

DS #: 5123

APN: 137-22-101-001

PROJECT: Summerlin V25-Redpoint Drive

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		April 27, 2019
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	COPIES TO:	
Drainage Study for:	GCW Engineers / Surveyors	
Summerlin V25 – Redpoint Drive (Sky Vista to Fox Hill)		
Cross Streets:	Redpoint between Sky Vista and Fox Hill	Howard Hughes
File Number:	F:\Depot\DSMemos\DS5123A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-22-101-001	
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 #
1 st Submittal	4/11/2019	4/24/2019	See Comments Below	\$400.00	3089557: \$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.

- The project proposed to construct temporary drainage facilities including drainage berms/swales in various locations for the interim protection of the proposed segment of *Redpoint Drive*. Prior to the final plans approval, the developer must complete a **Maintenance & Liability Agreement** for the interim drainage improvements and post a minimum maintenance bond of \$50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

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

- The "**Las Vegas Valley 2018 Flood Control Master Plan Update**" (LVVMPU) is officially adopted for public use. Replace all the pertinent MPU exhibits such as the F-Maps and H-Maps (replaced by the W-Maps) with the 2018 version in the next submittal.
- The subject drainage study is premised on the protection of an interim ditch along the alignment of future *Sky Vista Drive* to the west and the fully developed *Fox Hill Drive* on the downstream end and the *Redpoint Drive* segment from *Fox Hill* to *Desert Foothill*. The subject improvement plans will not be approved prior to the buildout of *Fox Hill Drive (Far Hills to Redpoint)* and *Redpoint Drive (Fox Hill to Desert Foothill)* and the associated storm drain facilities.

4. Page 3 of the *Study*, under *Sub-chapter XI (Storm Drain)*, it was stated that the proposed stub to convey the flows in COS-2 to be a 24"-RCP while it was shown to be 18"-RCP in all the pertinent improvement plans. Address and clarify to match each other in the next submittal.
5. The *WSPG Model* appears to be wrongly titled "*Fox Hill Drive (Far Hills to Redpoint)*" which should be "*Redpoint Drive (Sky Vista to Fox Hill)*". Review and revise accordingly.
6. A portion of the proposed storm drain in *Redpoint Drive* shows velocity greater than 25ft/s. Identify on the pertinent plan & profile sheets that sacrificial concrete will be provided.
7. **Sheet PP4:** The proposed 48"-RCP ties to an existing 48"-RCP at Station 24+88.34 in *Redpoint Drive*. Provide connection detail in the next submittal.
8. 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.
9. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

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

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



Sample Letter to
certify CD.pdf

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

END OF REMARKS

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T/R/S: T20S/R59E/22
AREA K-22

**TECHNICAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 25 REDPOINT DRIVE
SKY VISTA DRIVE TO FOX HILL DRIVE**

62025-204

April 2019

Prepared for:

**Hughes Howard Company, LLC
10801 Charleston Blvd., 3Rd Floor
Las Vegas, Nevada 89146
Phone: (702) 791-4300**

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin Village 25 Redpoint Drive - Sky Vista Drive to Fox Hill Drive Date: April 11, 2019

Location of Development: a) Descriptive (Cross Streets) North/South: Sky Vista Drive/Fox Hill Drive
East/West: Redpoint Drive

b) Section: 22 Township: 20S Range: 59E

c) APN : 137-22-101-001

Name of Owner: Howard Hughes Company, LLC

Telephone No.: 702.791.4300 Fax No.: Not Available E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 Charleston Blvd., 3rd Floor Las Vegas, Nevada 89146

Contact Person-Name: Steve Jones, P.E. Telephone No.: 702.804.2000

* E-Mail Address: sjones@gcwengineering.com Fax No.: 702.804.2299

Firm: GCW

Address: 1555 South Rainbow Boulevard Las Vegas, Nevada 89146

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 745.57 acres Being Developed/Disturbed: +/- 3.30 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 and Storm Drain

5. Approximate upstream land area which drains to the subject site: 0.00 Acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Master Conceptual Drainage Study for Summerlin West Village 25

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Exisitng Storm Drain within Redpoint Drive

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



Engineer's Seal

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

***New Required Field**

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

Revision	Date

Local Entity File No. _____

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL		
DRAINAGE SUBMITTAL CHECKLIST		
Project Name: Summerlin Village 25 Redpoint Drive-Sky Vista Drive to Fox Hill Drive	Map ID: 137-22-101-001	
Firm Name: GCW	Engineer: Steve Jones, P.E.	
Address: 1555 Outh Rainbow Boulevard		
City: Las Vegas	State: Nevada	Zip: 89146
Phone Number: 702.804.2000	Fax Number: 702.804.2299	
Property Owner: Howard Hughes Company, LLC		
Address: 10801 Charleston Blvd., 3 rd Floor		
City: Las Vegas	State: Nevada	Zip: 89146
Reviewed By:	Date Received:	Date Accepted for Review:
The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCDD) Hydrologic Criteria and Drainage Design Manual (MANUAL). This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use. If items are not applicable for the subject site, provide N/A. I. GENERAL REQUIREMENT Yes No <u>X</u> _____ Design Manual Standard Form 1 with the engineer's seal and signature. _____ <u>N/A</u> Design Manual Standard Form 4. <u>X</u> _____ 2 copies of the 24" x 36" Drainage Plan. _____ <u>N/A</u> A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. II. MAPS AND EXHIBITS Yes No <u>X</u> _____ A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. <u>X</u> _____ A copy of the current CCRFCDD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.		
REFERENCE:		STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes No

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

III. DRAINAGE PLAN

Yes No

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

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

- | | | |
|-------------------------------------|--------------------------|---|
| ☐ | <u>N/A</u> | Streets with off-set crowns. |
| ☒ | ☐ | Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes. |
| ☒ | ☐ | Property lines. |
| ☒ | ☐ | Right-of-way lines and widths, existing and proposed. |
| ☒ | ☐ | Existing improvements and their elevations. |
| ☒ | ☐ | Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points. |
| ☒ | ☐ | Concentration points and drainage flow direction with Q100 and V100 and D100 in streets. |
| ☒ | ☐ | Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows. |
| ☒ | ☐ | Location and cross-section of street capacity calculations. |
| ☒ | ☐ | Cross-sectional detail for channels, including cutoff wall locations. |
| ☒ | ☐ | Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations. |
| ☒ | ☐ | Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement. |
| ☐ | <u>N/A</u> | Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs. |
| ☐ | <u>N/A</u> | Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc. |
| ☐ | <u>N/A</u> | Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit. |
| ☐ | <u>N/A</u> | Building and/or lot numbers. |
| ☒ | ☐ | Alignment of all existing, proposed, or future Regional Facilities adjacent to the site. |
| ☒ | ☐ | Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information. |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

_____ N/A For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.

_____ N/A Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q100 flows.

X _____ Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

_____ N/A Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes No

_____ N/A Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.

_____ N/A Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.

_____ N/A Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.

_____ N/A Use of correct precipitation values in and around the McCarran Airport rainfall area.

X _____ A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.

X _____ A summary table of stormwater flows showing basin area, Q10 and Q100 for both individual basins and combined basin flows, where applicable.

X _____ Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.

X _____ On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

_____ N/A Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

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

REFERENCE:

STANDARD FORM 2



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

I. GENERAL REQUIREMENT		
Yes	No	
	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.)
X		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.)

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

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.
	N/A	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
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.
X		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.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

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 VILLAGE 25 REDPOINT DRIVE
SKY VISTA DRIVE TO FOX HILL DRIVE**

62025-204

April 2019

Authored by:

Nelson Baggs, E.I.

Prepared for:

**Howard Hughes Company, LLC
10801 Charleston Blvd., 3rd Floor
Las Vegas, Nevada 89146
Phone: (702) 791-4300**

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I. INTRODUCTION

The Howard Hughes Company, LLC (THHC) is proposing to construct roadway and storm drain improvements for Redpoint Drive in Summerlin Village 25, from Fox Hill Drive to Sky Vista Drive. The project is located west of the intersection at Fox Hill Drive and Redpoint Drive. The purpose of this report is to provide detailed hydrologic and hydraulic analyses for the site, and to propose storm drain facilities to convey runoff to the existing flood control facilities in accordance with the CCRFCD Manual (Reference 1, hereafter referred to as HCDDM) and local drainage criteria. The following tasks were performed in the preparation of this study:

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

II. LOCATION AND DESCRIPTION OF IMPROVEMENTS

The proposed site is located within Section 22, Township 20 South, Range 59 East on APN 137-22-101-001, within the jurisdictional limits of unincorporated City of Las Vegas (CLV). Please refer to Figure 1 in Appendix D for location of the project. For this study, the proposed improvements consist of street and storm drain improvements.

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

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

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

Figures 3 and 4, included in Appendix D, are reproductions of Figure H-24 and F-24 of the CCRFCD 2013 Las Vegas Valley Master Plan Update (Reference 2, hereafter referred to as the 2013 MPU). As shown on Figure 4, the site is adjacent to the proposed CCRFCD Facilities APD6 0000. The 2013 MPU describes the proposed CCRFCD Facility APD6 0000 as a 6' by 6' RCB. Note that the 2013 MPU has been superseded by the Summerlin West Planning Area (SWPA) Master Plan Update (hereafter referred to as the Summerlin West MPU).

V. REFERENCED STUDIES

In preparation of this study, the following approved drainage study and improvement plans have been referenced to complete the hydrologic and hydraulic analysis of the project site. These studies have been reviewed and accepted as suitable for reference material. A brief synopsis of the pertinence of each of the referenced items is as follows:

- The project entitled *Master Conceptual Drainage Study for Summerlin West Village 25* (hereafter referred to as the V25 Study, Reference 3). The ultimate condition was referenced from the V25 Study. Also the street subbasin for Redpoint was prorated from this study.
- The project entitled *Technical Drainage Study for Summerlin Village 21 Redpoint Drive Improvements (Fox Hill Drive to Desert Foothills Drive)* (hereinafter referred to as the V21 Redpoint Study, Reference 4) provided offsite flow rates adjacent to the project site. The existing conditions for this project was referenced from this study. Pertinent reference material has been included in Appendix C.
- The project entitled *Technical Drainage Study for Summerlin West Village 21 Desert Foothills Drive (Far Hills Avenue to Street A)* (hereinafter referred to as the Desert Foothills Study, Reference 5) provided hydrological analysis that was used to determine flow rates impacting proposed improvements.
- The project entitled *Technical Drainage Study for Fox Hill Drive Improvements Phase 1* (hereinafter referred to as the Fox Hill Study, Reference 6) provided the downstream connection for the proposed storm drain. The starting HGL for the WSPGW model has been referenced from this study.

VI. HYDROLOGY

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

Model Description

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

Drainage Areas and Flow Patterns

The subbasins and flow patterns have been determined from referenced studies, 1-ft aerial topography of the project site, and proposed grading. Inspection of the land use and drainage patterns show they are consistent with the referenced studies. Therefore, flow rates have been referenced and no HEC-1 model has been prepared with this study. Pertinent reference material has been included in Appendix C.

VII. EXISTING DRAINAGE CONDITION

The existing condition is defined as the project site undeveloped and the offsite watershed in its current state. The existing condition hydrology for the project site was performed in the Summerlin West Study and is included in Appendix C. Therefore, no additional hydrological analysis has been performed for the existing condition of the project site.

VIII. INTERIM DRAINAGE CONDITION

The interim condition is defined as Village 25 portions of Sky Vista Drive, Fox Hills Drive, and Redpoint Drive being fully developed and the offsite watershed is in its current state. Refer to Figures 5 in Appendix D for an illustration of the interim drainage condition.

In the interim condition, a ditch constructed with the V21 Redpoint Study directs offsite flow at the west side of Redpoint Drive north around the proposed roadway and into an existing wash. Runoff generated from basin OFF3-1 (prorated from the Desert Foothills Study) is conveyed by a proposed ditch north to a proposed 48" stub to match the ultimate condition drainage pattern for the area. Note that since this ditch cuts off flow there will be no adverse impacts to downstream existing facilities.

IX. ULTIMATE DRAINAGE CONDITION

The ultimate condition is defined as the entire Village 25 area developed and the offsite watershed developed. The ultimate condition was reference from the Village 25 Study, therefore no additional hydrological analysis was performed.

X. STREET HYDRAULICS

Street flow data is the same in the interim and ultimate condition. Full width street sections have been provided with the flow evenly distributed through the cross sections. Note that the drop inlets on both sides of Redpoint Drive are able to intercept all runoff generated in the street. Hydraulic calculations have been included in Appendix B.

Based on the calculated street flow characteristics, the criteria for depth (D) and velocity times depth ($D \cdot V$) for the 100-year storm event will be met. Street flow also meets local Summerlin design criteria of being contained at or below top of curb in Redpoint Drive.

XI. STORM DRAIN

As part of this project storm drain will be extended approximately 850-ft west in Redpoint Drive. Two stubs are proposed on the south side of the street. The 48" stub will collect runoff during the interim condition from the proposed ditch. The 24" stub will be capped for future use with the development of COS-2 of the V25 Study. Hydraulic calculations for the storm drain system have been provided in Appendix B. The starting HGL for the WSPGW Model was taken from the Fox Hill Study. The WSPGW model utilizes the Ultimate condition flow rates since the interim condition flow rates are less. Table 1 contains a comparison of the interim condition and ultimate condition flow rates collected by the proposed storm drain improvements.

Table 1: Interim and Ultimate Condition Flow Rate Comparison

Storm Drain Improvement	Interim Condition Flow Rate Q100	Ultimate Condition Flow Rate Q100
48" RCP STA:1611.62 - STA:1684.28	87	99

Storm Drain Improvement	Interim Condition Flow Rate Q100	Ultimate Condition Flow Rate Q100
48" RCP STA:1684.281 - STA:1709.40	92	104
48" RCP STA:1709.401 - STA:1856.04	96	108
48" RCP STA:1856.041 - STA:1969.33	98	115
48" RCP STA:1969.33 - STA:2248.260	98	115
48" RCP STA:2248.260 - STA:2320.270	98	115
48" RCP STA:2320.27- STA:2398.74	98	115
48" RCP STA:2398.741- STA:2488.340	101	118
Stationing Reported from WSPG Model Stationing.		

XII. CONCLUSIONS AND RECOMMENDATIONS

1. Methodology used in this report is in compliance with Clark County Regional Flood Control District (CCRFCD) criteria.
2. The project area lies within a designated FEMA Flood Zone X. Therefore, the project is not located in a FEMA-designated Special Flood Hazard Area.
3. The site is adjacent to CCRFCD Facility APD6 0000.
4. The proposed drainage patterns in this report are generally consistent with all referenced studies.
5. In general, the proposed development does not adversely impact the drainage patterns and downstream properties or facilities

XIII. REFERENCES

1. Clark County Regional Flood Control District. *Hydrologic Criteria and Drainage Design Manual*. August 1999.
2. CCRFCD 2013 Las Vegas Valley Master Plan Update. 2013.
3. VTN. *Master Conceptual Drainage Study for Summerlin West Village 25*. February 2019.
4. GCW, Inc. *Technical Drainage Study for Summerlin Village 21 Redpoint Drive Improvements (Fox Hill Drive to Desert Foothills Drive)*. January 2019.
5. VTN. *Technical Drainage Study for Summerlin West Village 21 Desert Foothills Drive (Far Hills Avenue to Redpoint Drive)*. August 2018.
6. GCW, Inc. *Technical Drainage Study for Fox Hill Drive Improvements Phase 1*. February 2019

Summerlin Village 25 Redpoint Drive – Sky Vista Drive to Fox Hill Drive

Appendix A. Hydrologic Calculations

1. Prorated Flow Rate Calculations

Appendix B. Hydraulic Calculations

1. Hydraulic Sections
2. Inlet Calculations
3. WSPGW Models

Appendix C. Reference Material

1. *Master Conceptual Drainage Study for Summerlin West Village 25*
2. *Technical Drainage Study for Summerlin Village 21 Redpoint Drive Improvements*
3. *Technical Drainage Study for Summerlin Village 21 Desert Foothills Drive*
4. *Technical Drainage Study for Fox Hill Drive Improvements Phase 1*

Appendix D. Figures

1. Figure 1 - Vicinity Map
2. Figure 2 - FEMA FIRMette Panel 32003C2150E
3. Figure 3 - CCRFCD Las Vegas Valley Flood Control Master Plan Update Figure H-24
4. Figure 4 - CCRFCD Las Vegas Valley Flood Control Master Plan Update Figure F-24
5. Figure 5 - Interim Condition Drainage Map

APPENDIX A

Hydrologic Calculations

Prorated Flow Rate Calculations

**Summerlin Village 25 Redpoint Drive
Sky Vista Drive to Fox Hill Drive**

INTERIM CONDITION PRORATED FLOW SUMMARY			
Referenced Parent Basins			
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	cfs/acre
OFF3**	390	146.9	2.66
STA1*	10	2.3	4.37
Prorated Basins			
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	cfs/acre
OFF3-1	87	32.8	2.66
STA1-1	14	3.3****	4.37

* Referenced from the Village 25 Study

** Referenced from the Desert Foothills Study

**** Larger area than referenced street basin due to landscape areas draining to street basin. Conservatively assumes prorated flow rate for entire area.

APPENDIX B

Hydraulic Calculations

Hydraulic Sections

Cross Section for Section 1 - 100-Yr - Min Slope

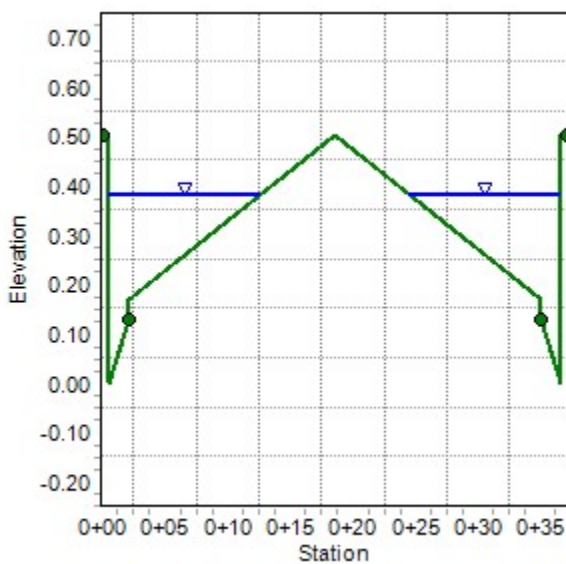
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.40	%
Normal Depth	0.38	ft
Discharge	14.00	ft ³ /s

Cross Section Image



Project Description

Input Data

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

Roughness Segment Definitions

Options

02/28/2019 09:56:55 AM Bentley Systems, Inc. Bentley FlowMaster V8i (SELECTseries 1) [08.11.01.03] 27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 2

Worksheet for Section 1 - 100-Yr - Min Slope

Results

Normal Depth		0.38	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		3.16	ft ²
Wetted Perimeter		24.89	ft
Hydraulic Radius		0.13	ft
Top Width		24.04	ft
Normal Depth		0.38	ft
Critical Depth		0.48	ft
Critical Slope		0.00658	ft/ft
Velocity		4.43	ft/s
Velocity Head		0.31	ft
Specific Energy		0.69	ft
Froude Number		2.16	
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	0.38	ft
Critical Depth	0.48	ft
Channel Slope	3.40	%
Critical Slope	0.00658	ft/ft

Cross Section for Section 1 - 100-Yr - Max Slope

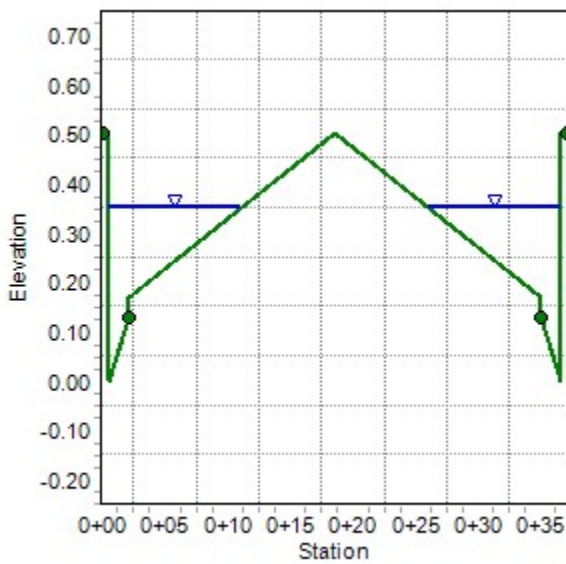
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	6.30	%
Normal Depth	0.35	ft
Discharge	14.00	ft ³ /s

Cross Section Image



Project Description

Manning Formula

Normal Depth

Channel Slope	6.30	%
Discharge	14.00	ft³/s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+18.50	0.50
0+35.00	0.17
0+35.00	0.13
0+36.50	0.00
0+36.50	0.50
0+37.00	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+35.00, 0.13)	0.016
(0+35.00, 0.13)	(0+37.00, 0.50)	0.013

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

Worksheet for Section 1 - 100-Yr - Max Slope

Results

Normal Depth		0.35	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		2.49	ft ²
Wetted Perimeter		21.85	ft
Hydraulic Radius		0.11	ft
Top Width		21.05	ft
Normal Depth		0.35	ft
Critical Depth		0.48	ft
Critical Slope		0.00654	ft/ft
Velocity		5.63	ft/s
Velocity Head		0.49	ft
Specific Energy		0.84	ft
Froude Number		2.89	
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	0.48	ft
Channel Slope	6.30	%
Critical Slope	0.00654	ft/ft

