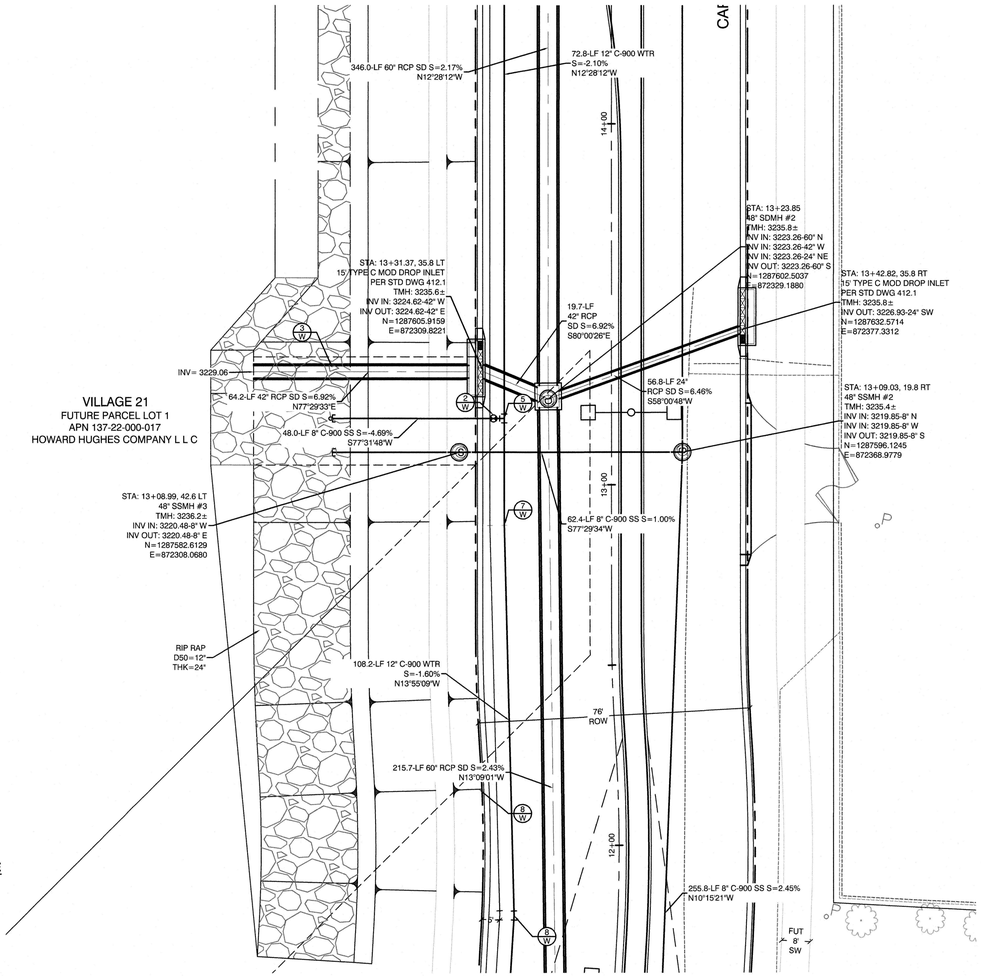

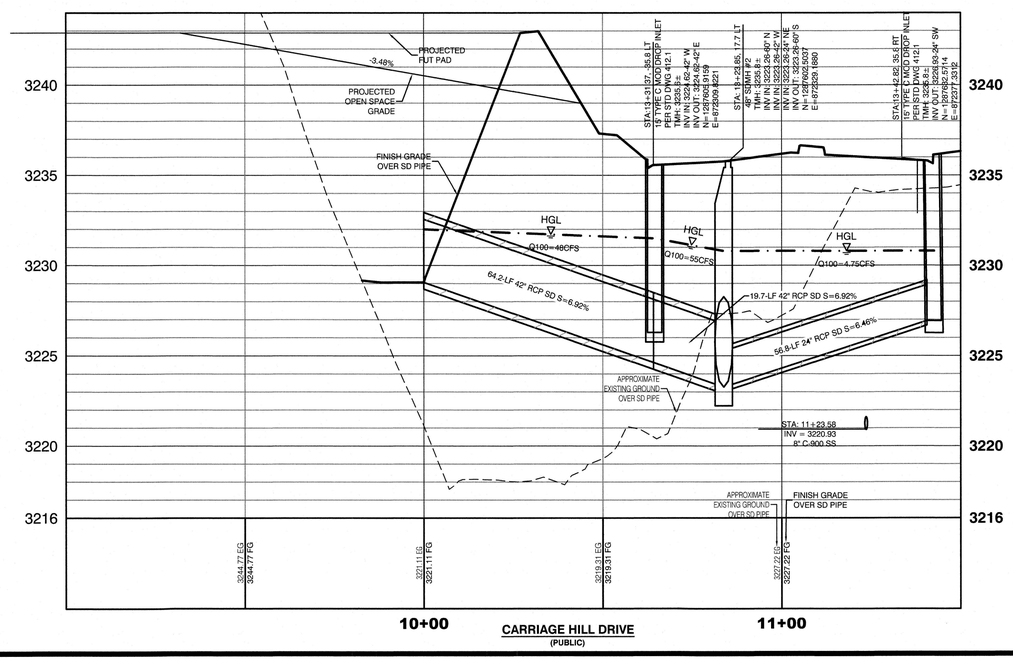

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929
Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS
AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CABLES (TS CABLE)
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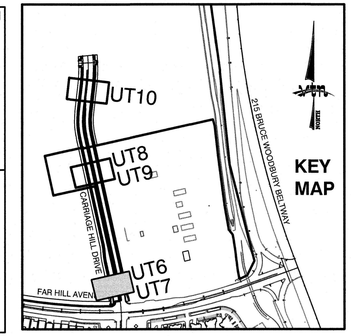
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

NORTH



GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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

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

WATER LINE MARKER BALLS NOTE
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BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

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2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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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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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

	WATER	PUBLIC
1W	FIRE HYDRANT ASSEMBLY: INCLUDING 12"X6" TEE WITH 6" G.V. (PER UDACS PLATE 39 & 40)	4 EA.
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3W	8" CAP & BLOW OFF (PER UDACS PLATE 36)	2 EA.
4W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
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6W	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
7W	12" 1° BEND (PER UDACS PLATE 31)	1 EA.
8W	12" 5° BEND (PER UDACS PLATE 31)	11 EA.
9W	12" 11° BEND (PER UDACS PLATE 31)	2 EA.
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11W	12"X1" REDUCER (PER UDACS PLATE 30)	1 EA.
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	1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
	SEWER POINT OF CONNECTION		

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90%
NOT FOR CONSTRUCTION
03/05/2018

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
(702) 791-4000

CITY OF LAS VEGAS

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

UTILITY PLAN & PROFILE 6
STORM DRAIN LATERAL 11+84.91

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DEH 10/25/2017
DESIGNED BY: DEH 10/23/2017
CHECKED BY: WJM 02/07/2018
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7851

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745

SHEET
UT6
19 OF 41 SHEETS
DRAWING NO.

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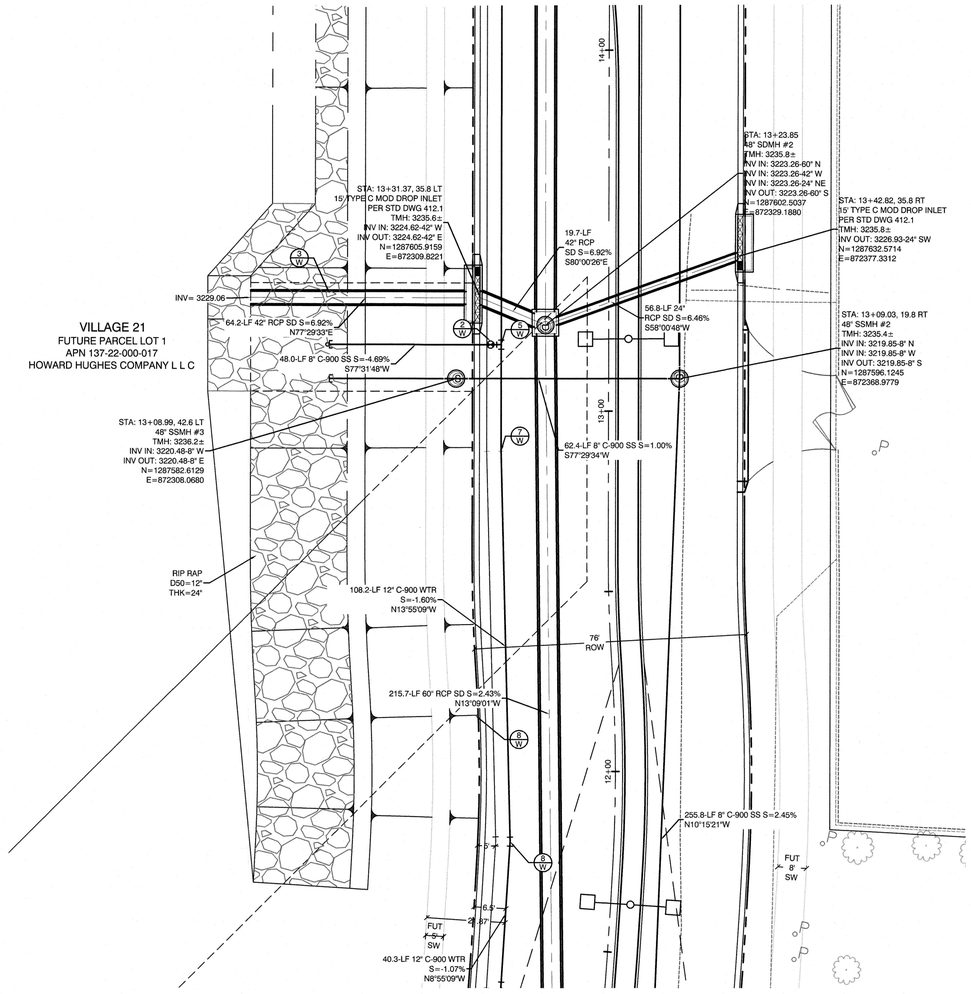
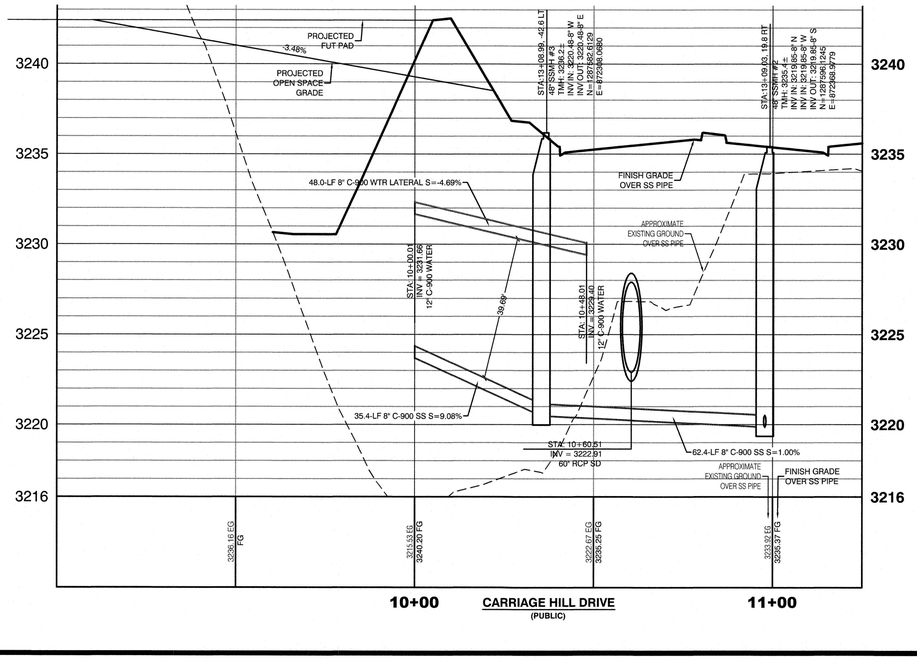




CARRIAGE HILL DRIVE
(PUBLIC)

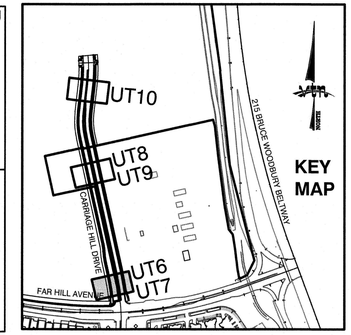
PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CABLES
FLUSH(1)
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

NORTH



GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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

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

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.

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 ---- GPM AT 20 P.S.I. RESIDUAL

BASIS OF BEARING
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

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°1'0.00"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.