Cross Section for Section 2 - 100-Yr

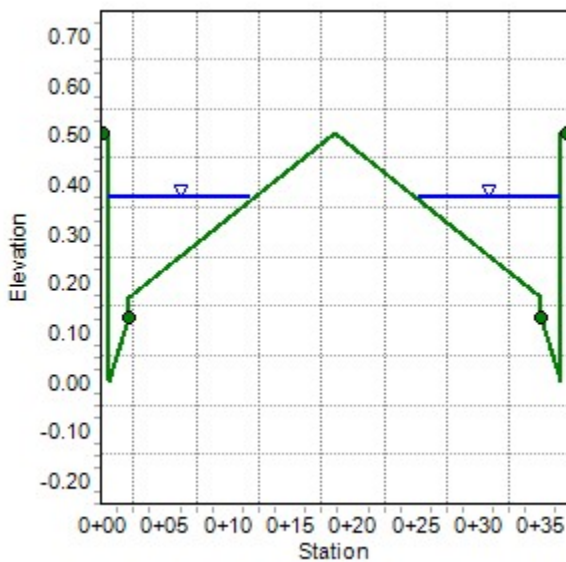
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.40	%
Normal Depth	0.37	ft
Discharge	14.00	ft ³ /s

Cross Section Image



Worksheet for Section 2 - 100-Yr

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 4.40 %
Discharge 14.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+18.50	0.50
0+35.00	0.17
0+35.00	0.13
0+36.50	0.00
0+36.50	0.50
0+37.00	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+35.00, 0.13)	0.016
(0+35.00, 0.13)	(0+37.00, 0.50)	0.013

Options

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

Worksheet for Section 2 - 100-Yr

Results

Normal Depth		0.37	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		2.85	ft ²
Wetted Perimeter		23.55	ft
Hydraulic Radius		0.12	ft
Top Width		22.72	ft
Normal Depth		0.37	ft
Critical Depth		0.48	ft
Critical Slope		0.00656	ft/ft
Velocity		4.91	ft/s
Velocity Head		0.37	ft
Specific Energy		0.74	ft
Froude Number		2.44	
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	0.37	ft
Critical Depth	0.48	ft
Channel Slope	4.40	%
Critical Slope	0.00656	ft/ft

Cross Section for Section 3 (Min Slope)

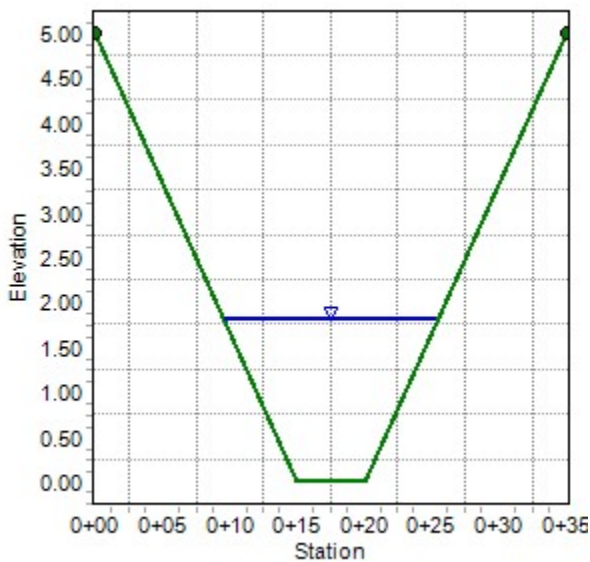
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50	%
Normal Depth	1.81	ft
Discharge	87.00	ft ³ /s

Cross Section Image



Worksheet for Section 3 (Min Slope)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50	%
Discharge	87.00	ft ³ /s
Section Definitions		

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

0+00	5.00
0+15	0.00
0+20	0.00
0+35	5.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5.00)	(0+35, 5.00)	0.025

Options

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

Results

Normal Depth	1.81	ft
Elevation Range	0.00 to 5.00	ft
Flow Area	18.88	ft²
Wetted Perimeter	16.45	ft
Hydraulic Radius	1.15	ft
Top Width	15.86	ft
Normal Depth	1.81	ft
Critical Depth	1.55	ft
Critical Slope	0.00939	ft/ft

Worksheet for Section 3 (Min Slope)

Results

Velocity	4.61	ft/s
Velocity Head	0.33	ft
Specific Energy	2.14	ft
Froude Number	0.74	
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	1.81	ft
Critical Depth	1.55	ft
Channel Slope	0.50	%
Critical Slope	0.00939	ft/ft

Cross Section for Section 3 (Max Slope)

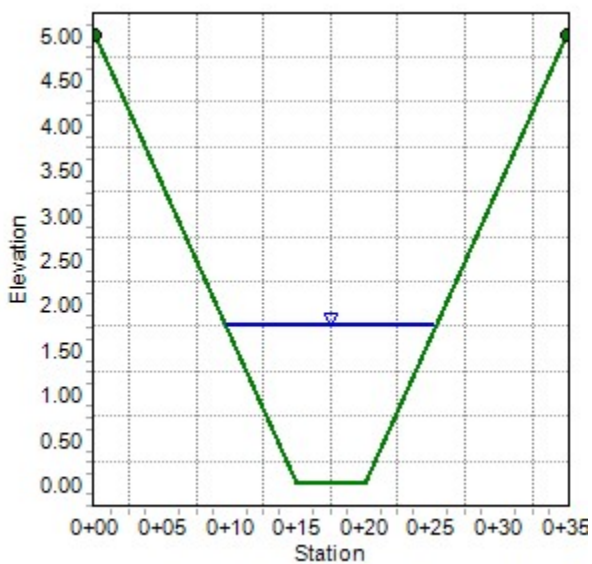
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.56	%
Normal Depth	1.76	ft
Discharge	87.00	ft ³ /s

Cross Section Image



Worksheet for Section 3 (Max Slope)

Results

Velocity	4.80	ft/s
Velocity Head	0.36	ft
Specific Energy	2.12	ft
Froude Number	0.79	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

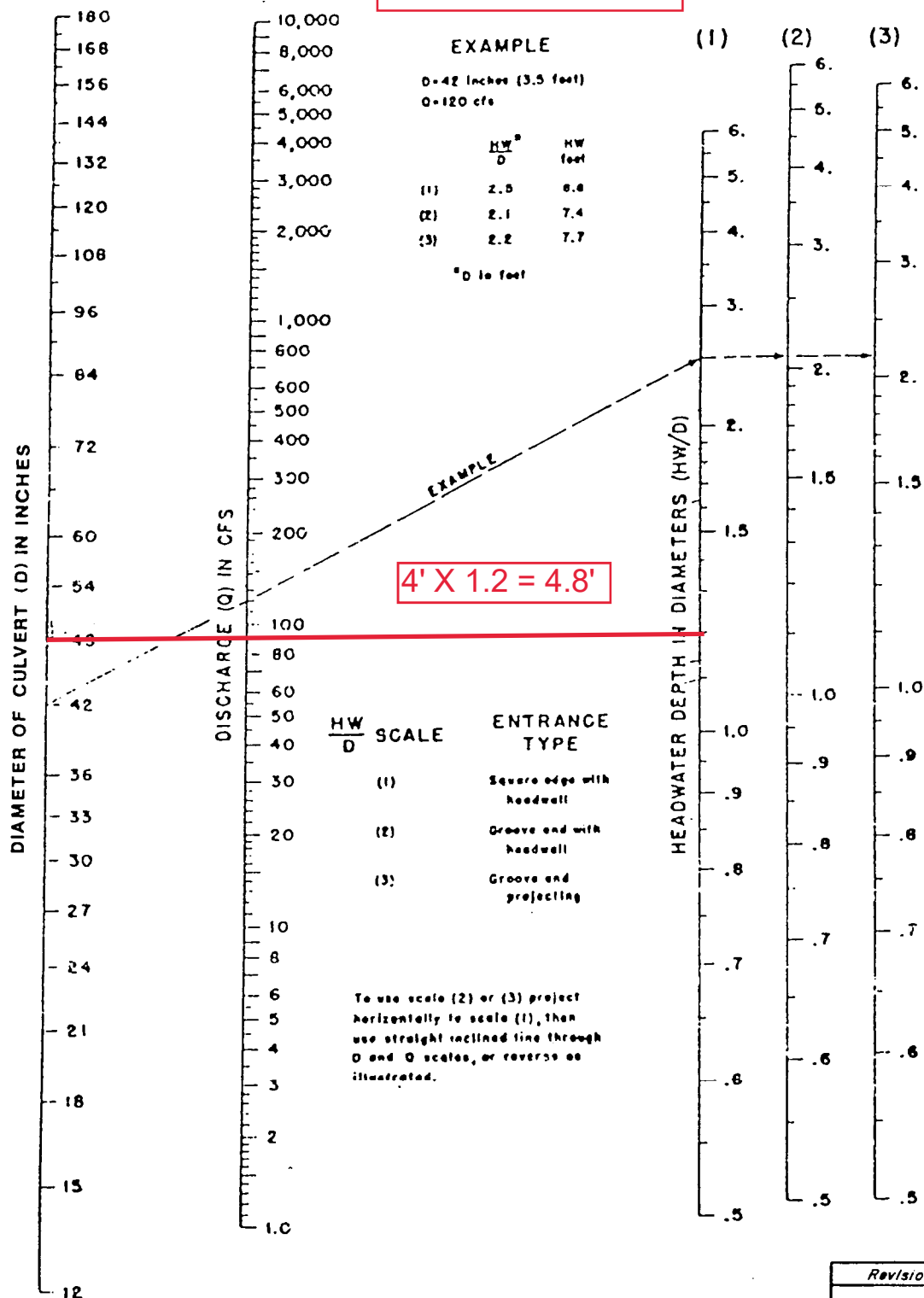
Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.76	ft
Critical Depth	1.55	ft
Channel Slope	0.56	%
Critical Slope	0.00939	ft/ft

Inlet Calculations

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

48" INTERIM STUB



Revision	Date

GCV

ENGINEERS & SURVEYORS

Drop Inlet Sizing Calculation

Project Name: Redpoint Drive

By: CB

Date: 02/22/2019

Drop Inlet Sizing on a Continuous Grade

DI #1.1 7.50 Type CM2

Known:

Q _s = Street Flow	7.0	cfs
S _o = Longitudinal Slope	0.0632	ft/ft
n= Manning's Roughness Coefficient	0.016	
V _s = Flow Velocity	5.63	fps
D= Flow Depth	0.35	ft
S _x = Street Transverse Slope	0.02	ft/ft
W= Grate Width	1.5	ft
a= Gutter Depression	5.0	in
L _g = Length of Grate	5.0	ft
L _c = Length of Curb Opening	7.5	ft
C _{fg} = Clogging Factor for Grate	50	%
C _{fc} = Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R _f = Frontal flow factor = $1 - 0.09(V_s - V_o)$ if $V_s > V_o$; else $R_f = 1$	1.00
V _o = Splash over velocity = $p + q(L_g(1 - (C_{fg}/100))) - r(L_g(1 - (C_{fg}/100)))^2 + s(L_g(1 - (C_{fg}/100)))^3$	7.22 fps
E _o = Grate flow ratio = Q_w/Q_s	0.37
Q _w = Frontal flow = $A_w V_s$	2.60 cfs
Q _x = Side flow = $Q_s - Q_w$	4.40 cfs
R _s = Side flow factor = $1 / (1 + (0.15 V_s^{1.8}) / (S_x (L_g (1 - C_{fg}/100))^{2.3}))$	0.05
Q _{ig} = Flow intercepted = $[R_f E_o + R_s (1 - E_o)] Q_s$	2.8 cfs
†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)	

Curb Opening Capacity Calculations

S _e = Equivalent cross slope = $S_x + S_w E_o$	0.126 ft/ft
S _w = Gutter cross slope = $(0.137 + a \text{ feet}) / W$	0.285 ft/ft
L _t = Total interception L = $0.60 Q_s^{0.42} S_o^{0.30} (1/n S_e)^{0.6}$	24.56 ft
Q _{ic} = Flow intercepted = $(1 - (1 - (L_c (1 - C_{fc}/100)) / L_t)^{1.8}) Q_s$	1.8 cfs

Total Inlet Calculations

Q _{ti} = Total flow intercepted = $Q_{ig} + Q_{ic}$	4.6 cfs
Q _{tq} = Flow bypass = $Q_s - Q_{ti}$	2.4 cfs
q= Interception per unit ratio = Q_{ti}/L_g	0.62 cfs/ft
E _q = Efficiency = $(Q_{ti}/Q_s) * 100$	66 %

GCV

ENGINEERS & SURVEYORS

Drop Inlet Sizing Calculation

Project Name: Redpoint Drive

By: CB

Date: 02/22/2019

Drop Inlet Sizing on a Continuous Grade

DI #1.2 7.50 Type CM2

Known:

Q _s = Street Flow	7.0	cfs
S _o = Longitudinal Slope	0.0632	ft/ft
n= Manning's Roughness Coefficient	0.016	
V _s = Flow Velocity	5.63	fps
D= Flow Depth	0.35	ft
S _x = Street Transverse Slope	0.02	ft/ft
W= Grate Width	1.5	ft
a= Gutter Depression	5.0	in
L _g = Length of Grate	2.5	ft
L _c = Length of Curb Opening	5.0	ft
C _{fg} = Clogging Factor for Grate	50	%
C _{fc} = Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R _f = Frontal flow factor = $1 - 0.09(V_s - V_o)$ if $V_s > V_o$; else $R_f = 1$	0.94
V _o = Splash over velocity = $p + q(L_g(1 - (C_{fg}/100))) - r(L_g(1 - (C_{fg}/100)))^2 + s(L_g(1 - (C_{fg}/100)))^3$	5.02 fps
E _o = Grate flow ratio = Q_w/Q_s	0.37
Q _w = Frontal flow = $A_w V_s$	2.60 cfs
Q _x = Side flow = $Q_s - Q_w$	4.40 cfs
R _s = Side flow factor = $1 / (1 + (0.15 V_s^{1.8}) / (S_x (L_g (1 - C_{fg}/100))^{2.3}))$	0.01
Q _{ig} = Flow intercepted = $[R_f E_o + R_s (1 - E_o)] Q_s$	2.5 cfs
†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)	

Curb Opening Capacity Calculations

S _e = Equivalent cross slope = $S_x + S_w E_o$	0.126 ft/ft
S _w = Gutter cross slope = $(0.137 + a \text{ feet}) / W$	0.285 ft/ft
L _t = Total interception L = $0.60 Q_s^{0.42} S_o^{0.30} (1/n S_e)^{0.6}$	24.56 ft
Q _{ic} = Flow intercepted = $(1 - (1 - (L_c (1 - C_{fc}/100)) / L_t)^{1.8}) Q_s$	1.2 cfs

Total Inlet Calculations

Q _{ti} = Total flow intercepted = $Q_{ig} + Q_{ic}$	3.7 cfs
Q _{tq} = Flow bypass = $Q_s - Q_{ti}$	3.3 cfs
q= Interception per unit ratio = Q_{ti}/L_g	0.75 cfs/ft
E _q = Efficiency = $(Q_{ti}/Q_s) * 100$	53 %

GCV

ENGINEERS & SURVEYORS

Drop Inlet Sizing Calculation

Project Name: Redpoint Drive

By: CB

Date: 02/22/2019

Drop Inlet Sizing on a Continuous Grade

DI #2.1 5.00 Type CM2

Known:

Q _s = Street Flow	2.0	cfs
S _o = Longitudinal Slope	0.0632	ft/ft
n= Manning's Roughness Coefficient	0.016	
V _s = Flow Velocity	5.63	fps
D= Flow Depth	0.35	ft
S _x = Street Transverse Slope	0.02	ft/ft
W= Grate Width	1.5	ft
a= Gutter Depression	5.0	in
L _g = Length of Grate	2.5	ft
L _c = Length of Curb Opening	5.0	ft
C _{fg} = Clogging Factor for Grate	50	%
C _{fc} = Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R _f = Frontal flow factor = $1 - 0.09(V_s - V_o)$ if $V_s > V_o$; else $R_f = 1$	0.94
V _o = Splash over velocity = $p + q(L_g(1 - (C_{fg}/100))) - r(L_g(1 - (C_{fg}/100)))^2 + s(L_g(1 - (C_{fg}/100)))^3$	5.02 fps
E _o = Grate flow ratio = Q_w/Q_s	1.30
Q _w = Frontal flow = $A_w V_s$	2.60 cfs
Q _x = Side flow = $Q_s - Q_w$	-0.60 cfs
R _s = Side flow factor = $1 / (1 + (0.15 V_s^{1.8}) / (S_x (L_g (1 - C_{fg}/100))^{2.3}))$	0.01
Q _{ig} = Flow intercepted = $[R_f E_o + R_s (1 - E_o)] Q_s$	2.0 cfs
†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)	

Curb Opening Capacity Calculations

S _e = Equivalent cross slope = $S_x + S_w E_o$	0.392 ft/ft
S _w = Gutter cross slope = $(0.137 + a \text{ feet}) / W$	0.285 ft/ft
L _t = Total interception L = $0.60 Q_s^{0.42} S_o^{0.30} (1/n S_e)^{0.6}$	7.36 ft
Q _{ic} = Flow intercepted = $(1 - (1 - (L_c (1 - C_{fc}/100)) / L_t)^{1.8}) Q_s$	1.1 cfs

Total Inlet Calculations

Q _{ti} = Total flow intercepted = $Q_{ig} + Q_{ic}$	2.0 cfs
Q _{tq} = Flow bypass = $Q_s - Q_{ti}$	0.0 cfs
q= Interception per unit ratio = Q_{ti}/L_g	0.40 cfs/ft
E _q = Efficiency = $(Q_{ti}/Q_s) * 100$	100 %

GCV

ENGINEERS & SURVEYORS

Drop Inlet Sizing Calculation

Project Name: Redpoint Drive

By: CB

Date: 02/22/2019

Drop Inlet Sizing on a Continuous Grade

DI #6.1 12.50 Type CM2

Known:

Q _s = Street Flow	1.0	cfs
S _o = Longitudinal Slope	0.0632	ft/ft
n= Manning's Roughness Coefficient	0.016	
V _s = Flow Velocity	5.63	fps
D= Flow Depth	0.35	ft
S _x = Street Transverse Slope	0.02	ft/ft
W= Grate Width	1.5	ft
a= Gutter Depression	5.0	in
L _g = Length of Grate	10.0	ft
L _c = Length of Curb Opening	12.5	ft
C _{fg} = Clogging Factor for Grate	50	%
C _{fc} = Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R _f = Frontal flow factor = $1 - 0.09 \cdot (V_s - V_o)$ if $V_s > V_o$; else $R_f = 1$	1.00
V _o = Splash over velocity = $p + q \cdot (L_g \cdot (1 - (C_{fg}/100))) - r \cdot (L_g \cdot (1 - (C_{fg}/100)))^2 + s \cdot (L_g \cdot (1 - (C_{fg}/100)))^3$	9.86 fps
E _o = Grate flow ratio = Q_w/Q_s	2.60
Q _w = Frontal flow = $A_w \cdot V_s$	2.60 cfs
Q _x = Side flow = $Q_s - Q_w$	-1.60 cfs
R _s = Side flow factor = $1 / (1 + (0.15 \cdot V_s^{1.8}) / (S_x \cdot (L_g \cdot (1 - C_{fg}/100))^{2.3}))$	0.19
Q _{ig} = Flow intercepted = $[R_f \cdot E_o + R_s \cdot (1 - E_o)] \cdot Q_s$	1.0 cfs
†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)	

Curb Opening Capacity Calculations

S _e = Equivalent cross slope = $S_x + S_w \cdot E_o$	0.763 ft/ft
S _w = Gutter cross slope = $(0.137 + a \cdot \text{feet}) / W$	0.285 ft/ft
L _t = Total interception L = $0.60 \cdot Q_s^{0.42} \cdot S_o^{0.30} \cdot (1/n \cdot S_e)^{0.6}$	3.68 ft
Q _{ic} = Flow intercepted = $(1 - (1 - (L_c \cdot (1 - C_{fc}/100)) / L_t)^{1.8}) \cdot Q_s$	1.0 cfs

Total Inlet Calculations

Q _{ti} = Total flow intercepted = $Q_{ig} + Q_{ic}$	1.0 cfs
Q _{tq} = Flow bypass = $Q_s - Q_{ti}$	0.0 cfs
q= Interception per unit ratio = Q_{ti}/L_g	0.08 cfs/ft
E _q = Efficiency = $(Q_{ti}/Q_s) \cdot 100$	100 %

GCV

ENGINEERS & SURVEYORS

Drop Inlet Sizing Calculation

Project Name: Redpoint Drive

By: CB

Date: 02/22/2019

Drop Inlet Sizing on a Continuous Grade

DI #6.2 12.50 Type CM2

Known:

Q _s = Street Flow	3.0	cfs
S _o = Longitudinal Slope	0.0632	ft/ft
n= Manning's Roughness Coefficient	0.016	
V _s = Flow Velocity	5.63	fps
D= Flow Depth	0.35	ft
S _x = Street Transverse Slope	0.02	ft/ft
W= Grate Width	1.5	ft
a= Gutter Depression	5.0	in
L _g = Length of Grate	10.0	ft
L _c = Length of Curb Opening	12.5	ft
C _{fg} = Clogging Factor for Grate	50	%
C _{fc} = Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R _f = Frontal flow factor = $1 - 0.09(V_s - V_o)$ if $V_s > V_o$; else $R_f = 1$	1.00
V _o = Splash over velocity = $p + q(L_g(1 - (C_{fg}/100))) - r(L_g(1 - (C_{fg}/100)))^2 + s(L_g(1 - (C_{fg}/100)))^3$	9.86 fps
E _o = Grate flow ratio = Q_w/Q_s	0.87
Q _w = Frontal flow = $A_w V_s$	2.60 cfs
Q _x = Side flow = $Q_s - Q_w$	0.40 cfs
R _s = Side flow factor = $1 / (1 + (0.15 V_s^{1.8}) / (S_x (L_g (1 - C_{fg}/100))^{2.3}))$	0.19
Q _{ig} = Flow intercepted = $[R_f E_o + R_s (1 - E_o)] Q_s$	2.7 cfs
†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)	