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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

CONSTRUCTION NOTES

	WATER	PUBLIC
1W	FIRE HYDRANT ASSEMBLY: INCLUDING 12"X6" TEE WITH 6" G.V. (PER UDACS PLATE 39 & 40)	4 EA.
2W	12" GATE VALVE (PER UDACS PLATE 39)	4 EA.
3W	8" CAP & BLOW OFF (PER UDACS PLATE 36)	2 EA.
4W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
5W	12"X8" TEE (PER UDACS PLATE 31)	2 EA.
6W	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
7W	12" 1° BEND (PER UDACS PLATE 31)	1 EA.
8W	12" 5° BEND (PER UDACS PLATE 31)	11 EA.
9W	12" 11° BEND (PER UDACS PLATE 31)	2 EA.
10W	12" 45° VERTICAL BEND (PER UDACS PLATE 31)	1 EA.
11W	12"X1" REDUCER (PER UDACS PLATE 30)	1 EA.
12W	1" LATERAL-COPPER WATER SERVICE WITH 1" METER PER UDACS PLATE 3 (IRRIGATION) AND 1" RPPA PER UDACS PLATE 8	1 EA.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,869 LF.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	39 LF.
	1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
WP	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
SP	SEWER POINT OF CONNECTION		

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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90%
NOT FOR CONSTRUCTION
03/05/2018

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVD. SUITE 300
LAS VEGAS, NEVADA 89135
(702) 791-4000

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

UTILITY PLAN & PROFILE 7
SEWER & WATER LATERALS

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DEH 10/23/2017
DESIGNED BY: DEH 10/23/2017
CHECKED BY: WJM 02/07/2018
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7851

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745

SHEET
UT7
20 OF **41** SHEETS
DRAWING NO.

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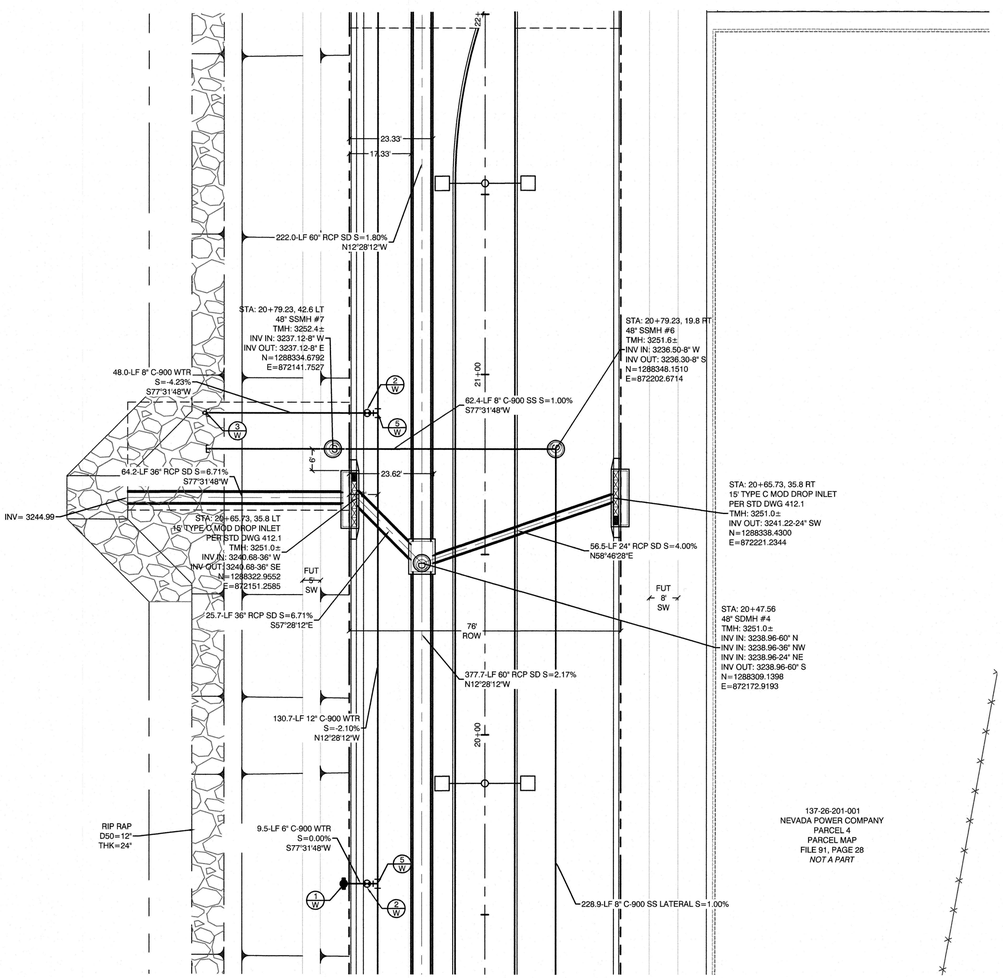

CARRIAGE HILL DRIVE
(PUBLIC)