Curb Opening Capacity Calculations

S _e = Equivalent cross slope = $S_x + S_w E_o$	0.268 ft/ft
S _w = Gutter cross slope = $(0.137 + a \text{ feet}) / W$	0.285 ft/ft
L _t = Total interception L = $0.60 Q_s^{0.42} S_o^{0.30} (1/n S_e)^{0.6}$	10.96 ft
Q _{ic} = Flow intercepted = $(1 - (1 - (L_c (1 - C_{fc}/100)) / L_t)^{1.8}) Q_s$	2.3 cfs

Total Inlet Calculations

Q _{ti} = Total flow intercepted = $Q_{ig} + Q_{ic}$	3.0 cfs
Q _{tq} = Flow bypass = $Q_s - Q_{ti}$	0.0 cfs
q= Interception per unit ratio = Q_{ti}/L_g	0.24 cfs/ft
E _q = Efficiency = $(Q_{ti}/Q_s) * 100$	100 %

WSPGW Models

T1 V25 FOX Hill DRIVE
T2 FAR HILLS AVENUE TO REDPOINT DRIVE
T3 Mainline

SO	-2583.0803437.670	1				3447.340						
R	-2488.3403442.530	1	.013				.000	.000	1			
R	-2398.7413447.129	1	.013				.000	.000	1			
JX	-2398.7403447.130	1	2	.013	0.001	3.0003447.1303447.130	-45.0	45.0	-5.000			
R	-2320.3003451.920	1	.013				.000	-5.000	1			
R	-2248.3203456.310	1	.013				.000	-5.000	1			
R	-1969.3903473.880	1	.013				.000	5.000	1			
R	-1856.1613481.319	1	.013				.000	.000	1			
JX	-1856.1603481.320	1	2	.013	7.000	3481.320	-70.0		5.000			
R	-1709.6413490.239	1	.013				.000	.000	1			
JX	-1709.6403490.240	1	2	.013	4.000	3490.240	-90.0		45.000			
R	-1684.5213493.699	1	.013				.000	.000	1			
JX	-1684.5203493.700	1	2	.013	5.000	3493.700	-90.0		45.000			
R	-1611.9203494.430	1	.013				.000	.000	1			
SH	-1611.9203494.430	1				3496.240						
CD	1	4	1	.000	4.000	.000	.000	.000	.00			
CD	2	4	1	.000	1.500	.000	.000	.000	.00			
Q				99.000	.0							

FILE: V25_ULT.WSW W S P G W - EDIT LISTING - Version 14.10 Date: 4- 8-2019 Time: 8:43:12
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1
CARD SECT CHN NO OF AVE PIER HEIGHT 1 BASE ZL ZR INV Y(1) Y(2) Y(3) Y(4) Y(5) Y(6) Y(7) Y(8) Y(9) Y(10)
CODE NO TYPE PIER/PIP WIDTH DIAMETER WIDTH DROP
CD 1 4 1 4.000
CD 2 4 1 1.500

W S P G W PAGE NO 1
WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS - V25 FOX Hill DRIVE
HEADING LINE NO 2 IS - FAR HILLS AVENUE TO REDPOINT DRIVE
HEADING LINE NO 3 IS - Mainline

W S P G W PAGE NO 2
WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT W S ELEV
-2583.080 3437.670 1 3447.340
ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-2488.340 3442.530 1 .013 .000 .000 .000 1
ELEMENT NO 3 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-2398.741 3447.129 1 .013 .000 .000 .000 1
ELEMENT NO 4 IS A JUNCTION * * * * *
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
-2398.740 3447.130 1 2 2 .013 .001 3.000 3447.130 3447.130 -45.000 45.000
RADIUS ANGLE
.011 -5.000
ELEMENT NO 5 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-2320.300 3451.920 1 .013 .000 .000 -5.000 1
ELEMENT NO 6 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-2248.320 3456.310 1 .013 .000 .000 -5.000 1
ELEMENT NO 7 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-1969.390 3473.880 1 .013 .000 .000 5.000 1
ELEMENT NO 8 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-1856.161 3481.319 1 .013 .000 .000 .000 1
ELEMENT NO 9 IS A JUNCTION * * * * *
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
-1856.160 3481.320 1 2 0 .013 7.000 .000 3481.320 .000 -70.000 .000
RADIUS ANGLE
.011 5.000
ELEMENT NO 10 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-1709.641 3490.239 1 .013 .000 .000 .000 1
W S P G W PAGE NO 3
WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO 11 IS A JUNCTION * * * * *
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
-1709.640 3490.240 1 2 0 .013 4.000 .000 3490.240 .000 -90.000 .000
RADIUS ANGLE
.001 45.000
ELEMENT NO 12 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-1684.521 3493.699 1 .013 .000 .000 .000 1
ELEMENT NO 13 IS A JUNCTION * * * * *
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
-1684.520 3493.700 1 2 0 .013 5.000 .000 3493.700 .000 -90.000 .000
RADIUS ANGLE
.001 45.000
ELEMENT NO 14 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
-1611.920 3494.430 1 .013 .000 .000 .000 1
ELEMENT NO 15 IS A SYSTEM HEADWORKS *
U/S DATA STATION INVERT SECT W S ELEV
-1611.920 3494.430 1 3496.240

V25 FOX HILL DRIVE
FAR HILLS AVENUE TO REDPOINT DRIVE
Mainline

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
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-2583.080	3437.670	9.670	3447.340	118.00	9.39	1.37	3448.71	.00	3.27	.00	4.000	.000	.00	1 .0
71.168	.0513					.0067	.48	9.67	.00	1.67	.013	.00	.00	PIPE
-2511.912	3441.321	6.548	3447.869	118.00	9.39	1.37	3449.24	.00	3.27	.00	4.000	.000	.00	1 .0
HYDRAULIC JUMP														
-2511.912	3441.321	1.653	3442.974	118.00	24.08	9.00	3451.97	.00	3.27	3.94	4.000	.000	.00	1 .0
23.572	.0513					.0529	1.25	1.65	3.80	1.67	.013	.00	.00	PIPE
-2488.340	3442.530	1.651	3444.181	118.00	24.11	9.03	3453.21	.00	3.27	3.94	4.000	.000	.00	1 .0
89.599	.0513					.0541	4.85	1.65	3.81	1.67	.013	.00	.00	PIPE
-2398.741	3447.129	1.633	3448.762	118.00	24.47	9.30	3458.06	4.00	3.27	3.93	4.000	.000	.00	1 .0
JUNCT STR	1.0000					.0583	.00	4.00	3.89		.013	.00	.00	PIPE
-2398.740	3447.130	1.564	3448.694	115.00	25.26	9.90	3458.60	.00	3.24	3.90	4.000	.000	.00	1 .0
78.440	.0611					.0615	4.83	1.56	4.12	1.57	.013	.00	.00	PIPE
-2320.300	3451.920	1.561	3453.481	115.00	25.32	9.95	3463.43	.00	3.24	3.90	4.000	.000	.00	1 .0
71.980	.0610					.0621	4.47	1.56	4.14	1.57	.013	.00	.00	PIPE
-2248.320	3456.310	1.556	3457.866	115.00	25.43	10.04	3467.91	.00	3.24	3.90	4.000	.000	.00	1 .0
111.322	.0630					.0621	6.91	1.56	4.16	1.55	.013	.00	.00	PIPE
-2136.999	3463.322	1.561	3464.883	115.00	25.31	9.95	3474.83	.00	3.24	3.90	4.000	.000	.00	1 .0
167.609	.0630					.0579	9.71	1.56	4.13	1.55	.013	.00	.00	PIPE

V25 FOX HILL DRIVE
FAR HILLS AVENUE TO REDPOINT DRIVE
Mainline

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
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-1969.390	3473.880	1.618	3475.498	115.00	24.13	9.04	3484.54	.00	3.24	3.93	4.000	.000	.00	1 .0
19.479	.0657					.0531	1.03	1.62	3.86	1.54	.013	.00	.00	PIPE
-1949.911	3475.159	1.636	3476.795	115.00	23.77	8.77	3485.57	.00	3.24	3.93	4.000	.000	.00	1 .0
43.595	.0657					.0488	2.13	1.64	3.78	1.54	.013	.00	.00	PIPE
-1906.315	3478.024	1.696	3479.720	115.00	22.66	7.98	3487.70	.00	3.24	3.95	4.000	.000	.00	1 .0
28.975	.0657					.0429	1.24	1.70	3.53	1.54	.013	.00	.00	PIPE
-1877.340	3479.927	1.759	3481.687	115.00	21.61	7.25	3488.94	.00	3.24	3.97	4.000	.000	.00	1 .0
21.179	.0657					.0377	.80	1.76	3.29	1.54	.013	.00	.00	PIPE
-1856.161	3481.319	1.824	3483.144	115.00	20.60	6.59	3489.74	4.00	3.24	3.98	4.000	.000	.00	1 .0
JUNCT STR	1.0000					.0402	.00	4.00	3.07		.013	.00	.00	PIPE
-1856.160	3481.320	1.643	3482.962	108.00	22.22	7.66	3490.63	.00	3.14	3.94	4.000	.000	.00	1 .0
13.106	.0609					.0442	.58	1.64	3.52	1.51	.013	.00	.00	PIPE
-1843.054	3482.118	1.662	3483.780	108.00	21.86	7.42	3491.20	.00	3.14	3.94	4.000	.000	.00	1 .0
30.321	.0609					.0406	1.23	1.66	3.44	1.51	.013	.00	.00	PIPE

V25_ULT.OUT

-1812.734	3483.963	1.723	3485.687	108.00	20.84	6.75	3492.43	.00	3.14	3.96	4.000	.000	.00	1	.0
21.820	.0609					.0357	.78	1.72	3.21	1.51	.013	.00	.00	PIPE	
-1790.913	3485.292	1.787	3487.079	108.00	19.87	6.13	3493.21	.00	3.14	3.98	4.000	.000	.00	1	.0
16.664	.0609					.0314	.52	1.79	3.00	1.51	.013	.00	.00	PIPE	

FILE: V25_ULT.WSW
 W S P G W - CIVILDESIGN Version 14.08
 Program Package Serial Number: 3074
 WATER SURFACE PROFILE LISTING
 Date: 4- 8-2019 Time: 8:43:14

V25 FOX Hill DRIVE
 FAR HILLS AVENUE TO REDPOINT DRIVE
 Mainline

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
-1774.249	3486.306	1.853	3488.159	108.00	18.95	5.58	3493.73	.00	3.14	3.99	4.000	.000	.00	1 .0
13.126	.0609					.0276	.36	1.85	2.79	1.51	.013	.00	.00	PIPE
-1761.123	3487.105	1.923	3489.028	108.00	18.07	5.07	3494.10	.00	3.14	4.00	4.000	.000	.00	1 .0
10.598	.0609					.0243	.26	1.92	2.60	1.51	.013	.00	.00	PIPE
-1750.525	3487.750	1.996	3489.746	108.00	17.23	4.61	3494.35	.00	3.14	4.00	4.000	.000	.00	1 .0
8.658	.0609					.0214	.19	2.00	2.42	1.51	.013	.00	.00	PIPE
-1741.867	3488.277	2.073	3490.350	108.00	16.42	4.19	3494.54	.00	3.14	4.00	4.000	.000	.00	1 .0
7.158	.0609					.0188	.13	2.07	2.26	1.51	.013	.00	.00	PIPE
-1734.709	3488.713	2.153	3490.866	108.00	15.66	3.81	3494.67	.00	3.14	3.99	4.000	.000	.00	1 .0
5.903	.0609					.0166	.10	2.15	2.10	1.51	.013	.00	.00	PIPE
-1728.806	3489.073	2.238	3491.311	108.00	14.93	3.46	3494.77	.00	3.14	3.97	4.000	.000	.00	1 .0
4.887	.0609					.0147	.07	2.24	1.95	1.51	.013	.00	.00	PIPE
-1723.919	3489.370	2.327	3491.697	108.00	14.24	3.15	3494.84	.00	3.14	3.95	4.000	.000	.00	1 .0
4.011	.0609					.0130	.05	2.33	1.81	1.51	.013	.00	.00	PIPE
-1719.908	3489.614	2.421	3492.035	108.00	13.57	2.86	3494.90	.00	3.14	3.91	4.000	.000	.00	1 .0
3.242	.0609					.0115	.04	2.42	1.68	1.51	.013	.00	.00	PIPE
-1716.666	3489.811	2.521	3492.332	108.00	12.94	2.60	3494.93	.00	3.14	3.86	4.000	.000	.00	1 .0
2.574	.0609					.0102	.03	2.52	1.55	1.51	.013	.00	.00	PIPE

FILE: V25_ULT.WSW
 W S P G W - CIVILDESIGN Version 14.08
 Program Package Serial Number: 3074
 WATER SURFACE PROFILE LISTING
 Date: 4- 8-2019 Time: 8:43:14

V25 FOX Hill DRIVE
 FAR HILLS AVENUE TO REDPOINT DRIVE
 Mainline

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
-1714.093	3489.968	2.627	3492.595	108.00	12.34	2.36	3494.96	.00	3.14	3.80	4.000	.000	.00	1 .0
1.948	.0609					.0091	.02	2.63	1.43	1.51	.013	.00	.00	PIPE
-1712.144	3490.087	2.741	3492.828	108.00	11.77	2.15	3494.98	.00	3.14	3.72	4.000	.000	.00	1 .0
1.390	.0609					.0081	.01	2.74	1.32	1.51	.013	.00	.00	PIPE
-1710.754	3490.171	2.863	3493.034	108.00	11.22	1.95	3494.99	.00	3.14	3.61	4.000	.000	.00	1 .0
.832	.0609					.0072	.01	2.86	1.21	1.51	.013	.00	.00	PIPE
-1709.922	3490.222	2.996	3493.218	108.00	10.70	1.78	3494.99	.00	3.14	3.47	4.000	.000	.00	1 .0
.281	.0609					.0065	.00	3.00	1.10	1.51	.013	.00	.00	PIPE
-1709.641	3490.239	3.143	3493.382	108.00	10.20	1.61	3495.00	4.00	3.14	3.28	4.000	.000	.00	1 .0
JUNCT STR	1.0000							4.00	1.00		.013	.00	.00	PIPE
-1709.640	3490.240	1.771	3492.011	104.00	19.36	5.82	3497.83	.00	3.09	3.97	4.000	.000	.00	1 .0

V25_ULT.OUT

3.765	.1377					.0303	.11	1.77	2.94	1.20	.013	.00	.00	PIPE
-1705.876	3490.758	1.828	3492.586	104.00	18.57	5.36	3497.94	.00	3.09	3.99	4.000	.000	.00	1 .0
3.771	.1377					.0268	.10	1.83	2.76	1.20	.013	.00	.00	PIPE
-1702.105	3491.277	1.897	3493.175	104.00	17.71	4.87	3498.04	.00	3.09	3.99	4.000	.000	.00	1 .0
3.258	.1377					.0236	.08	1.90	2.57	1.20	.013	.00	.00	PIPE
-1698.847	3491.726	1.968	3493.694	104.00	16.89	4.43	3498.12	.00	3.09	4.00	4.000	.000	.00	1 .0
2.793	.1377					.0208	.06	1.97	2.40	1.20	.013	.00	.00	PIPE

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 W S P G W - CIVILDESIGN Version 14.08
 Program Package Serial Number: 3074
 WATER SURFACE PROFILE LISTING
 Date: 4- 8-2019 Time: 8:43:14
 PAGE 5

V25 FOX Hill DRIVE
FAR HILLS AVENUE TO REDPOINT DRIVE
Mainline

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
-1696.054	3492.111	2.044	3494.155	104.00	16.10	4.02	3498.18	.00	3.09	4.00	4.000	.000	.00	1 .0
2.403	.1377					.0183	.04	2.04	2.23	1.20	.013	.00	.00	PIPE
-1693.651	3492.441	2.123	3494.564	104.00	15.35	3.66	3498.22	.00	3.09	3.99	4.000	.000	.00	1 .0
2.062	.1377					.0162	.03	2.12	2.08	1.20	.013	.00	.00	PIPE
-1691.589	3492.725	2.205	3494.930	104.00	14.64	3.33	3498.26	.00	3.09	3.98	4.000	.000	.00	1 .0
1.737	.1377					.0143	.02	2.21	1.93	1.20	.013	.00	.00	PIPE
-1689.852	3492.965	2.293	3495.258	104.00	13.95	3.02	3498.28	.00	3.09	3.96	4.000	.000	.00	1 .0
1.462	.1377					.0126	.02	2.29	1.79	1.20	.013	.00	.00	PIPE
-1688.390	3493.166	2.385	3495.551	104.00	13.31	2.75	3498.30	.00	3.09	3.93	4.000	.000	.00	1 .0
1.200	.1377					.0111	.01	2.39	1.66	1.20	.013	.00	.00	PIPE
-1687.190	3493.331	2.483	3495.814	104.00	12.69	2.50	3498.31	.00	3.09	3.88	4.000	.000	.00	1 .0
.964	.1377					.0099	.01	2.48	1.54	1.20	.013	.00	.00	PIPE
-1686.226	3493.464	2.587	3496.051	104.00	12.10	2.27	3498.32	.00	3.09	3.82	4.000	.000	.00	1 .0
.741	.1377					.0088	.01	2.59	1.42	1.20	.013	.00	.00	PIPE
-1685.485	3493.566	2.698	3496.264	104.00	11.53	2.07	3498.33	.00	3.09	3.75	4.000	.000	.00	1 .0
.537	.1377					.0078	.00	2.70	1.31	1.20	.013	.00	.00	PIPE
-1684.948	3493.640	2.816	3496.456	104.00	11.00	1.88	3498.33	.00	3.09	3.65	4.000	.000	.00	1 .0
.319	.1377					.0070	.00	2.82	1.20	1.20	.013	.00	.00	PIPE

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 Program Package Serial Number: 3074
 WATER SURFACE PROFILE LISTING
 Date: 4- 8-2019 Time: 8:43:14
 PAGE 6

V25 FOX Hill DRIVE
FAR HILLS AVENUE TO REDPOINT DRIVE
Mainline

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
-1684.629	3493.684	2.945	3496.629	104.00	10.48	1.71	3498.34	.00	3.09	3.53	4.000	.000	.00	1 .0
.108	.1377					.0062	.00	2.95	1.10	1.20	.013	.00	.00	PIPE
-1684.521	3493.699	3.087	3496.786	104.00	9.99	1.55	3498.34	4.00	3.09	3.36	4.000	.000	.00	1 .0
JUNCT STR 1.0000								4.00	1.00		.013	.00	.00	PIPE
-1684.520	3493.700	1.993	3495.693	99.00	15.82	3.89	3499.58	.00	3.02	4.00	4.000	.000	.00	1 .0
19.013	.0101					.0200	.38	1.99	2.23	2.44	.013	.00	.00	PIPE
-1665.507	3493.891	1.948	3495.839	99.00	16.29	4.12	3499.96	.00	3.02	4.00	4.000	.000	.00	1 .0

V25_ULT.OUT														
28.121	.0101					.0222	.62	1.95	2.33	2.44	.013	.00	.00	PIPE
-1637.386	3494.174	1.877	3496.051	99.00	17.09	4.53	3500.58	.00	3.02	3.99	4.000	.000	.00	1 .0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.466	.0101					.0252	.64	1.88	2.50	2.44	.013	.00	.00	PIPE
-1611.920	3494.430	1.810	3496.240	99.00	17.92	4.99	3501.23	.00	3.02	3.98	4.000	.000	.00	1 .0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^
^

V25 FOX Hill DRIVE

FAR HILLS AVENUE TO REDPOINT DRIVE

Mainline

-2583.08	.I	CH	W E											R
-2573.46	.													.
-2563.85	.													.
-2554.23	.													.
-2544.62	.													.
-2535.00	.													.
-2525.39	.													.
-2515.77	.													.
-2506.16	.	I	C H	W E										R
-2496.54	.	I	W C H	E										R
-2486.93	.	I	W CH	E										R
-2477.31	.													.
-2467.69	.													.
-2458.08	.													.
-2448.46	.													.
-2438.85	.													.
-2429.23	.													.
-2419.62	.													.
-2410.00	.													.
-2400.39	.													.
-2390.77	.		I	W CH	E									JX
-2381.16	.		I	W C H	E									R

				V25_ULT.OUT	
-2371.54	.				.
-2361.92	.				.
-2352.31	.				.
-2342.69	.				.
-2333.08	.				.
-2323.46	.				.
-2313.85	.	I	W	CH	E
					.
-2304.23	.				.
-2294.62	.				.
-2285.00	.				.
-2275.39	.				.
-2265.77	.				.
-2256.16	.				.
-2246.54	.	I	W	CH	E
					.
-2236.92	.				.
-2227.31	.				.
-2217.69	.				.
-2208.08	.				.
-2198.46	.				.
-2188.85	.				.
-2179.23	.				.
-2169.62	.				.
-2160.00	.				.
-2150.39	.				.
-2140.77	.				.
-2131.15	.	I	W	CH	E
					.
-2121.54	.				.
-2111.92	.				.
-2102.31	.				.
-2092.69	.				.

-2083.08	.				.					
-2073.46	.				.					
-2063.85	.				.					
-2054.23	.				.					
-2044.62	.				.					
-2035.00	.				.					
-2025.38	.				.					
-2015.77	.				.					
-2006.15	.				.					
-1996.54	.				.					
-1986.92	.				.					
-1977.31	.				.					
-1967.69	.	I	W	CH	E	.	R			
-1958.08	.					.				
-1948.46	.	I	W	CH	E	.	R			
-1938.85	.					.				
-1929.23	.					.				
-1919.61	.					.				
-1910.00	.					.				
-1900.38	.	I	W	CH	E	.	R			
-1890.77	.					.				
-1881.15	.					.				
-1871.54	.	I	W	CH	E	.	R			
-1861.92	.					.				
-1852.31	.	I	W	CH	E	.	JX			
-1842.69	.	I	W	CH	E	.	R			
-1833.08	.	I	W	C	H	E	R			
-1823.46	.					.				
-1813.84	.					.				
-1804.23	.			I	W	C	H	E	.	R

V25_ULT.OUT

-1794.61	.			.
-1785.00	.	I	W C H E	. R
-1775.38	.			.
-1765.77	.	I	W C H E	. R
-1756.15	.	I	W C H E	. R
-1746.54	.	I	W C H E	. R
-1736.92	.	I	W C H E	. R
-1727.31	.	I	W C H E	. R
-1717.69	.	I	W C H E	. R
-1708.07	.	I	W C H E	. R
-1698.46	.	I	W C H E	. R
-1688.84	.	I	W H E	. R
-1679.23	.	I	W C H E	. R
-1669.61	.	I	W C H E	. R
-1660.00	.	I	W H E	. R
-1650.38	.	I	W H E	. R
-1640.77	.	I	W H E	. JX
-1631.15	.	I	W C H E	. R
-1621.54	.	I	W C H E	. R
-1611.92	.			

APPENDIX C

Reference Material

Master Conceptual Drainage Study for Summerlin West Village 25

Master Conceptual Drainage Study for

Summerlin West Village 25

Las Vegas, Nevada

W.O. # 7919-A

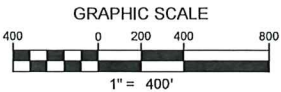
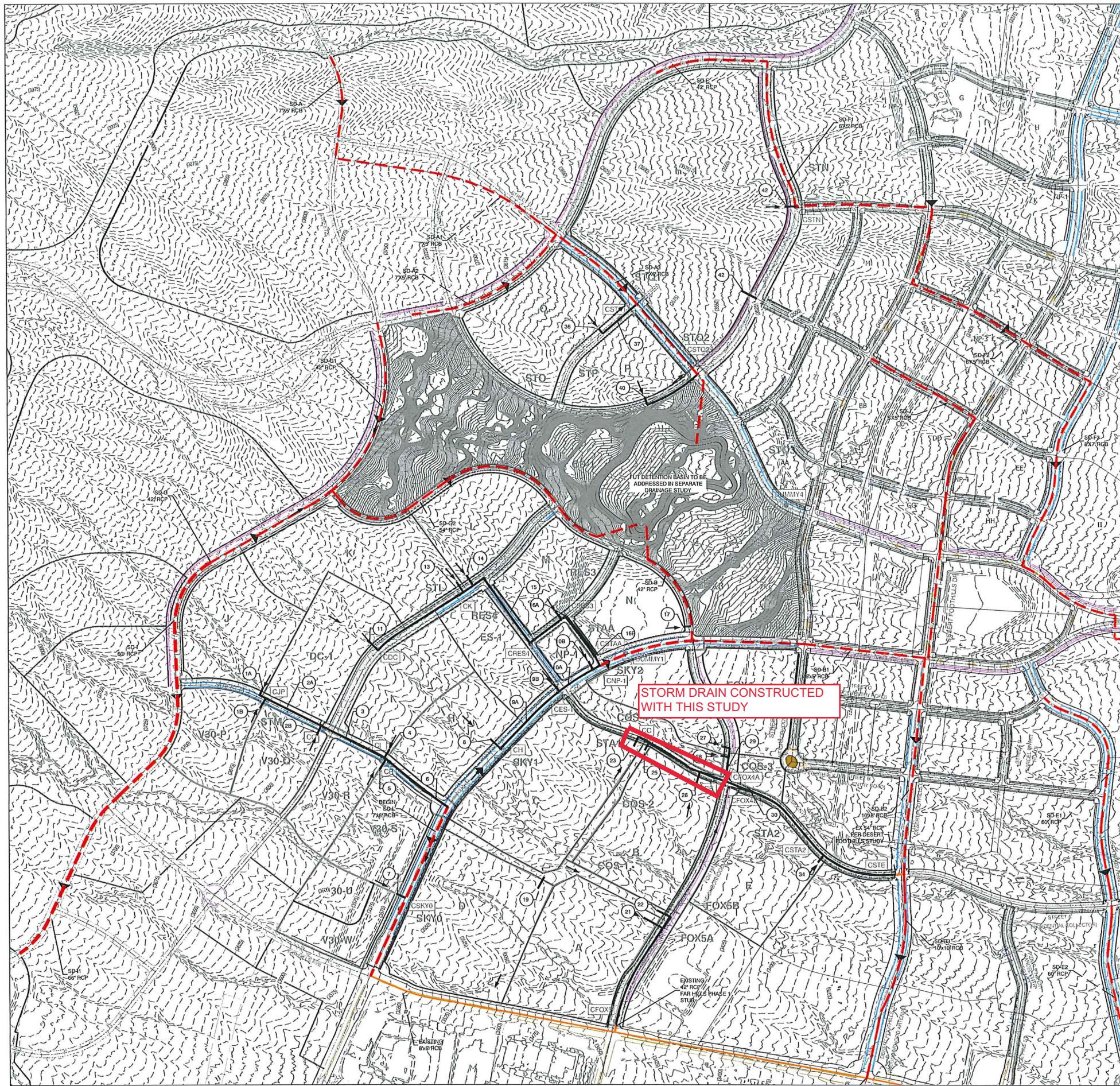
Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works





LEGEND

- CCRFC D STORM DRAIN ALIGNMENT
- EXISTING FACILITY
- VILLAGE 25 LOCAL STORM DRAIN
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- LOCAL FACILITY DESIGNATION
- DEVELOPED CONDITION FLOW ARROW

VILLAGE 25 LOCAL FLOOD PROTECTION FACILITIES					
Facility #	Design Slope %	Q100 cfs	Tributary Basin/CP	Facility	Velocity fps
1A	6.00%	69	J	30" RCP	22.05
1B	3.78%	39	V30-P	24" RCP	15.81
2A	0.50%	128	CJP	54" RCP	9.92
2B	0.50%	37	V30-Q	36" RCP	7.39
3	6.00%	165	CQ	54" RCP	27.44
4	0.50%	53	I	42" RCP	8.10
5	2.84%	35	V30-R	30" RCP	14.12
6	5.18%	252	CR	54" RCP	28.98
7	1.00%	346	CUWS	66" RCP	16.08
8	6.00%	49	H	24" RCP	19.86
9A	0.50%	64	CH	42" RCP	8.37
9B	0.99%	42	ES-1	36" RCP	9.93
10A	6.00%	106	CES-1	42" RCP	24.65
10B	5.78%	9	NP-1	24" RCP	12.81
11	1.62%	56	DC-1	36" RCP	12.83
13	0.50%	86	K	48" RCP	9.07
14	6.00%	53	L	30" RCP	20.74
15	5.98%	223	CL	42" RCP	28.96
16A	6.00%	46	M	24" RCP	19.72
16B	4.05%	287	CSTAA	48" RCP	26.22
17	2.55%	40	N	30" RCP	14.00
19	0.50%	105	D	54" RCP	9.61
21	6.00%	81	A	30" RCP	22.77
22	4.70%	114	D, COS-1	54" RCP	22.70
23	0.50%	101	C	48" RCP	9.21
25	0.50%	5	COS-2	24" RCP	4.50
26	0.50%	76	B	48" RCP	8.87
27	1.33%	42	F	30" RCP	10.89
28	0.50%	16	COS-4	30" RCP	5.96
29	3.49%	73	CFOXAA	36" RCP	18.26
30	5.50%	275	CFOXAB	48" RCP	28.89
31	4.27%	8	COS-3	24" RCP	11.12
34	0.50%	65	E	42" RCP	8.38
36	6.00%	46	O	30" RCP	20.02
37	6.00%	55	CSTP	30" RCP	20.93
40	6.00%	42	P	24" RCP	19.39
42	6.00%	234	HS-1	48" RCP	29.96

THE HOWARD HUGHES CORPORATION

10001 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

FIGURE 7
LOCAL STORM DRAIN
FACILITIES MAP

DRAWN BY: JULY 2016

DESIGNED BY: JULY 2016

CHECKED BY: JULY 2016

PROJECT NO: SCALE: HORIZ. VERT.

SUMMERLIN WEST VILLAGE 25

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 875-7550 FAX (702) 362-2887 WEB WWW.VTNV.COM
CONSULTING ENGINEERS PLANNERS LAND SURVEYORS



Technical Drainage Study for Summerlin Village 21 Redpoint Drive
Improvements

**TECHNICAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 21 REDPOINT DRIVE IMPROVEMENTS
(FOX HILL DRIVE TO DESERT FOOTHILLS DRIVE)**

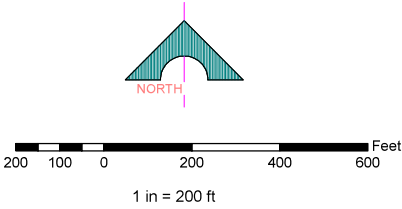
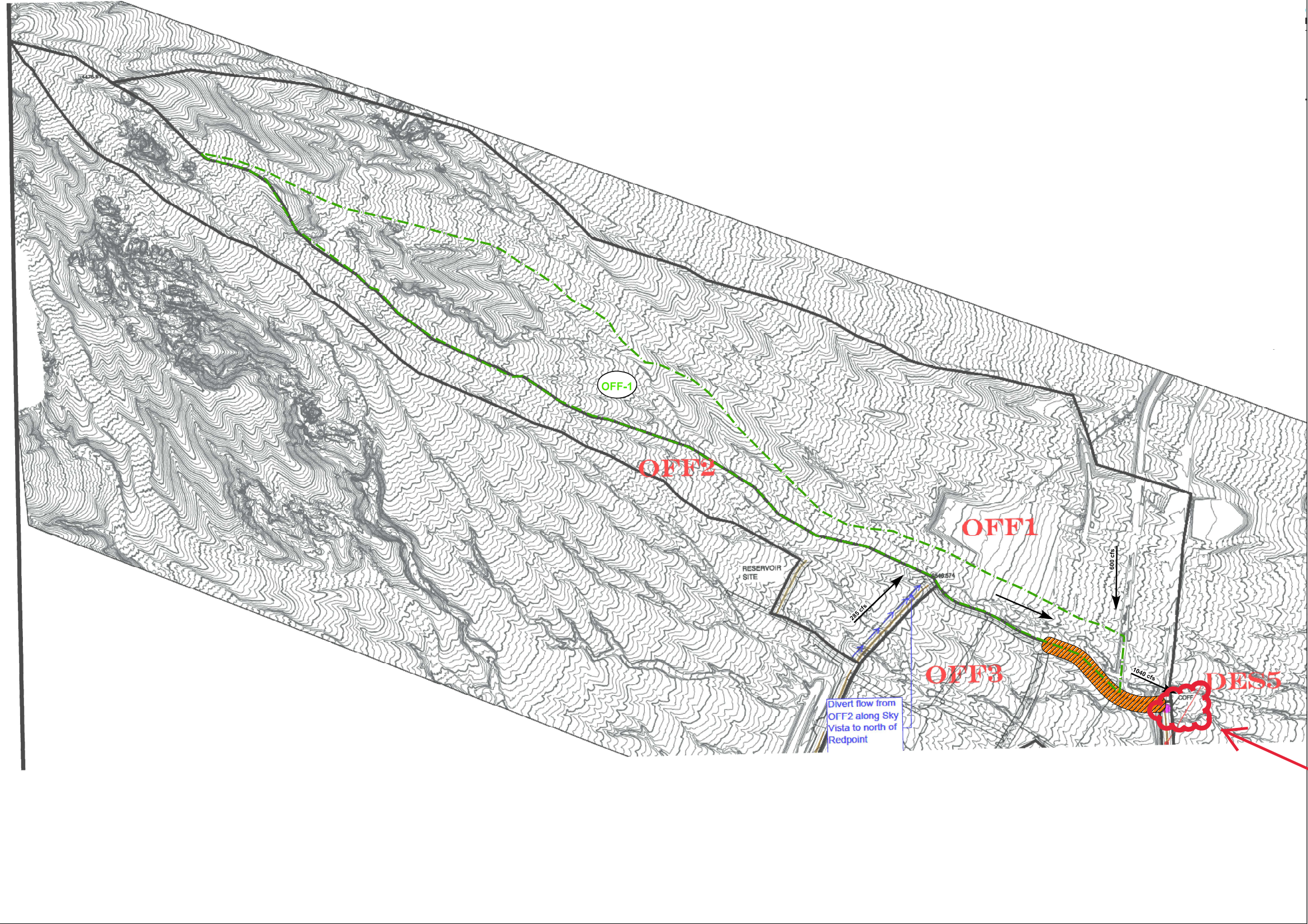
62021-206

January 2019

Prepared for:

**Hughes Howard Company, LLC
10801 Charleston Blvd., 3Rd Floor
Las Vegas, Nevada 89146
Phone: (702) 791-4300**





Legend

- Flow Direction
- Offsite Basin
- Redpoint Boundary

Interim Condition			
HEC-1 Summary Table			
Basin/Point ID	Area (acre)	Q ₁₀₀ (cfs)	
OFF1	642.2	828	
OFF2	170.3	285	
COFF	-	1040	

Summary of Prorated Basins			
Basin ID	Area	Q ₁₀₀ (cfs)	Reference
OFF-1	176.8	228	OFF1

SEE REFERENCED MATERIALS FOR SUBBASINS

PROJECT NO.	62021-206
DESIGN	
DRAWN	
CHECK	
PLOT DATE	07/14/2019
PLOT TIME	8:23:00 AM



ENGINEERS SURVEYORS
F:\Projects\62021-206\Division\Fall\Figures\GIS\Reference.mxd
medalst

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

SUMMERLIN DEVELOPMENT, LLC
V21 STREET A (DFHD TO FOX)
INTERIM CONDITION OFFSITE BASINS

NOTE: SUBBASINS ARE PRORATED BASED ON WATERSHED DELINEATION REFERENCED FROM THE DESERT FOOTHILLS STUDY.

Concentration point
COFF flowrate shows
1040 csf. See Reference
Material for more
information.

Technical Drainage Study for Summerlin Village 21 Desert Foothills
Drive

Technical Drainage Study for

Summerlin West Village 21 Desert Foothills Drive (Far Hills Avenue to Street A)

Las Vegas, Nevada

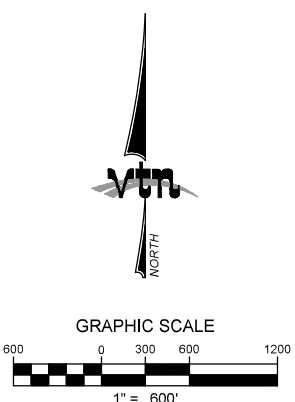
Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works





LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- PRORATED SUBBASIN BOUNDARY
- OFF1** BASIN DESIGNATION
- OFF2A PRORATED SUBBASIN DESIGNATION
- FLOW ARROW

INTERIM CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	AREA (ac)	Q100 (CFS)
DES5*	5.46	20
OFF1	642.20	828
OFF2	170.30	285
COFF		1040
OFF3	146.86	350
OFF4	35.82	106
CINT	-	1181

*Refer to Master Study Village 21

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

CLV

FIGURE 7
INTERIM CONDITION BASIN MAP

FIGURE 7 - Interim Condition Map.dwg

DRAWN BY:
ATM/AH

DESIGNED BY:
JVA

CHECKED BY:
JVA

PROJECT NO:
7891-1-1

AUGUST 2018

SCALE:
HORIZ.
VERT.

SHEET

OF SHEETS

DRAWING NO.

CLV

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89166-5148
PH: (702) 873-7550 FAX: (702) 952-2597 WEB: WWW.VTHN.COM
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

Technical Drainage Study for Fox Hill Drive Improvements Phase 1

**TECHNICAL DRAINAGE STUDY
FOR
FOX HILL DRIVE IMPROVEMENTS PHASE 1**

62025-201

February 2019

Prepared for:

**Hughes Howard Company, LLC
10801 Charleston Blvd., 3Rd Floor
Las Vegas, Nevada 89146
Phone: (702) 791-4300**



HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Fox Hill Drive Improvements Phase I Date: March 2019

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

East/West: Far Hills

b) Section: 27 Township: 20 S Range: 59 E

c) APN : 137-22-101-001

Name of Owner: Hughes Howard Company, LLC

Telephone No.: 702-791-4300 Fax No.: 702-791-4385 E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 Charleston Blvd., 3rd Floor, Las Vegas, Nevada 89146

Contact Person-Name: Steve Jones Telephone No.: (702) 804-2130

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

Firm: GCW, Inc.

Address: 1555 South Rainbow Blvd, Las Vegas, Nevada 89146

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 1,800 Acres Being Developed/Disturbed: +/- 8 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.): Road Improvement

5. Approximate upstream land area which drains to the subject site: +/- 70 Acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Drainage Study for Summerlin West Village 21 Desert Foothills Drive (Far Hills Avenue to Street A)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
South portion drains into the existing 8'X6' RCB on Far Hills, north portion drains into the existing 54" RCP on Redpoint Drive.

8. Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal

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

***New Required Field**

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

Revision	Date

Local Entity File No. _____

REFERENCE:

STANDARD FORM 1

										FXH-N.WSW	
										0	
T1 FOX HILL DRIVE											
T2 FAR HILLS TO REDPOINT											
T3 Mainline											
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R	986.0003341.550	1	.013						.000	-36.000	1
R	1000.0003342.860	1	.013						.000	.000	1
R	1085.7003346.120	1	.013						.000	.000	1
R	1285.0003355.590	1	.013						16.300	.000	1
R	1522.9003374.500	1	.013						19.500	.000	1
R	1686.3903387.499	1	.013						13.400	.000	1
JX	1686.4003387.500	1	2	.013	77.000				.000	.000	
R	1721.6003390.300	1	.013						-2.900	.000	1
R	2056.9003411.960	1	.013						.000	.000	1
R	2310.6903427.749	1	.013						-29.100	.000	1
JX	2310.7003427.750	1	3	.013	8.000				.000	.000	
R	2529.4003435.660	1	.013						.000	.000	1
R	2568.2003436.830	1	.013						.000	.000	1
R	2596.3003437.670	1	.013						.000	.000	1
JX	2596.3103437.671	2	4	5.013	73.000	114.000	3436.840	3436.840	45.0	.0	.000
R	2596.3203437.672	2	.013						.000	-45.000	1
R	2635.0203438.420	2	.013						.000	-45.000	1
R	2830.8203440.380	2	.013						4.500	.000	1
R	2830.8303440.381	2	.013						.000	45.000	1
R	2857.0203443.000	2	.013						.000	45.000	1
R	2933.5203443.760	2	.013						.000	.000	1
SH	2933.5203443.760	2								3443.760	
CD	1	4	1	.000	4.500	.000	.000	.000	.00		
CD	2	4	1	.000	4.000	.000	.000	.000	.00		
CD	3	4	1	.000	2.000	.000	.000	.000	.00		
CD	4	4	1	.000	3.000	.000	.000	.000	.00		
CD	5	4	1	.000	4.000	.000	.000	.000	.00		
Q				76.000	.0						

CD 1 4 1 4.500
CD 2 4 1 4.000
CD 3 4 1 2.000
CD 4 4 1 3.000
CD 5 4 1 4.000

W S P G W

PAGE NO 1

HEADING LINE NO 1 IS -

WATER SURFACE PROFILE - TITLE CARD LISTING

FOX HILL DRIVE

0

HEADING LINE NO 2 IS -

FAR HILLS TO REDPOINT

HEADING LINE NO 3 IS -

Mainline

W S P G W

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS	A	SYSTEM OUTLET	929.600	3336.340	1	3348.073				
2	IS	A	REACH	986.000	3341.550	1		.000	.000	-36.000	1
3	IS	A	REACH	1000.000	3342.860	1		.000	.000	.000	1
4	IS	A	REACH	1085.700	3346.120	1		.000	.000	.000	1
5	IS	A	REACH	1285.000	3355.590	1		700.555	16.300	.000	1
6	IS	A	REACH	1522.900	3374.500	1		699.009	19.500	.000	1
7	IS	A	REACH	1686.390	3387.499	1		699.051	13.400	.000	1
8	IS	A	JUNCTION	1686.400	3387.500	1		3388.150	.000	.000	.000
9	IS	A	REACH	1721.600	3390.300	1		695.451	-2.900	.000	1
10	IS	A	REACH	2056.900	3411.960	1		.000	.000	.000	1
11	IS	A	REACH	2310.690	3427.749	1		499.694	-29.100	.000	1
12	IS	A	JUNCTION	2310.700	3427.750	1		3427.770	.000	.000	.000

W S P G W

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	REACH	STATION	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H
13	IS	A	REACH	2529.400	3435.660	1		.000	.000	.000
14	IS	A	REACH	2568.200	3436.830	1		.000	.000	.000
15	IS	A	REACH	2596.300	3437.670	1		.000	.000	.000
16	IS	A	JUNCTION	2596.310	3437.671	2		3436.840	3436.840	45.000
17	IS	A	REACH	2596.320	3437.672	2		.000	.000	-45.000
18	IS	A	REACH	2635.020	3438.420	2		.000	.000	-45.000
19	IS	A	REACH	2830.820	3440.380	2		2493.004	4.500	.000
20	IS	A	REACH	2830.830	3440.381	2		.000	.000	45.000
21	IS	A	REACH							

					FXH-N.EDT				
U/S DATA STATION INVERT SECT					N	RADIUS	ANGLE	ANG PT	MAN H
2857.020 3443.000 2					.013	.000	.000	45.000	1
ELEMENT NO	22	IS	A	REACH	*				
U/S DATA STATION INVERT SECT					N	RADIUS	ANGLE	ANG PT	MAN H
2933.520 3443.760 2					.013	.000	.000	.000	1
ELEMENT NO	23	IS	A	SYSTEM HEADWORKS	*				
U/S DATA STATION INVERT SECT						W S ELEV			
2933.520 3443.760 2						3443.760			