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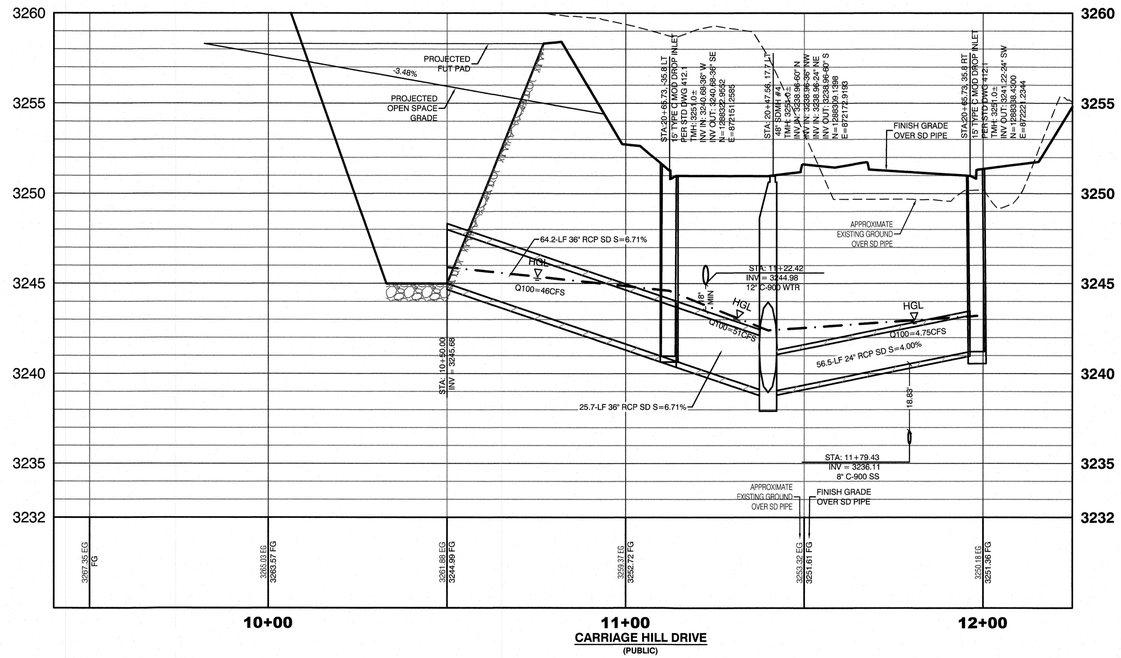

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(PUBLIC)

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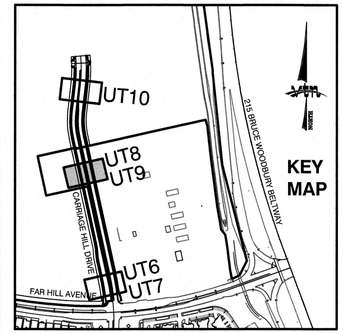
AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
Call before you
Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6511
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

NORTH



GRAPHIC SCALE
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WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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

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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

CONSTRUCTION NOTES

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POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
C	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
POC	SEWER POINT OF CONNECTION		

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90%
NOT FOR CONSTRUCTION
03/05/2018

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD #700
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 891-46-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS● PLANNERS● LAND SURVEYORS

UTILITY PLAN & PROFILE 8
STORM DRAIN LATERAL 19+67.99

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DEH 10/23/2017
DESIGNED BY: DEH 10/23/2017
CHECKED BY: WJM 02/07/2018
PROJECT NO: 7851
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15145
3/6/18

SHEET
UT8
21 OF 41 SHEETS
DRAWING NO.