FOX HILL DRIVE
 FAR HILLS TO REDPOINT
 Mainline

*****															*****
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt/ I.D.	ZL	No Wth Prs/Pip	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	
929.600	3336.340	11.733	3348.073	348.00	21.88	7.43	3355.51	.00	4.44	.00	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
47.699	.0924					.0313	1.49	11.73	.00	2.47	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
977.299	3340.746	9.881	3350.628	348.00	21.88	7.43	3358.06	.00	4.44	.00	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
HYDRAULIC JUMP															
977.299	3340.746	2.923	3343.670	348.00	31.82	15.72	3359.39	.00	4.44	4.29	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8.701	.0924					.0541	.47	2.92	3.51	2.47	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
986.000	3341.550	2.951	3344.501	348.00	31.48	15.39	3359.89	.00	4.44	4.28	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14.000	.0936					.0520	.73	2.95	3.45	2.46	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1000.000	3342.860	3.006	3345.866	348.00	30.83	14.76	3360.62	.00	4.44	4.24	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
.373	.0380					.0507	.02	3.01	3.33	3.36	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1000.373	3342.874	3.005	3345.879	348.00	30.84	14.77	3360.64	.00	4.44	4.24	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
85.327	.0380					.0539	4.60	3.01	3.33	3.36	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1085.700	3346.120	2.882	3349.003	348.00	32.34	16.24	3365.24	.20	4.44	4.32	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10.072	.0475					.0573	.58	3.08	3.61	3.08	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1095.772	3346.599	2.874	3349.473	348.00	32.44	16.34	3365.82	.20	4.44	4.32	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
110.986	.0475					.0612	6.79	3.08	3.63	3.08	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1206.758	3351.872	2.760	3354.632	348.00	34.03	17.98	3372.61	.22	4.44	4.38	4.500	.000	.00	1 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
78.242	.0475					.0691	5.41	2.99	3.93	3.08	.013	.00	.00	PIPE	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
^ FILE: FXH-N.WSW															
W S P G W - CIVILDESIGN Version 14.08															
PAGE															

FOX HILL DRIVE
 FAR HILLS TO REDPOINT
 Mainline

mainline															*****
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt/ I.D.	ZL	No Wth Prs/Pip	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	
1285.000	3355.590	2.652	3358.242	348.00	35.69	19.78	3378.02	.25	4.44	4.43	4.500	.000	.00	1 .0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
147.979	.0795					.0697	10.31	2.90	4.24	2.58	.013	.00	.00	PIPE	
1432.979	3367.353	2.743	3370.096	348.00	34.27	18.23	3388.33	.23	4.44	4.39	4.500	.000	.00	1 .0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
89.921	.0795					.0623	5.60	2.97	3.97	2.58	.013	.00	.00	PIPE	
1522.900	3374.500	2.857	3377.357	348.00	32.67	16.58	3393.93	.21	4.44	4.33	4.500	.000	.00	1 .0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
30.772	.0795					.0569	1.75	3.06	3.67	2.58	.013	.00	.00	PIPE	
1553.672	3376.947	2.915	3379.862	348.00	31.92	15.82	3395.68	.19	4.44	4.30	4.500	.000	.00	1 .0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
48.045	.0795					.0522	2.51	3.11	3.53	2.58	.013	.00	.00	PIPE	
1601.717	3380.767	3.040	3383.807	348.00	30.43	14.38	3398.19	.17	4.44	4.21	4.500	.000	.00	1 .0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
35.488	.0795					.0464	1.65	3.21	3.26	2.58	.013	.00	.00	PIPE	
1637.205	3383.588	3.174	3386.762	348.00	29.02	13.07	3399.84	.15	4.44	4.10	4.500	.000	.00	1 .0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
27.429	.0795					.0415	1.14	3.33	2.99	2.58	.013	.00	.00	PIPE	
1664.634	3385.769	3.319	3389.088	348.00	27.67	11.89	3400.97	.13	4.44	3.96	4.500	.000	.00	1 .0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
21.756	.0795					.0372	.81	3.45	2.74	2.58	.013	.00	.00	PIPE	

FXH-N.OUT

1686.390	3387.499	3.479	3390.978	348.00	26.38	10.81	3401.78	.00	4.44	3.77	4.500	.000	.00	1	.0
JUNCT STR	.0976					.0506	.00	3.60	2.49		.013	.00	.00	PIPE	
1686.400	3387.500	2.345	3389.845	271.00	32.34	16.24	3406.08	.21	4.33	4.50	4.500	.000	.00	1	.0
35.200	.0795					.0646	2.27	2.56	4.17	2.22	.013	.00	.00	PIPE	

▲ FILE: FXH-N.WSW W S P G W - CIVILDESIGN Version 14.08
 Program Package Serial Number: 3074
 WATER SURFACE PROFILE LISTING
 Date: 2-26-2019 Time: 4:44: 9
 FOX HILL DRIVE
 FAR HILLS TO REDPOINT
 Mainline
 0
 PAGE 3

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	
1721.600	3390.300	2.378	3392.678	271.00	31.78	15.68	3408.36	.00	4.33	4.49	4.500	.000	.00	1 .0
175.235	.0646					.0616	10.80	2.38	4.06	2.36	.013	.00	.00	PIPE
1896.835	3401.620	2.412	3404.032	271.00	31.21	15.12	3419.15	.00	4.33	4.49	4.500	.000	.00	1 .0
160.065	.0646					.0566	9.06	2.41	3.95	2.36	.013	.00	.00	PIPE
2056.900	3411.960	2.507	3414.468	271.00	29.75	13.75	3428.21	.25	4.33	4.47	4.500	.000	.00	1 .0
49.889	.0622					.0517	2.58	2.75	3.67	2.39	.013	.00	.00	PIPE
2106.789	3415.064	2.551	3417.615	271.00	29.13	13.18	3430.79	.24	4.33	4.46	4.500	.000	.00	1 .0
73.551	.0622					.0473	3.48	2.79	3.55	2.39	.013	.00	.00	PIPE
2180.341	3419.640	2.653	3422.293	271.00	27.77	11.98	3434.27	.21	4.33	4.43	4.500	.000	.00	1 .0
48.168	.0622					.0418	2.02	2.87	3.30	2.39	.013	.00	.00	PIPE
2228.508	3422.636	2.761	3425.397	271.00	26.48	10.89	3436.29	.19	4.33	4.38	4.500	.000	.00	1 .0
34.801	.0622					.0371	1.29	2.95	3.05	2.39	.013	.00	.00	PIPE
2263.309	3424.802	2.876	3427.678	271.00	25.25	9.90	3437.58	.17	4.33	4.32	4.500	.000	.00	1 .0
26.538	.0622					.0329	.87	3.05	2.82	2.39	.013	.00	.00	PIPE
2289.847	3426.452	2.998	3429.450	271.00	24.07	9.00	3438.45	.15	4.33	4.24	4.500	.000	.00	1 .0
20.843	.0622					.0293	.61	3.15	2.61	2.39	.013	.00	.00	PIPE
2310.690	3427.749	3.129	3430.878	271.00	22.95	8.18	3439.06	.00	4.33	4.14	4.500	.000	.00	1 .0
JUNCT STR	.0976					.0291	.00	3.13	2.40		.013	.00	.00	PIPE

▲ FILE: FXH-N.WSW W S P G W - CIVILDESIGN Version 14.08
 Program Package Serial Number: 3074
 WATER SURFACE PROFILE LISTING
 Date: 2-26-2019 Time: 4:44: 9
 FOX HILL DRIVE
 FAR HILLS TO REDPOINT
 Mainline
 0
 PAGE 4

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	
2310.700	3427.750	2.947	3430.697	263.00	23.83	8.82	3439.51	.00	4.31	4.28	4.500	.000	.00	1 .0
6.559	.0362					.0305	.20	2.95	2.61	2.78	.013	.00	.00	PIPE
2317.259	3427.987	2.953	3430.940	263.00	23.77	8.77	3439.71	.00	4.31	4.27	4.500	.000	.00	1 .0
90.278	.0362					.0287	2.59	2.95	2.60	2.78	.013	.00	.00	PIPE
2407.537	3431.252	3.080	3434.332	263.00	22.66	7.98	3442.31	.00	4.31	4.18	4.500	.000	.00	1 .0
55.571	.0362					.0256	1.42	3.08	2.40	2.78	.013	.00	.00	PIPE
2463.109	3433.262	3.218	3436.480	263.00	21.61	7.25	3443.73	.00	4.31	4.06	4.500	.000	.00	1 .0
38.414	.0362					.0229	.88	3.22	2.20	2.78	.013	.00	.00	PIPE
2501.522	3434.652	3.367	3438.019	263.00	20.60	6.59	3444.61	.00	4.31	3.91	4.500	.000	.00	1 .0
27.877	.0362					.0205	.57	3.37	2.01	2.78	.013	.00	.00	PIPE
2529.400	3435.660	3.531	3439.191	263.00	19.64	5.99	3445.18	.00	4.31	3.70	4.500	.000	.00	1 .0

FXH-N.OUT

10.931	.0302						.0192	.21	3.53	1.82	2.96	.013	.00	.00	PIPE
2540.331	3435.990	3.585	3439.575	263.00	19.36	5.82	3445.39	.00	4.31	3.62	4.500	.000	.00	1	.0
27.869	.0302						.0180	.50	3.59	1.76	2.96	.013	.00	.00	PIPE
2568.200	3436.830	3.776	3440.606	263.00	18.46	5.29	3445.90	.00	4.31	3.31	4.500	.000	.00	1	.0
.031	.0299						.0172	.00	3.78	1.57	2.97	.013	.00	.00	PIPE
2568.231	3436.831	3.776	3440.607	263.00	18.45	5.29	3445.90	.00	4.31	3.31	4.500	.000	.00	1	.0
19.015	.0299						.0165	.31	3.78	1.57	2.97	.013	.00	.00	PIPE

FILE: FXH-N.WSW
 W S P G W - CIVILDESIGN Version 14.08
 Program Package Serial Number: 3074
 WATER SURFACE PROFILE LISTING
 Date: 2-26-2019 Time: 4:44: 9
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FOX HILL DRIVE
FAR HILLS TO REDPOINT
Mainline

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 or I.D.	Base Wt	ZL	No Wth
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2587.246	3437.399	4.003	3441.403	263.00	17.60	4.81	3446.21	.00	4.31	2.82	4.500	.000	.00	1 .0
9.054	.0299					.0157	.14	4.00	1.35	2.97	.013	.00	.00	PIPE
2596.300	3437.670	4.313	3441.983	263.00	16.77	4.37	3446.35	.00	4.31	1.80	4.500	.000	.00	1 .0
JUNCT STR	.0976					.0092	.00	4.31	1.00		.013	.00	.00	PIPE
2596.310	3437.671	9.556	3447.227	76.00	6.05	.57	3447.80	.00	2.64	.00	4.000	.000	.00	1 .0
.010	.1220					.0028	.00	9.56	.00	1.05	.013	.00	.00	PIPE
2596.320	3437.672	9.668	3447.340	76.00	6.05	.57	3447.91	.00	2.64	.00	4.000	.000	.00	1 .0
38.700	.0193					.0028	.11	9.67	.00	1.71	.013	.00	.00	PIPE
2635.020	3438.420	9.141	3447.561	76.00	6.05	.57	3448.13	.00	2.64	.00	4.000	.000	.00	1 .0
195.800	.0100					.0028	.55	.00	.00	2.07	.013	.00	.00	PIPE
2830.820	3440.380	7.783	3448.163	76.00	6.05	.57	3448.73	.00	2.64	.00	4.000	.000	.00	1 .0
.010	.1220					.0028	.00	7.78	.00	1.05	.013	.00	.00	PIPE
2830.830	3440.381	7.895	3448.276	76.00	6.05	.57	3448.84	.00	2.64	.00	4.000	.000	.00	1 .0
26.190	.1000					.0028	.07	7.89	.00	1.11	.013	.00	.00	PIPE
2857.020	3443.000	5.462	3448.462	76.00	6.05	.57	3449.03	.00	2.64	.00	4.000	.000	.00	1 .0
76.500	.0099					.0028	.21	5.46	.00	2.07	.013	.00	.00	PIPE
2933.520	3443.760	4.944	3448.704	76.00	6.05	.57	3449.27	.00	2.64	.00	4.000	.000	.00	1 .0

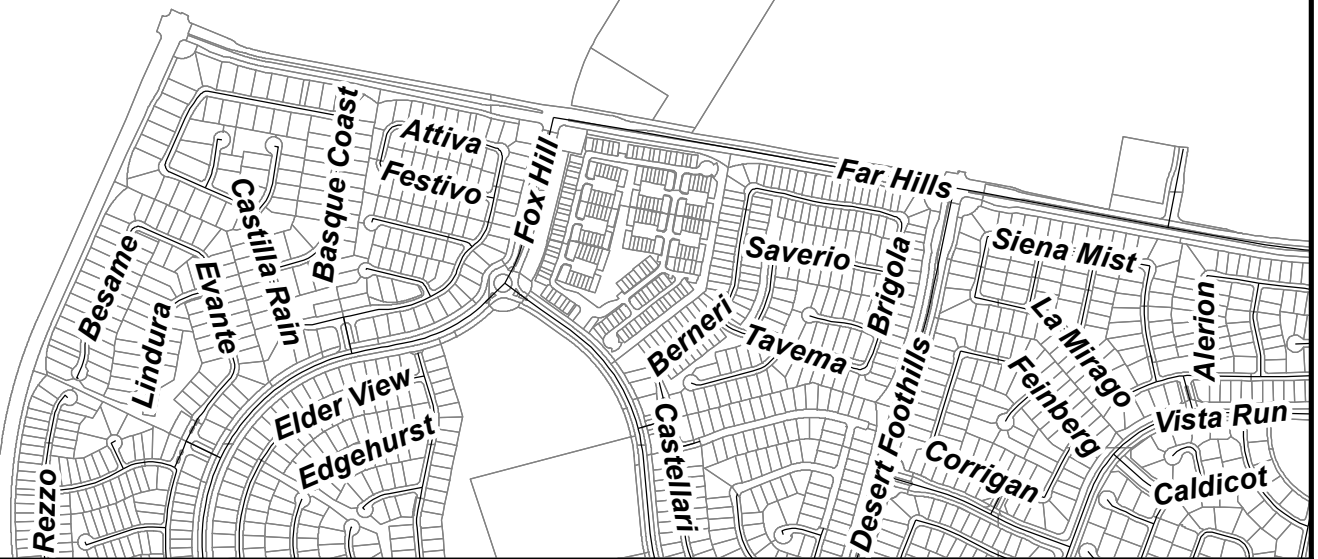
Starting WSE

APPENDIX D

Figures

PROJECT SITE

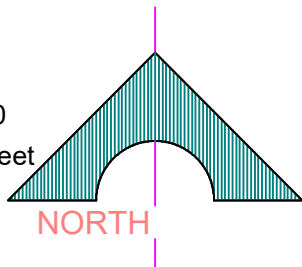
Acc W Lake Mead Blvd



GRAPHIC SCALE

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

1 in = 1,000 ft



THE HOWARD HUGHES COMPANY, LLC
VILLAGE 25 REDPOINT DRIVE IMPROVEMENT
SKY VISTA DRIVE TO FOX HILL DRIVE

FIG 1
VICINITY MAP

GCV
ENGINEERS SURVEYORS

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

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

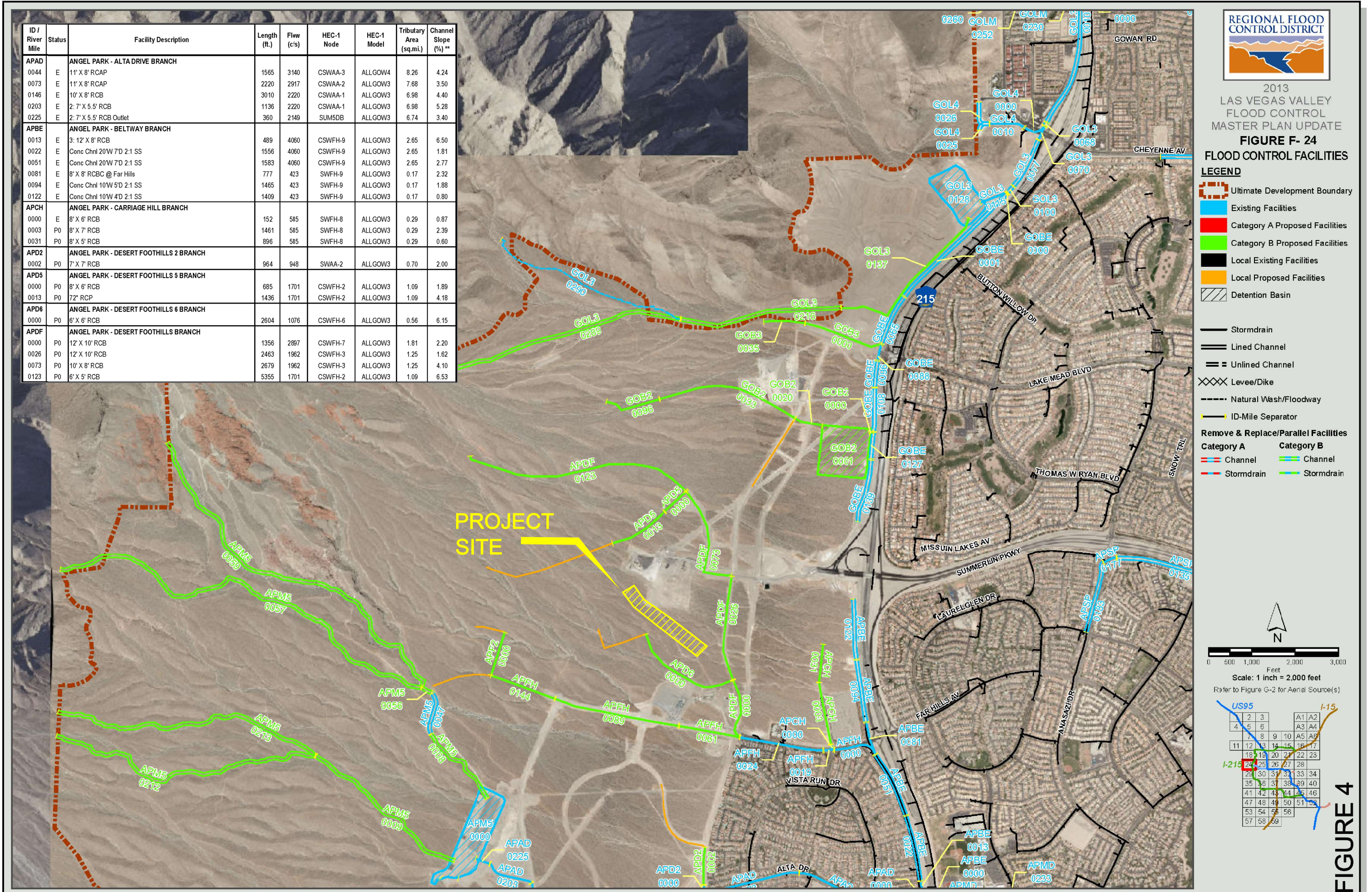
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/12/2018 at 6:47:35 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

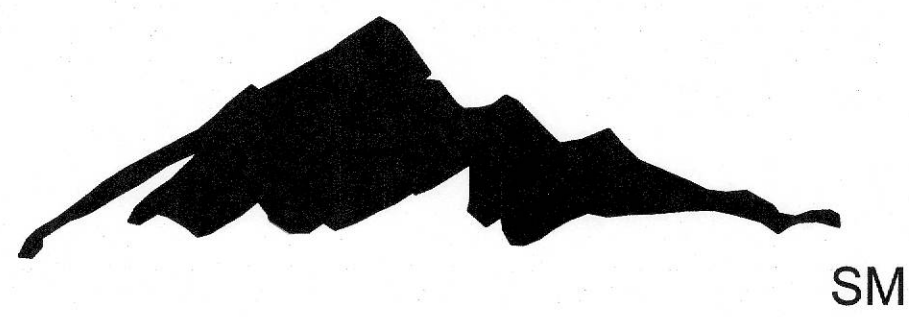
Figure 2



ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD 0044	E	ANGEL PARK - ALTA DRIVE BRANCH	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 0013	E	ANGEL PARK - BELTWAY BRANCH	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 0000	E	ANGEL PARK - CARRIAGE HILL BRANCH	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 0002	P0	ANGEL PARK - DESERT FOOTHILLS 2 BRANCH	964	948	SWAA-2	ALLGOW3	0.70	2.00
APD5 0000	P0	ANGEL PARK - DESERT FOOTHILLS 5 BRANCH	685	1701	CSWFH-2	ALLGOW3	1.09	1.89
0013	P0	72" RCP	1436	1701	CSWFH-2	ALLGOW3	1.09	4.18
APD6 0000	P0	ANGEL PARK - DESERT FOOTHILLS 6 BRANCH	2604	1076	CSWFH-6	ALLGOW3	0.56	6.15
APDF 0000	P0	ANGEL PARK - DESERT FOOTHILLS BRANCH	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