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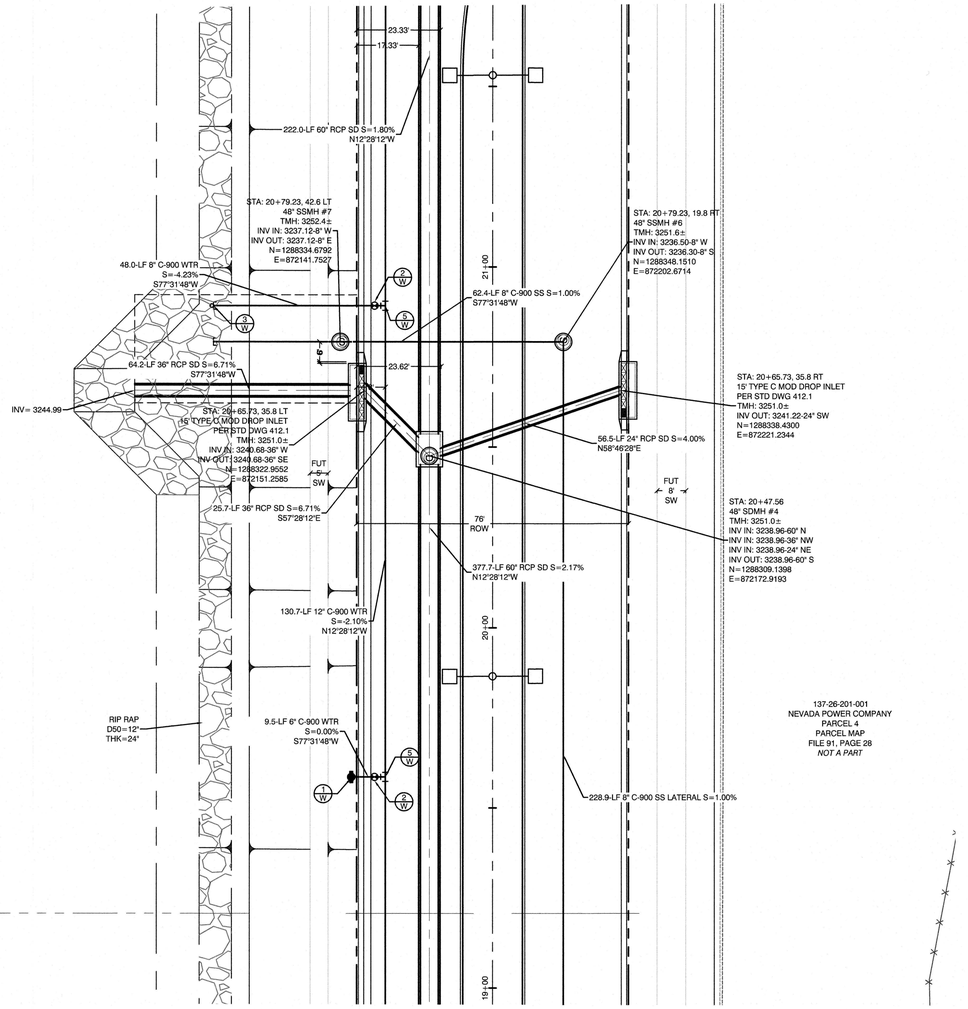

CARRIAGE HILL DRIVE
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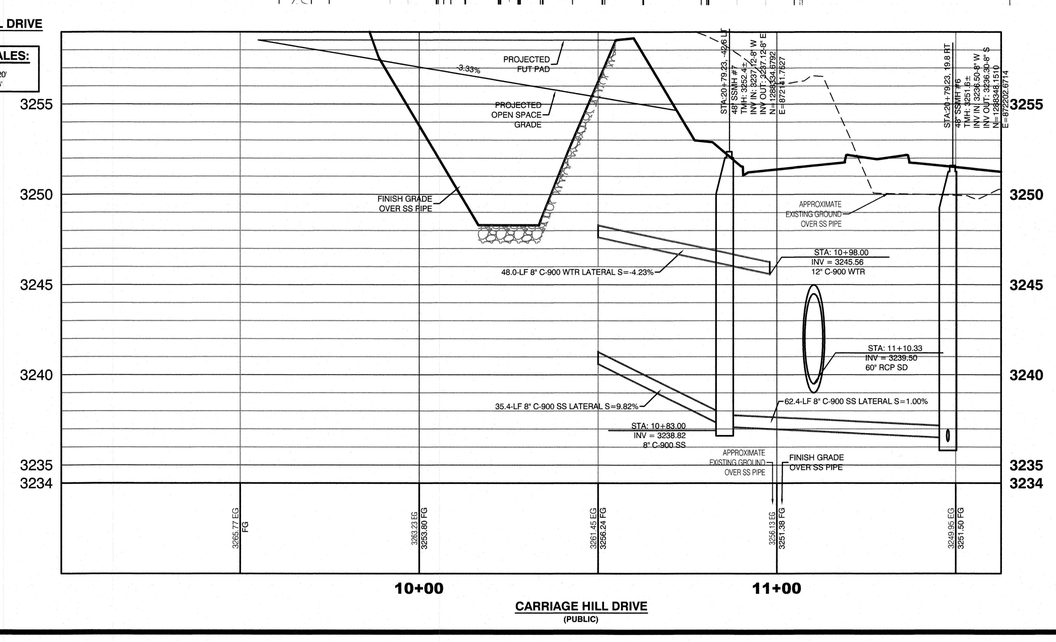