SUMMERLIN



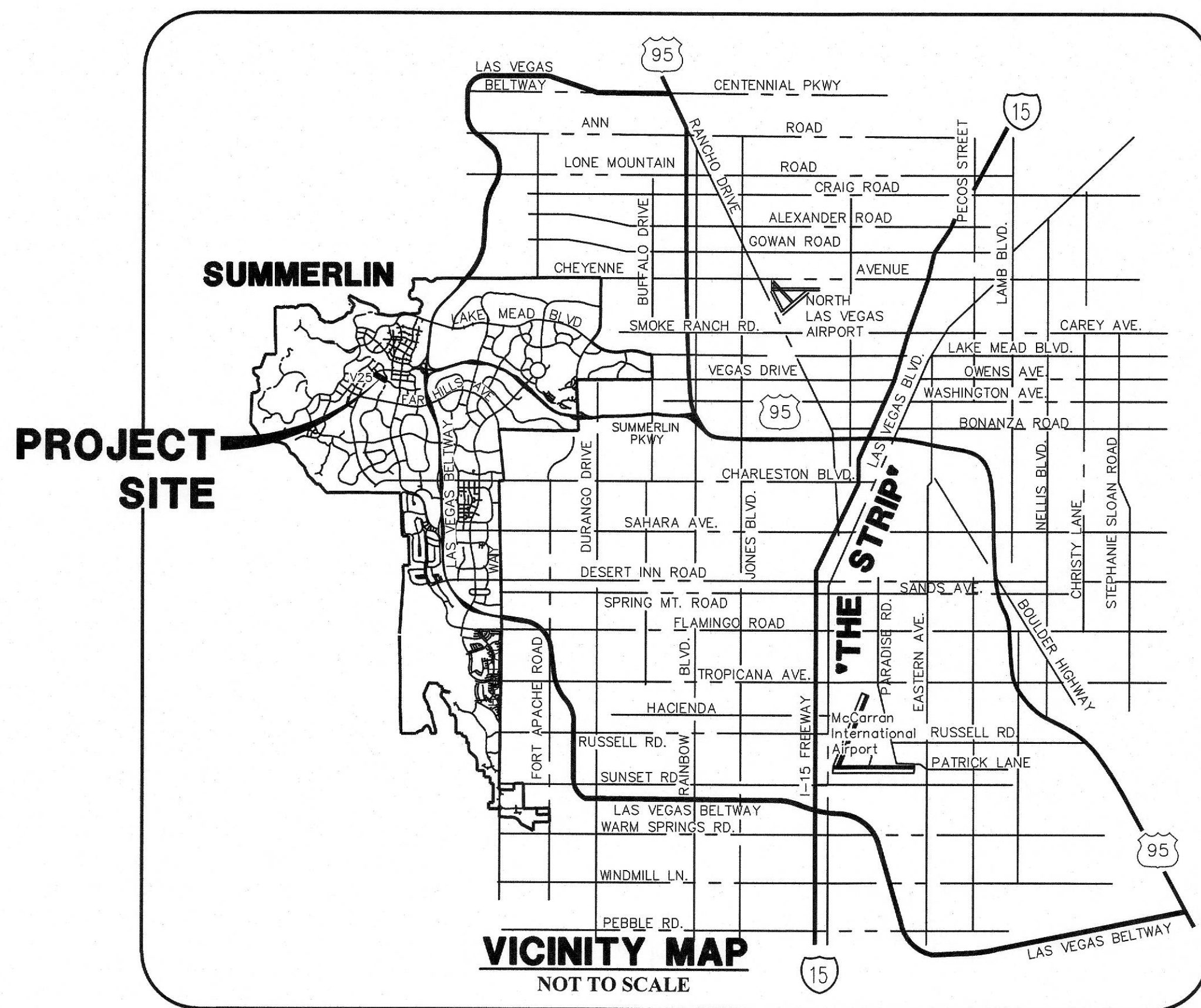
VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS

(SKY VISTA DRIVE TO FOX HILL DRIVE)

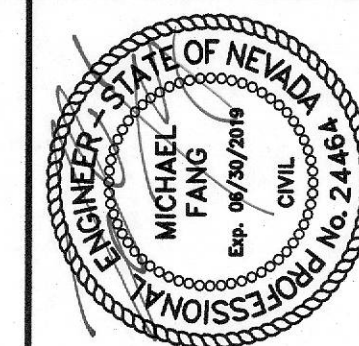
FUTURE SID PROJECT

A.P.N. 137-22-101-001

2019



SHEET INDEX		
NO.	DWG	DESCRIPTION
1	G1	COVER SHEET
2	G2	PROJECT DATA SHEET
3	G3	GENERAL NOTES
4	HC1	HORIZONTAL CONTROL 1
5	MU1	MASTER UTILITY PLAN - WATER
6	MU2	MASTER UTILITY PLAN - STORM
7	MU3	MASTER UTILITY PLAN - SEWER
8	MGD	MASTER GRADING PLAN
9	GD1	GRADING PLAN 1
10	PP1	PLAN AND PROFILE 1
11	PP2	PLAN AND PROFILE 2
12	PP3	PLAN AND PROFILE 3
13	PP4	PLAN AND PROFILE 4
14	LP1	LATERAL PROFILES 1
15	LP2	LATERAL PROFILES 2
16	LP3	LATERAL PROFILES 3
17	DT1	TYPICAL DETAILS & SECTIONS
18	DT2	UTILITY DETAILS
19	TR1	SIGNAGE AND STRIPING PLAN 1
20	TR2	SIGNAGE AND STRIPING PLAN 2
21	SL1	STREETLIGHT AND ELECTRICAL PLAN 1
22	SL2	STREETLIGHT AND ELECTRICAL PLAN 2
23	SL3	STREETLIGHT AND ELECTRICAL PLAN 3



FOR AGENCY REVIEW - NOT FOR CONSTRUCTION

PROJECT NO.
62025-204
DESIGN LG/MB
DRAWN NPD
CHECK LG/MB
PLOT DATE 04-09-19
PLOT TIME 09:59:18
REV DATE

1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEERS & SURVEYORS
ANDREW PARK-MURRAY

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS
(SKY VISTA DRIVE TO FOX HILL DRIVE)

DRAWING
G1
1 OF 23 SHTS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. XXXXXX FIRST APPROVAL DATE:
LVWMD APPROVED FIRE FLOW: TOTAL 1,500 GPM / ON-SITE N/A GPM
SHEETS: G1-G3, MU1, PP1-PP7, LP1-LP3, DT2

FIRE DEPARTMENT APPROVAL

CITY OF LAS VEGAS FIRE DEPARTMENT DATE

UTILITY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. DATE

CENTRAL TELEPHONE CO., DBA CENTURYLINK DATE

THE AFFIXED CENTURYLINK 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

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY 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.

NV ENERGY - TRANSMISSION ENGINEERING DATE

SOUTHWEST GAS CORPORATION DATE

CLV#:

CAUTION TO CONTRACTOR

THE CONTRACTOR SHALL BE RESPONSIBLE TO INVESTIGATE AND VERIFY THE ACTUAL LOCATION AND DEPTH OF ALL EXISTING UNDERGROUND FACILITIES AT LEAST 48 HOURS IN ADVANCE OF THE PERFORMANCE OF ANY WORK.

THE HOWARD HUGHES COMPANY, LLC

KEVIN ORROCK DATE
VICE PRESIDENT

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.

MICHAEL FANG, P.E. 24464 DATE

CLV PLANNING DEPARTMENT

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

CITY OF LAS VEGAS PLANNING DEPARTMENT DATE

ALLEN PAVELKA, P.E. 9029 DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

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 STANDARDS". 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.

OWNER/DEVELOPER

THE HOWARD HUGHES COMPANY, LLC
10801 W. CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89135
OFFICE PHONE NO. (702) 791-4300

ENGINEER

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



[illegible]

PROJECT NO.	62025-204
DESIGN:	LG/MB
DRAWN:	NPD
CHECK:	LG/MB
PLOT DATE:	04-09-19
PLOT TIME:	09:59:23

GCW
ENGINEERS \ SURVEYORS

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

PROJECTS: 6030, 6032, 20A (P&W PRODUCTION 60322-20A01, 60302)

ANDREW PARK-MURRAY

THE HOWARD HUGHES COMPANY, LLC	P
VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS (SKY VISTA DRIVE TO FOX HILL DRIVE)	
PROJECT DATA SHEET	

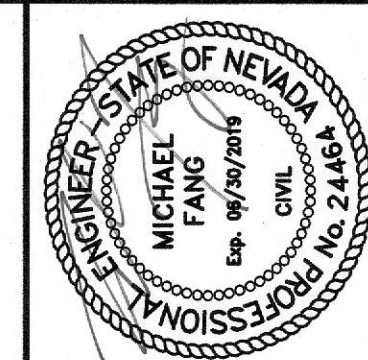
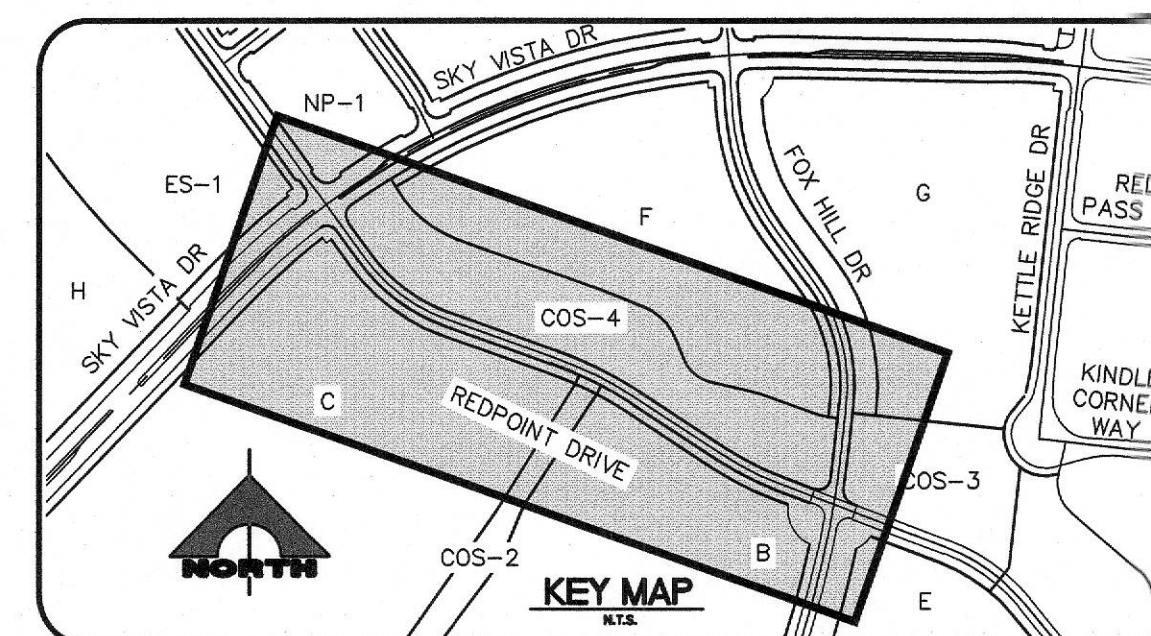
DRAWING
G2
2 OF 23 SHTS

ABBREVIATIONS

A	AIR	D/D.I.	DROP INLET	N.I.C.	NOT IN CONTRACT	SHT	SHEET
AC	ASPHALT CONCRETE, ACRE	DIA. Ø	DIAMETER	NO	NUMBER	SIS	SUMMERLIN IMPROVEMENT
ACP	ASBESTOS CEMENT PIPE	DIP	DUCTILE IRON PIPE	NOSHA	STATE OF NEVADA OCCUPATIONAL	ST	STANDARDS
ADD'L	ADDITIONAL	DIST	DISTANCE		SAFETY AND HEALTH	SL	STREET LIGHT
ADP	ANGLE POINT	DR	DRIVE		ADMINISTRATION	SP	SERVICE POINT
APN	ASSESSOR'S PARCEL NUMBER	DS	DOWNSPOUT	NPC	NEVADA POWER COMPANY	SQ	SQUARE
APPROX	APPROXIMATELY	DTL	DETAIL	NTS	NOT TO SCALE	SR	SEWER RECLAIM MAIN
AASHTO	AMERICAN ASSOCIATION OF	DW	DRIVEWAY	NVE	NV ENERGY	SS	SANITARY SEWER
	STATE HIGHWAY AND	DWG	DRAWING	OB	OVERBUILT	SSMH	SANITARY SEWER MANHOLE
	TRANSPORTATION OFFICIALS	E	EAST	OC	ON CENTER	STA	STATION
ASTM	AMERICAN SOCIETY FOR TESTING	ECR	END CURB RETURN	OHC	OVERHEAD CO COMMUNICATION	ST	STREET
	AND MATERIALS	ELE,ELEC	ELECTRICAL	OHF	OVERHEAD POWER LINE	STD	STANDARD
AVE	AVENUE	ELEV	ELEVATION	P	POWER LINE	STL	STEEL
AVR	AIR VALVE, AIR RELEASE	ESM	EDGE OF PAVEMENT	PB	PULL BOX	STRUC	STRUCTURE
		ASSEMBLY	EASEMENT	PBS	PLANTWIX BITUMINOUS SURFACE	SV	SKY VISTA DRIVE
AWWA	AMERICAN WATER WORKS	EVC	END VERTICAL CURVE	PCS	POINT OF CURVE, PRESSURE	SVZ	SIGHT VISIBILITY ZONE
	ASSOCIATION	EVF	END VERTICAL POINT	CLASS		SW	SIDEWALK
BC	BACK OF CURB	EXIST,EX	EXISTING	PCC	POINT OF COMPOUND CURVE	SWP	SOUTHWEST GAS
BOR	BEGIN CURB RETURN	EXPANSION	EXPANSION JOINT	PE	PROJECT ENGINEER OR	TEL	TELEPHONE OR TOP
BLM	BUREAU OF LAND MANAGEMENT	FC	FACE OF CURB	PE	POLYETHYLENE	T	TANGENT
BLVD	BOULEVARD	FF, FFE	FINISH FLOOR ELEVATION	PED	PEDESTRIAN	TB	TOP OF BERM
BM	BENCHMARK	FG	FINISH GRADE	PGL	PROFILE GRADE LINE	TC	TOP OF CURB
BO	BLOW-OFF	FI	FIRE HYDRANT	PCH	POTHOLE	TCE	TEMPORARY CONSTRUCTION ESMT
BVCE	BEGIN VERTICAL CURVE	FL	FLOW LINE	PI	POINT OF INTERSECTION	TELE	TELEPHONE
	ELEVATION	FO	FIBER OPTIC	PV	POST INDICATOR VALVE	TEMP	TEMPORARY
BVCS	BEGIN VERTICAL CURVE STATION	FRP	FIBERGLASS REINFORCED PLASTIC	Ø	PROPERTY LINE	TF	TOP OF FOOTING
BV	BEGIN VERTICAL POINT	FS	FINISH SURFACE	PLCP	POLYURETHANE LINED AND	TG	TOP OF GRADE
BW	BACK OF SIDEWALK	FT	FOOT/FEET		COATED STEEL PIPE	TH	THICKNESS
C, C	CENTERLINE	FTS	FOOTING	PMF	PAVEMENT MARKING FILM	TOP	TOP OF PIPE
C&G	CURB AND GUTTER	FUT	FUTURE	POT	POINT OF BEGINNING	TP	TELEPHONE POLE
CATV	UNDERGROUND CABLE TV	G	GAS	POC	POINT ON CURVE, POINT OF	TRANS	TRANSITION
CC	CLARK COUNTY BENCH MARK	GA	GAGE, GUY ANCHOR	POB	POINT OF CLARKING	TOP	TOP OF REINFORCING WALL
CCPW	CLARK COUNTY PUBLIC WORKS	GB	GRADE BREAK	POT	POINT ON TANGENT	TS	TEST STATION
CCTV	CLOSED—CIRCUIT TELEVISION	GND	GROUND	PP	POWER POLE	TS&V	TAPPING SLEEVE & VALVE
CCWRD	CLARK COUNTY WATER	GRD	GRADE, GROUND	PRO	PROPOSED	TW	TOP OF WALL
	REGULATION DISTRICT	H, HGT	HEIGHT	PRC	POINT OF REVERSE CURVE	TYP, (TYP)	TYPICAL
CE	COMMON ELEMENT	HEADWALL	HEADWALL	PRP	POINT OF REVERSE VERTICAL	UDACS	UNIFORM DESIGN AND
CFS	CUBIC FEET PER SECOND	HGL	HYDRAULIC GRADE LINE	PSI	CURVE		CONSTRUCTION STANDARDS FOR
CIP	CAPITAL IMPROVEMENTS PROJECT,	HORIZ	HORIZONTAL	PVS	POUNDS PER SQUARE INCH		WATER DISTRIBUTION SYSTEMS
	CORRUGATED IRON PIPE	HP	HIGH POINT, HIGH PRESSURE	PT	POINT OF TANGENCY	UG	UNDERGROUND
CIPM	CURED-IN-PLACE MANHOLE	HPS	HIGH PRESSURE SODIUM	PVC	POLYVINYL CHLORIDE	ULT	ULTIMATE
CIPP	CURED—IN—PLACE PIPE	IBC	INTERNATIONAL BUILDING CODE	PVI	POINT OF VERTICAL INTERSECTION	USD,	
CIR	CIRCLE	INV	INVERT	PVMT	PAVEMENT	USDOCA,	
CLR	CLEAR OR CLEARANCE	INT	INTERIM	PZ	PRESSURE ZONE	CCAUUSD	
CLSM	CONTROLLED LOW STRENGTH	JOINT	JOINT	R, RAD	RADIAL, RADII		UNIFORM STD. DRAWINGS FOR
	MATERIAL	JT	LENGTH	R, RT	RIGHT		PUBLIC WORKS CONSTRUCTION
CLV	CITY OF LAS VEGAS	L, LT	LEFT	RCB	REINFORCED CONCRETE BOX		OFF-SITE IMPROVEMENTS CLARK
CMP	CORRUGATED METAL PIPE	LF	LINEAR FEET	RPD	REINFORCED CONCRETE PIPE		COUNTY AREA, NEVADA (LATEST
CMU	CORRECTED MASONRY UNIT	LIP	LIP OF GUTTER	ROAD	ROAD		EDITION)
ONLY	CITY OF NORTH LAS VEGAS	LANE	LANE	ROWAY	ROWAY	UT	UNDERGROUND TELEPHONE
CO	CLEANOUT	LP	LOW POINT, LIGHT POLE	REC	RECTANGULAR	VAR	VARIABLE/VARIES
CONC	CONCRETE	LSCP	LANDSCAPE	REF	REFERENCE	VC	VERTICAL CURVE
COND	CONDUIT	LWVWD	LAS VEGAS VALLEY WATER	RENF	REINFORCED	VCP	VERTIFIED CLAY PIPE
CONC	CONSTRUCT OR CONSTRUCTION	MAX	MAXIMUM	RESTR	RESTRICTED	VERT	VERTICAL
COORD	COORDINATE	MIN	MINIMUM	RIM	TOP OF RIM ELEVATION	VG	VALLEY GUTTER
COR	CORNER	ML	MANHOLE	RND	ROUND	VOL	VOLUME
CPEP	CORRUGATED POLYETHYLENE PIPE	MIN	MINIMUM	ROW,R/W	RIGHT OF WAY	W	WATER, WATER
COURT	COURT	MLTMCIP	MORTAR LINED TAPE & MORTAR	RP	RADIUS POINT	W/	WITH
CY	CUBIC YARD(S)	MP	MESA PARK	RSGV	RAISED PAVEMENT MARKERS	WMH	WATER MANHOLE
Δ	DELTA	MOD	MODIFY/MODIFIED	S	SEWER, SOUTH	WS	WATER SUPPLY
DBL	DOUBLE	MON	MONUMENT	SCH	SCHEDULE	WT	WEIGHT
DCS's	DESIGN AND CONSTRUCTION	MON	MONUMENT	SD	STORM DRAIN	WTR	WATER
DCSWCS	STANDARDS FOR WASTEWATER	N	NORTH	SDMH	STORM DRAIN MANHOLE	XING	CROSSING
	COLLECTION SYSTEM (LATEST	NAP	NOT A PART	SECT	SECTION	YD	YARD, YARD DRAIN
	EDITION)	NDOT	NEVADA DEPARTMENT OF	SF	SQUARE FOOT/FEET	Z	PRESSURE ZONE
DEFL	DEFLECTION		TRANSPORTATION	SHLDR	SHOULDER		
DG	DESIGN GRADE						

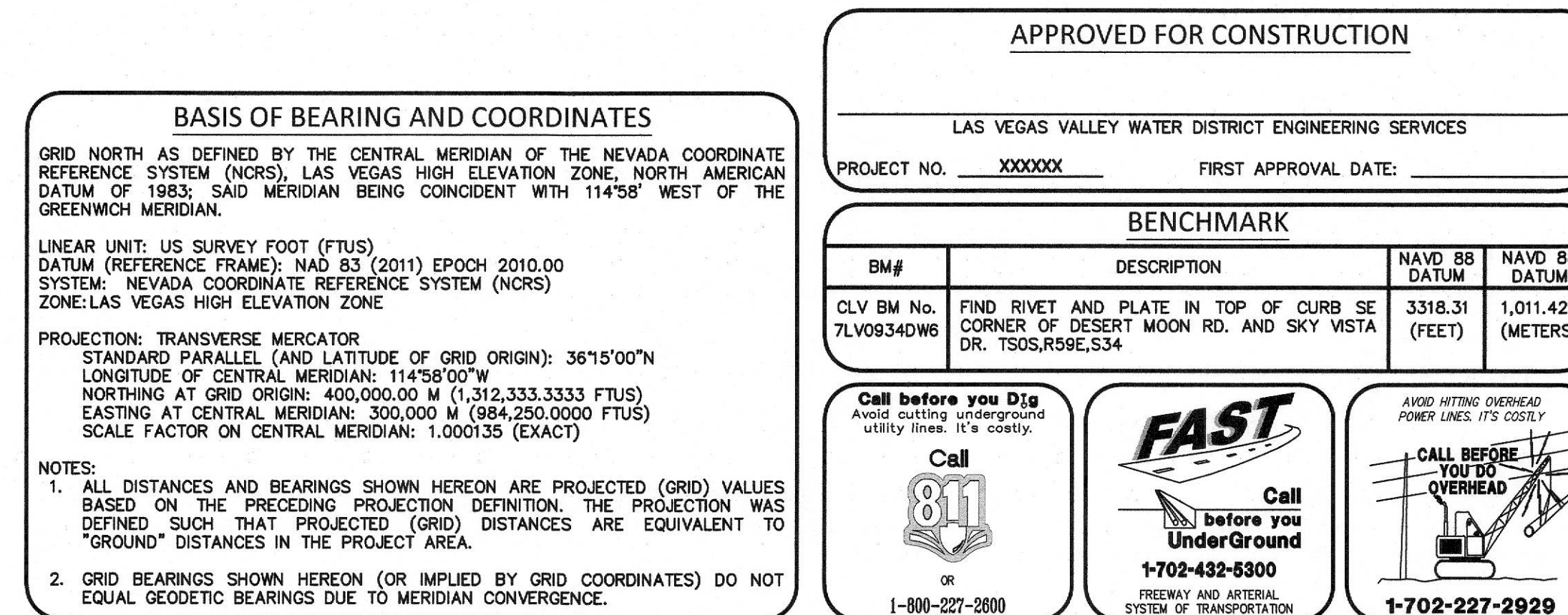
APPROVED FOR CONSTRUCTION

CLV#:



DATE	AGEN APP	DATE	GCW APP	DATE: 04/09/2019
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FOR AGENCY REVIEW - NOT FOR CONSTRUCTION



CLV#:

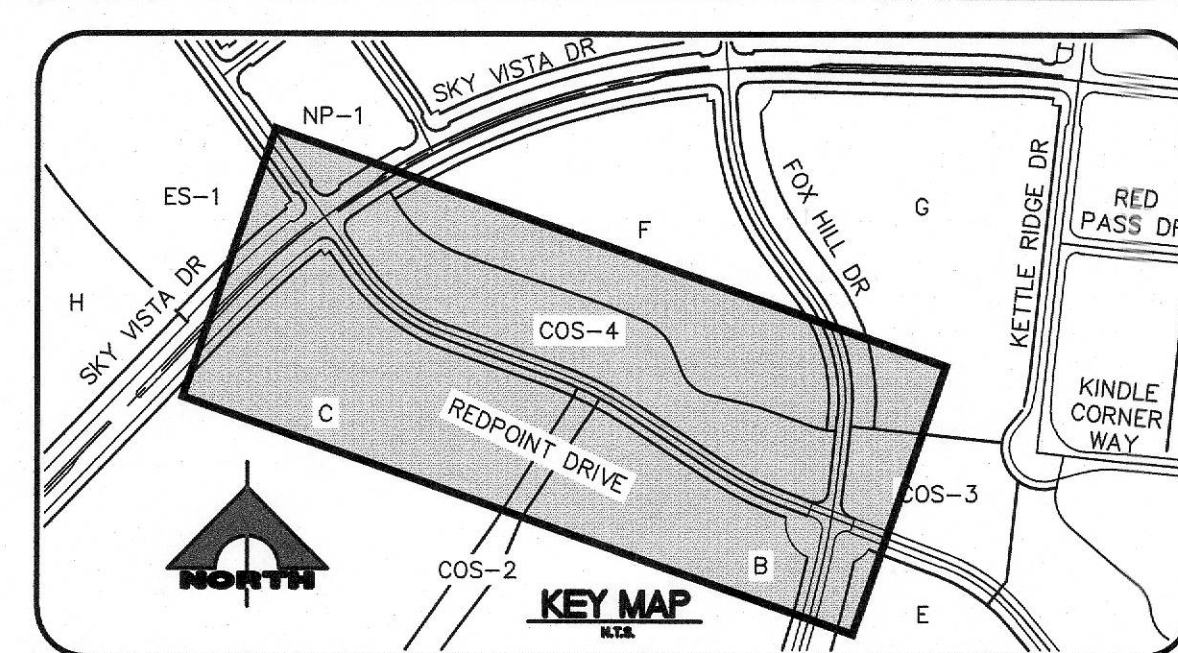
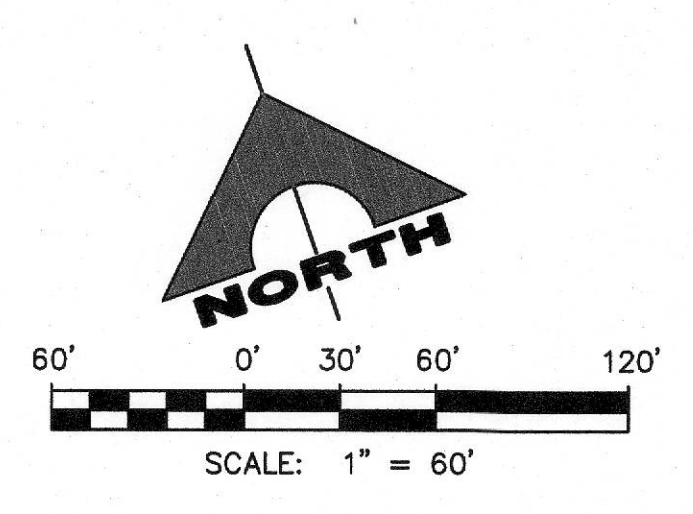
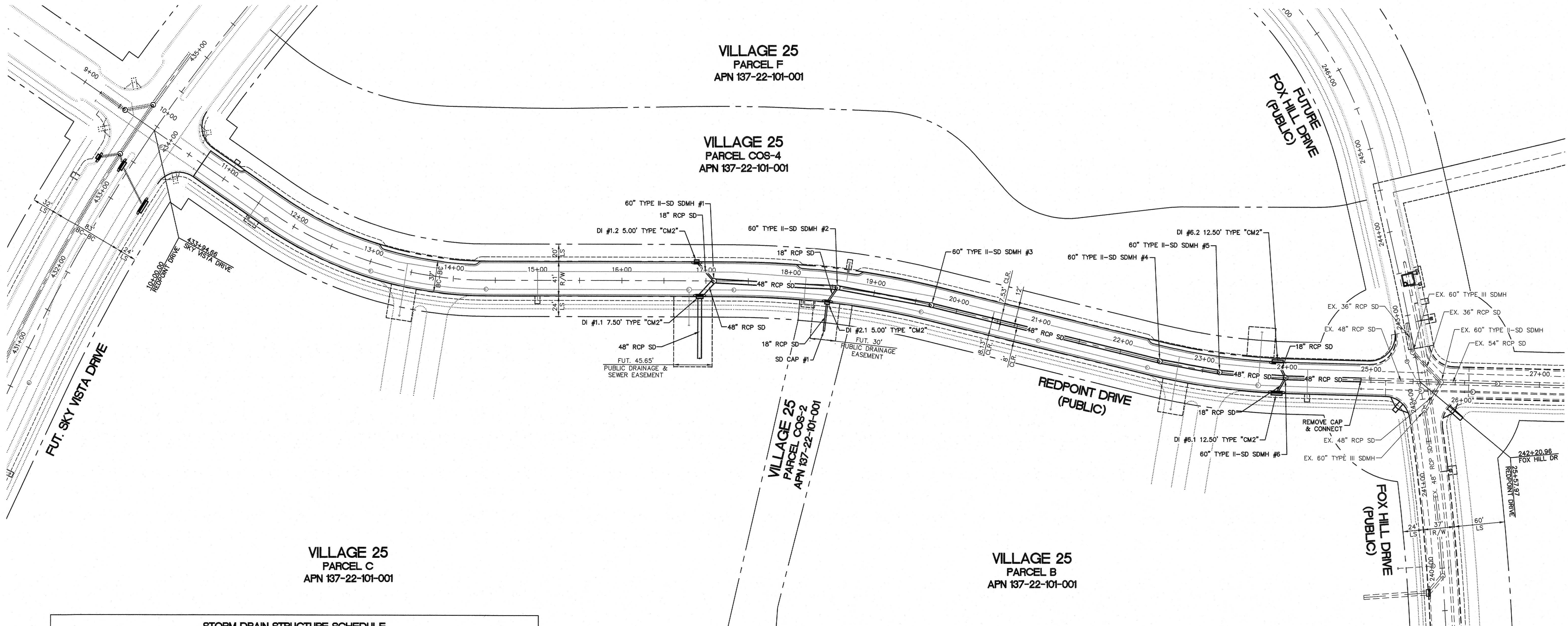
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS
(SKY VISTA DRIVE TO FOX HILL DRIVE)

MASTER UTILITY PLAN - WATER

DRAWING
MU1
5 OF 23 S

5 OF 23 SHOTS



STORM DRAIN STRUCTURE SCHEDULE								
STRUCT. #	STREET NAME	STATION & OFFSET	RIM	INV IN	INV OUT	NORTHING	EASTING	SIZE
SDMH #1	REDPOINT DRIVE	17+09.40, 0.00'	3501.8±	3490.24 3490.24	3490.24	1290460.39	868261.74	60"
SDMH #2	REDPOINT DRIVE	18+56.04, 0.00'	3492.5±	3481.32 3481.32	3481.32	1290404.97	868397.38	60"
SDMH #3	REDPOINT DRIVE	19+69.33, 0.00'	3485.4±	3473.88	3473.88	1290349.11	868495.87	60"
SDMH #4	REDPOINT DRIVE	22+48.26, 0.00'	3467.8±	3456.31	3456.31	1290198.07	868730.37	60"
SDMH #5	REDPOINT DRIVE	23+20.27, 0.00'	3463.5±	3451.92	3451.92	1290162.82	868793.13	60"
SDMH #6	REDPOINT DRIVE	23+98.74, 0.00'	3459.6±	3447.13 3447.13 3447.13	3447.13	1290131.00	868864.83	60"

STORM DRAIN STRUCTURE SCHEDULE								
STRUCT. #	STREET NAME	STATION & OFFSET	RIM	INV IN	INV OUT	NORTHING	EASTING	SIZE
DI #1.1	REDPOINT DRIVE	16+92.40, 18.50' RT	3502.9±	3493.70	3493.70	1290448.53	868239.59	7.5'
DI #1.2	REDPOINT DRIVE	16+88.73, 22.50' LT	3503.0±		3494.50	1290488.45	868249.65	5.0'
DI #2.1	REDPOINT DRIVE	18+45.85, 18.50' RT	3493.2±	3485.19	3485.19	1290392.78	868380.19	5.0'
DI #6.1	REDPOINT DRIVE	23+88.97, 18.50' RT	3460.0±		3452.01	1290117.41	868848.86	12.5'
DI #6.2	REDPOINT DRIVE	23+88.50, 18.50' LT	3460.0±		3452.03	1290151.92	868862.19	12.5'

BASIS OF BEARING AND COORDINATES

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.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXXXX FIRST APPROVAL DATE: _____

BENCHMARK		NAVD 88 DATUM	NAVD 88 DATUM
BM#	DESCRIPTION	(FEET)	(METERS)
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. TSOS,R59E,S34	3318.31	1,011.422

Call before you Dig
Avoid cutting underground utility lines. It's costly.

Call before you UnderGround
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

CALL BEFORE YOU DO OVERHEAD
AVOID HITTING OVERHEAD POWER LINES (75,000V+)

CLV#:

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS
(SKY VISTA DRIVE TO FOX HILL DRIVE)

MASTER UTILITY PLAN - STORM

DRAWING
MU2
6 OF 23 SHTS

PROJECT NO.
62025-204

DESIGN LG/MB
DRAWN NPD
CHECK LG/MB
PLOT DATE 04-09-19
PLOT TIME 10:04:51

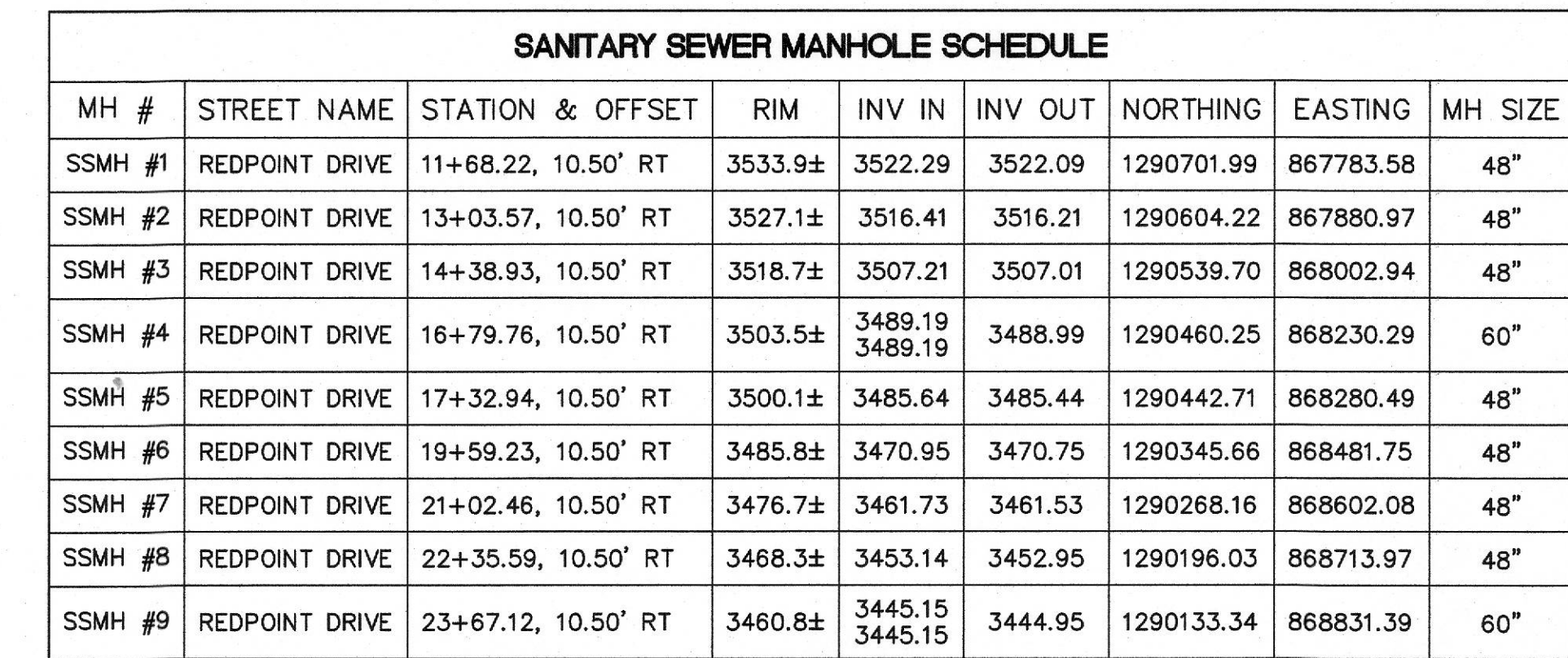
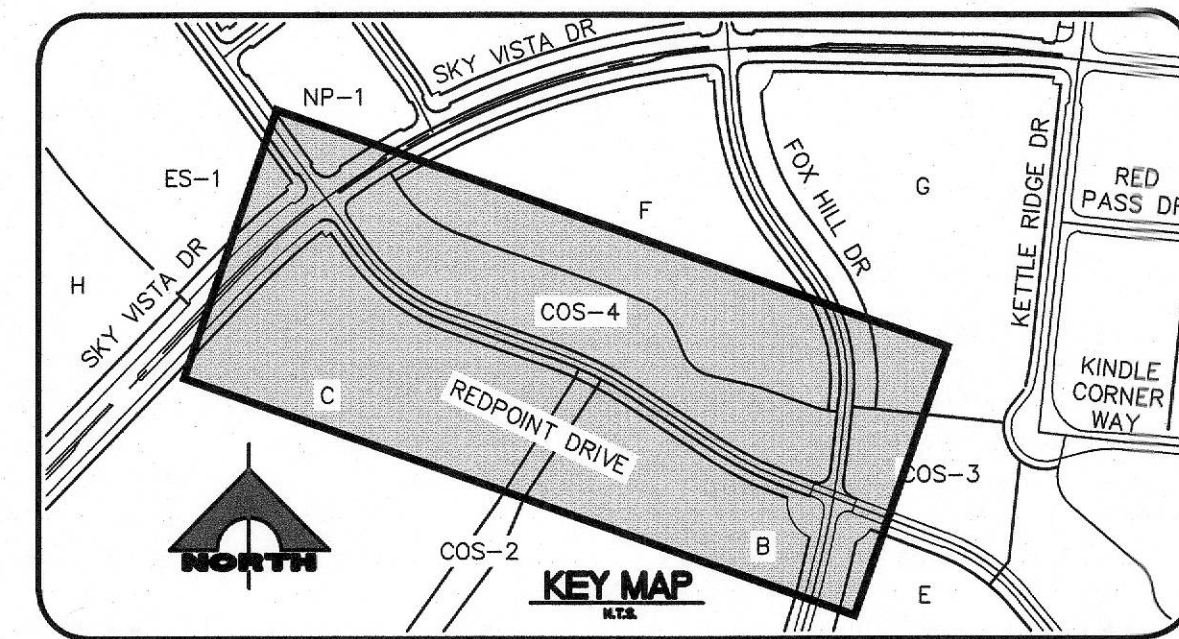
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gwwengineering.com

ANDREW PARK-MURRAY

GCW
ENGINEERS & SURVEYORS

PROFESSIONAL ENGINEER
MICHAEL FANG
No. 24464
DATE 04/09/2019

FOR AGENCY REVIEW - NOT FOR CONSTRUCTION



BASIS OF BEARING AND COORDINATES

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

LINEAR UNIT: US SURVEY FOOT (FT/US)

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

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR

STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N

CENTRAL LINE OF CENTRAL MERIDIAN: 114°58'00"W

NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FT)

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

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.

APPROVED FOR CONSTRUCTION			
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES			
PROJECT NO. XXXXXX	FIRST APPROVAL DATE: _____		

BENCHMARK			
BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. TSOS,R59E,S34.	3318.31 (FEET)	1,011.422 (METERS)

Call before you Dig

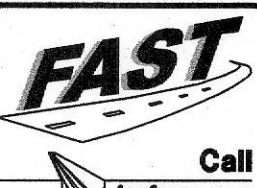
Avoid cutting underground utility lines. It's costly.