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FT1-1329-1

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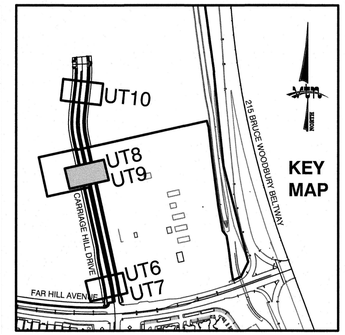
NORTH



GRAPHIC SCALE
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CONSTRUCTION NOTES

	WATER	PUBLIC
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	WATER POINT OF CONNECTION	

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LAS VEGAS FIRE & RESCUE APPROVAL
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LINEAR UNIT: US SURVEY FOOT (FTUS)

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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

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
(S)	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
	12" SDR-35 C-900 SANITARY SEWER MAIN	101 LF.	0 LF.
	8" SDR-35 C-900 SANITARY SEWER MAIN	1,459 LF.	0 LF.
	8" SEWER CAP (PER STD 4.6 & 4.11)	2 EA.	0 EA.
	SEWER POINT OF CONNECTION		

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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90%
NOT FOR CONSTRUCTION
03/05/2018

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 891 48-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 9
SEWER & WATER LATERALS

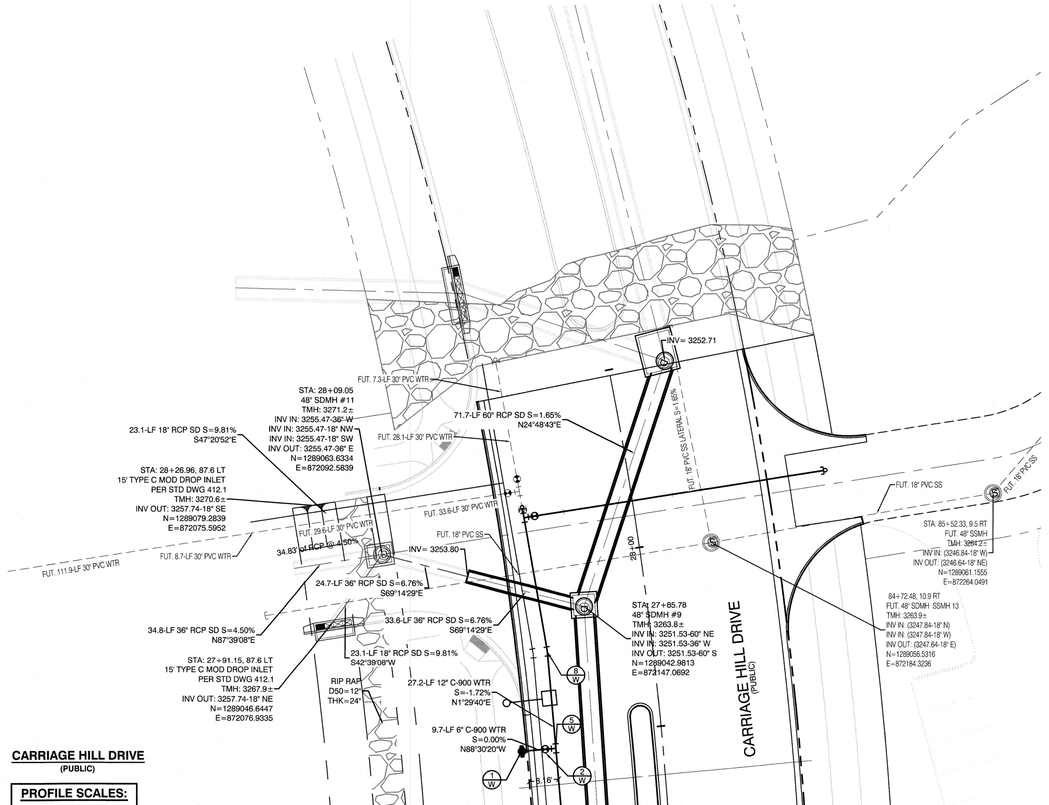
SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: DEI 10/23/2017
DESIGNED BY: DEH 10/23/2017
CHECKED BY: W.J.M 02/07/2018
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7951

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
3/6/18

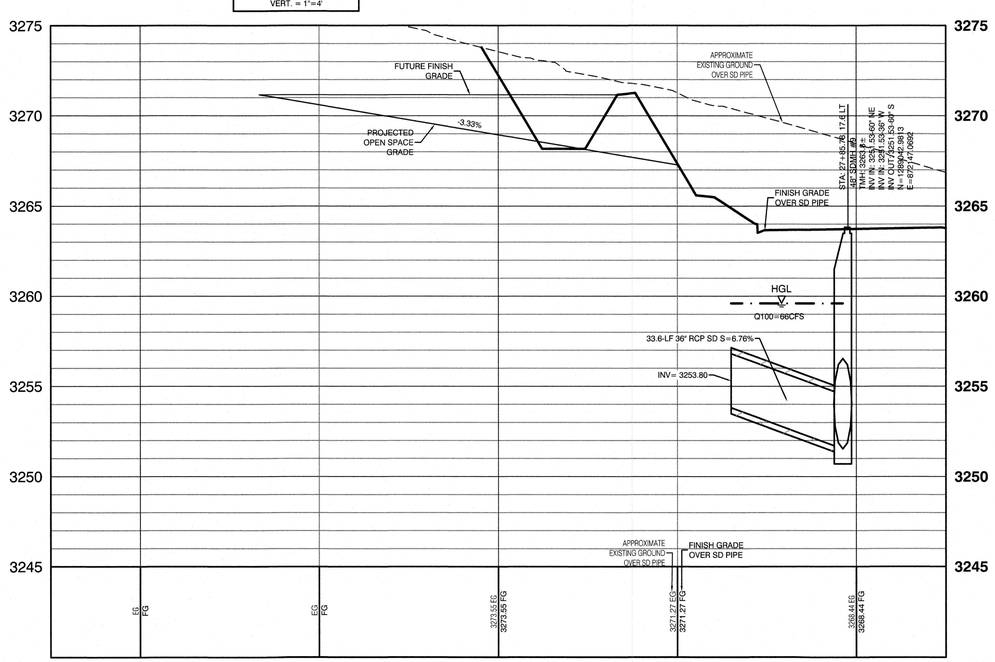
SHEET
UT9
22 OF **41** SHEETS
DRAWING NO.

H:\7951\Carriage Hill Drive-South\Sheet Set\7951-UT-LAT.dwg



CARRIAGE HILL DRIVE
(PUBLIC)

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



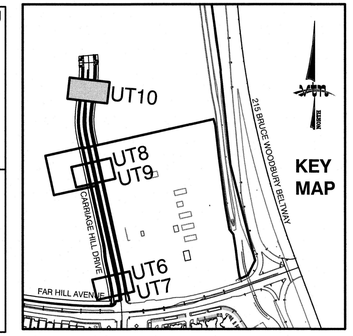
CARRIAGE HILL DRIVE
(PUBLIC)

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEMS IN CLARK COUNTY!
(7/1/2015)
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

NORTH



GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.06

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.

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 ---- GPM AT 20 P.S.I. RESIDUAL

BASIS OF BEARING
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE. NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

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
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T21S,R59E,S03

CONSTRUCTION NOTES

	WATER	PUBLIC
1W	FIRE HYDRANT ASSEMBLY: INCLUDING 12"X6" TEE WITH 6" G.V. (PER UDACS PLATE 39 & 40)	4 EA.
2W	12" GATE VALVE (PER UDACS PLATE 39)	4 EA.
3W	8" CAP & BLOW OFF (PER UDACS PLATE 36)	2 EA.
4W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	1 EA.
5W	12"X8" TEE (PER UDACS PLATE 31)	2 EA.
6W	12"X12" TEE (PER UDACS PLATE 31)	1 EA.
7W	12" 1° BEND (PER UDACS PLATE 31)	1 EA.
8W	12" 5° BEND (PER UDACS PLATE 31)	11 EA.
9W	12" 11° BEND (PER UDACS PLATE 31)	2 EA.
10W	12" 45° VERTICAL BEND (PER UDACS PLATE 31)	1 EA.
11W	12"X1" REDUCER (PER UDACS PLATE 30)	1 EA.
12W	1" LATERAL-COPPER WATER SERVICE WITH 1" METER PER UDACS PLATE 3 (IRRIGATION) AND 1" RPPA PER UDACS PLATE 8	1 EA.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,869 LF.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	39 LF.
	1" COPPER WATER PER UDACS 2.06.01 & PLATE 17	25 LF.
WPOC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	9 EA.	0 EA.
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SPOC	SEWER POINT OF CONNECTION		

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APPROVED FOR CONSTRUCTION

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DATE: PROJECT:----
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UTILITY PLAN & PROFILE 10
CARRIAGE HILL-27+80.17
SD LATERAL

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE

DRAWN BY: ----
DESIGNED BY: ----
CHECKED BY: NAM
02/07/2018
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7851

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
3/6/18

SHEET
UT10
23 OF 41 SHEETS
DRAWING NO.

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