Call
811

OR

1-800-227-2920

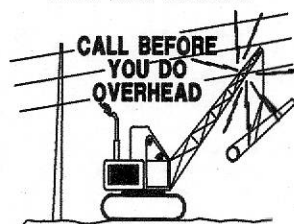


Call
before you
UnderGround

7-702-432-5300

FREEWAY AND ARTERIAL
SYSTEM OF TRANSPORTATION

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY

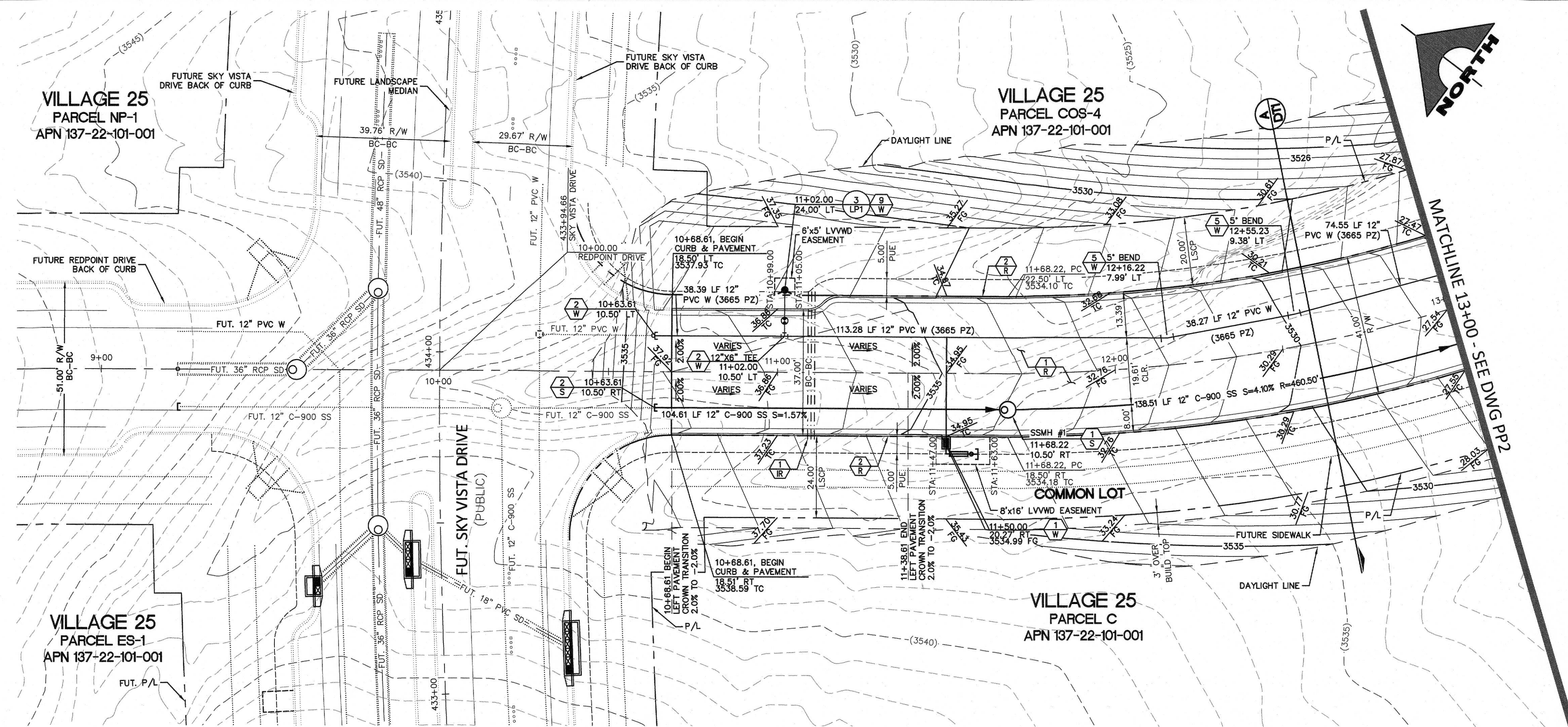


CALL BEFORE
YOU DO
OVERHEAD

1-702-227-2929

CLV #: _____

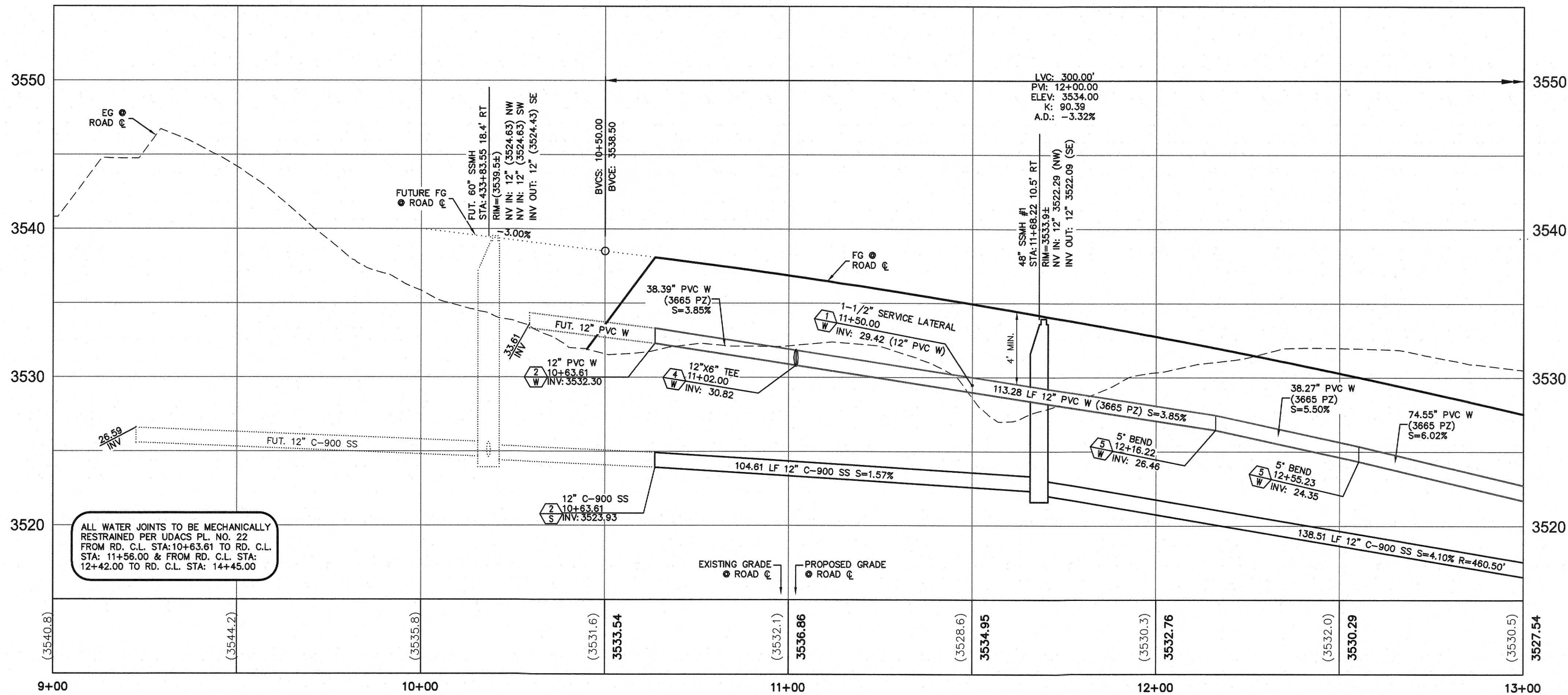
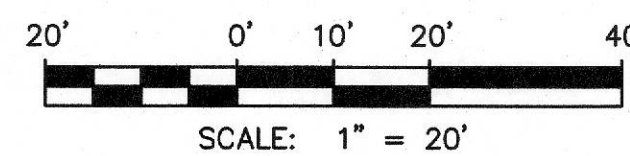
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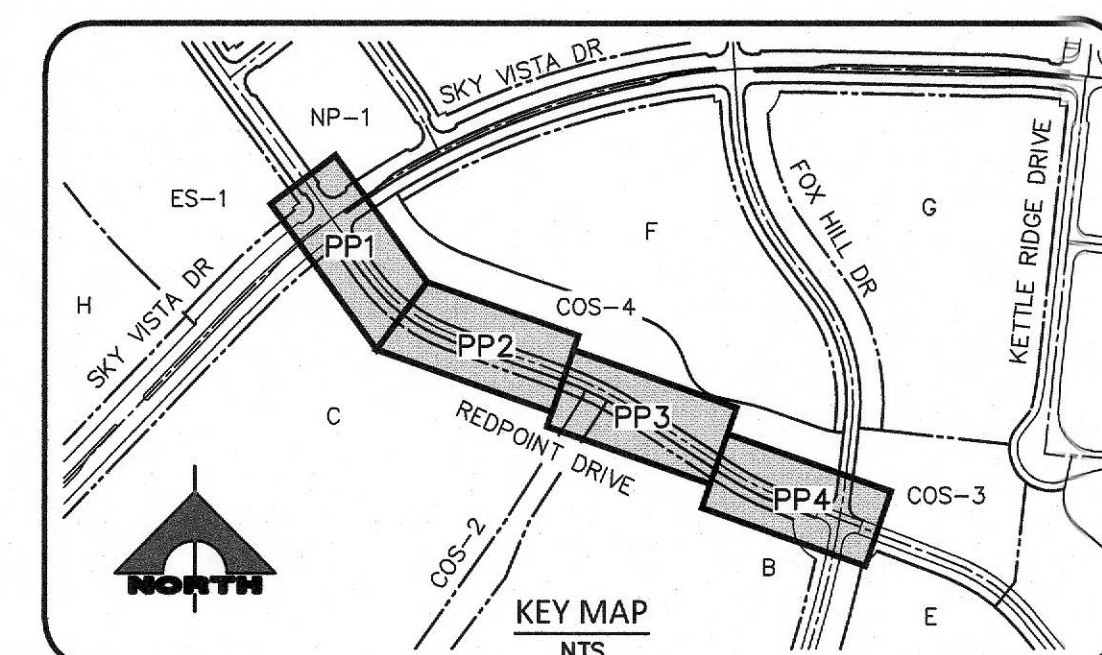
DROP INLET NOTE:
ALL STORM DRAIN DROP INLETS ARE TO BE CONSTRUCTED PER THE REQUIREMENTS OF USDOCA DWG. NO. 421 (STORMWATER QUALITY MANAGEMENT STAMP AND SIGN DETAIL).

OFF-SITE FLOOD CONTROL NOTE:
ALL OFF-SITE INTERIM FLOOD CONTROL FACILITIES SUCH AS, BUT NOT LIMITED TO, BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND ARE TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

REDPOINT DRIVE
(PUBLIC)
SCALE: HORIZ 1" = 20'
VERT. 1" = 5'



ALL WATER JOINTS TO BE MECHANICALLY RESTRAINED PER UDACS PL. NO. 22 FROM RD. C.L. STA: 10+43.61 TO RD. C.L. STA: 11+56.00 & FROM RD. C.L. STA: 12+42.00 TO RD. C.L. STA: 14+45.00



- PROTECTION NOTES:**
- EXISTING PAVEMENT, PROTECT IN PLACE
 - EXISTING CURB/GUTTER, PROTECT IN PLACE
 - EXISTING PULLBOX, ADJUST TO FINISH GRADE
 - EXISTING TEST STATION, ADJUST TO FINISH GRADE
 - EXISTING AVAR, ADJUST TO FINISH GRADE PER UDACS PL. NO. 37
 - EXISTING AVAR, ADJUST TO FINISH GRADE PER UDACS PL. NO. 38
 - EXISTING GATE VALVE, ADJUST TO FINISH GRADE PER UDACS PL. NO. 39
 - EXISTING WATER VAULT MH, ADJUST TO FINISH GRADE PER UDACS PL. NO. C-475
 - EXISTING SSMH, ADJUST TO FINISH GRADE
- ROADWAY IMPROVEMENTS NOTES:**
- INSTALL A.C. PAVEMENT PER STREET SECTIONS, SEE DWG DT1
 - INSTALL "L" TYPE CURB & GUTTER, SEE SUMMERLIN STD DWG S-47
 - INSTALL "A" TYPE ISLAND CURB, SEE SUMMERLIN STD DWG S-50
 - INSTALL CONCRETE SIDEWALK PER USD DWG NO. 234.
 - CONSTRUCT SIDEWALK RAMP PER USD DWG NO. 235 (CASE II)
- WATER CONSTRUCTION NOTES:**
- INSTALL 1-1/2" WATER METER AND 1-1/2" RPPA PER UDACS PL. NO. 4 AND 8
 - INSTALL CAP W/ 2" BLOW-OFF ASSEMBLY PER UDACS PL. NO. 36
 - INSTALL GATE VALVE AND BOX PER UDACS PL. NO. 30 AND 39
 - INSTALL TEE PER UDACS PL. NO. 31
 - INSTALL HORIZONTAL BEND PER UDACS PL. NO. 31
 - REMOVE CAP AND BLOWOFF PER UDACS PL. NO. 36 AND CONNECT TO EX WATER LINE
 - INSTALL VERTICAL BEND PER UDACS PL. NO. 31 UNLESS OTHERWISE IDENTIFIED. (SEE PLAN FOR ANGLE)
 - INSTALL FIRE HYDRANT PER UDACS PL. NO. 40
 - INSTALL DEEP FIRE HYDRANT PER UDACS PL. NO. 41
- SEWER CONSTRUCTION NOTES:**
- INSTALL SEWER MANHOLE PER DCS STD. DWG. 1A AND 1B
 - STUB AND CAP SEWER PIPE PER DETAIL 2, DWG DT2
 - REMOVE PLUG & CONNECT TO SEWER LINE W/ CONCRETE COLLAR PER DETAIL 1 ON DWG DT2
- STORM DRAIN CONSTRUCTION NOTES:**
- INSTALL TYPE II-SD MANHOLE PER USD DWG. NO. 405.2
 - INSTALL TYPE "CM2" DROP INLET PER USD DWG. NO. 412.1 AND 421
 - INSTALL TEMPORARY PLUG AND CAP
 - REMOVE PLUG & CONNECT TO STORM LINE W/ CONCRETE COLLAR PER DETAIL 1 ON DWG DT2
 - BANK "A": 1-6" & 2-4" SCH 40 PVC. PER DETAIL 3 DWG DT2
- IRIGATION CONSTRUCTION NOTES:**
- CONTRACTOR TO FIELD VERIFY SIZE, LOCATION AND INVERT OF EXISTING PIPE, AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO NEW SEWER CONSTRUCTION

BASIS OF BEARING AND COORDINATES

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:

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

BENCHMARK			
BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. TS05,R59E,S34	3318.31 (FEET)	1,011.422 (METERS)

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVAL DATE: _____

Call before you Dig
Avoid cutting underground utility lines. It's costly.

811
OR
1-800-227-2800

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

CALL BEFORE YOU DIG OVERHEAD
AHEAD HITTING OVERHEAD POWER LINES. IT'S COSTLY.

1-702-227-2929

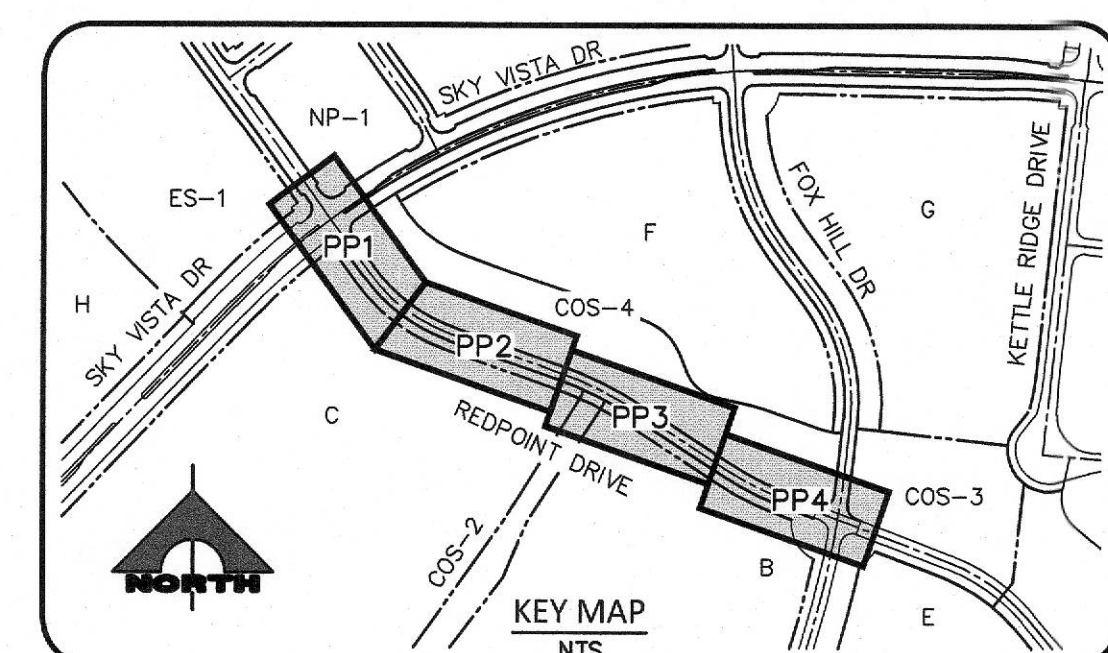
THE HOWARD HUGHES COMPANY, LLC
VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS
(SKY VISTA DRIVE TO FOX HILL DRIVE)

ENGINEERS' SURVEYORS
GCV
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcsengineering.com

PLAN AND PROFILE 1

DRAWING
PP1
10 OF 23 SHTS

FOR AGENCY REVIEW - NOT FOR CONSTRUCTION



PROTECTION NOTES:

- 1/1 EXISTING PAVEMENT, PROTECT IN PLACE
- 2/1 EXISTING CURB/GUTTER, PROTECT IN PLACE
- 3/1 EXISTING PULLBOX, ADJUST TO FINISH GRADE
- 4/1 EXISTING TEST STATION, ADJUST TO FINISH GRADE
- 5/1 EXISTING BLOW-OFF, ADJUST TO FINISH GRADE PER UDACS PL. NO. 37
- 6/1 EXISTING AVAR, ADJUST TO FINISH GRADE PER UDACS PL. NO. 38
- 7/1 EXISTING GATE VALVE, ADJUST TO FINISH GRADE PER UDACS PL. NO. 39
- 8/1 EXISTING WATER VAULT MH, ADJUST TO FINISH GRADE PER UDACS PL. NO. C-475
- 9/1 EXISTING SSMH, ADJUST TO FINISH GRADE

ROADWAY IMPROVEMENTS NOTES:

- 1/1 INSTALL A.C. PAVEMENT PER STREET SECTIONS, SEE DWG DT1
- 2/1 INSTALL "L" TYPE CURB & GUTTER, SEE SUMMERLIN STD DWG S-47
- 3/1 INSTALL "A" TYPE ISLAND CURB, SEE SUMMERLIN STD DWG S-50
- 4/1 INSTALL CONCRETE SIDEWALK PER USD DWG NO. 234.
- 5/1 CONSTRUCT SIDEWALK RAMP PER USD DWG NO. 235 (CASE II)

WATER CONSTRUCTION NOTES:

- 1/1 INSTALL 1- $\frac{1}{2}$ " WATER METER AND 1- $\frac{1}{2}$ " RPPA PER UDACS PL. NO. 4 AND 8
- 2/1 INSTALL CAP W/ 2" BLOW-OFF ASSEMBLY PER UDACS PL. NO. 36
- 3/1 INSTALL GATE VALVE AND BOX PER UDACS PL. NO. 30 AND 39
- 4/1 INSTALL TEE PER UDACS PL. NO. 31
- 5/1 INSTALL HORIZONTAL BEND PER UDACS PL. NO. 31
- 6/1 REMOVE CAP AND BLOWOFF PER UDACS PL. NO. 36 AND CONNECT TO EX WATER LINE
- 7/1 INSTALL VERTICAL BEND PER UDACS PL. NO. 31 UNLESS OTHERWISE IDENTIFIED. (SEE PLAN FOR ANGLE)
- 8/1 INSTALL FIRE HYDRANT PER UDACS PL. NO. 40
- 9/1 INSTALL DEEP FIRE HYDRANT PER UDACS PL. NO. 41

SEWER CONSTRUCTION NOTES:

- 1/1 INSTALL SEWER MANHOLE PER DCS STD. DWG. 1A AND 1B
- 2/1 STUB AND CAP SEWER PIPE PER DETAIL 2, DWG D72
- 3/1 REMOVE PLUG & CONNECT TO SEWER LINE W/ CONCRETE COLLAR PER DETAIL 1 ON DWG D72

STORM DRAIN CONSTRUCTION NOTES:

- 1/1 INSTALL TYPE II-SD MANHOLE PER USD DWG. NO. 405.2
- 2/1 INSTALL TYPE "CM2" DROP INLET PER USD DWG. NO. 412.1 AND 421
- 3/1 INSTALL TEMPORARY PLUG AND CAP
- 4/1 REMOVE PLUG & CONNECT TO STORM LINE W/ CONCRETE COLLAR PER DETAIL 1 ON DWG D72

IFFIGATION CONSTRUCTION NOTES:

- 1/1 BANK "A": 1-6" & 2-4" SCH 40 PVC. PER DETAIL 3 DWG D72

CONTRACTOR TO FIELD VERIFY SIZE, LOCATION AND INVERT OF EXISTING PIPE, AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO NEW SEWER CONSTRUCTION

BASIS OF BEARING AND COORDINATES

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 AND MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FT/US)

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

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR

STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N

APOXIMATE LATITUDE OF CENTRAL MERIDIAN: 36°15'00"N

NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FT)

EASTING AT CENTRAL MERIDIAN: 300,000.0 M (984,250.0000 FT/US)

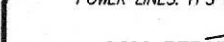
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

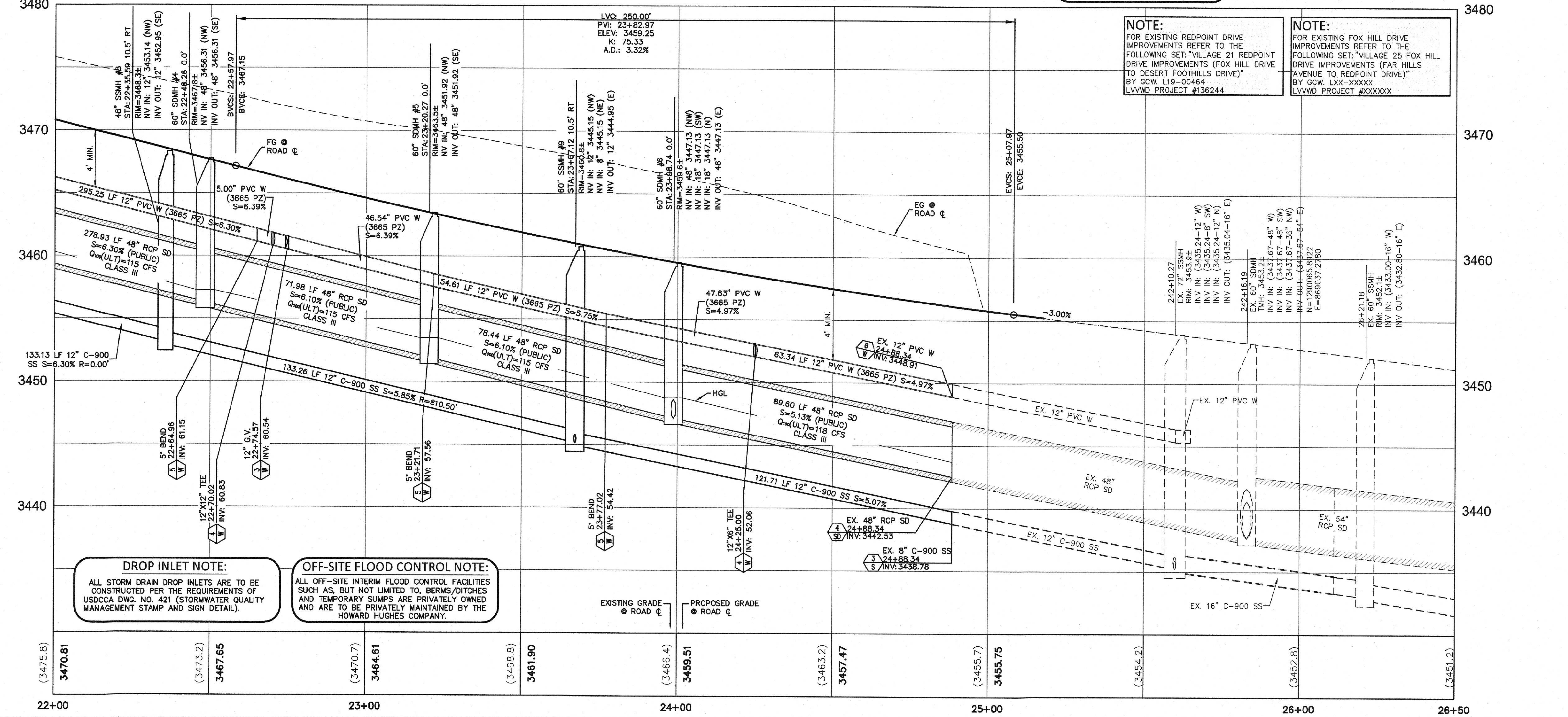
NOTES:

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BENCHMARK			
BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934DW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. TS05,R59E,S34	3318.31 (FEET)	1,011.422 (METERS)

<u>APPROVED FOR CONSTRUCTION</u>	
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES	
PROJECT NO. <u>XXXXXX</u>	FIRST APPROVAL DATE: _____

Call before you Dig Avoid cutting under ground utility lines. It's costly. Call  OR 1-800-227-2800	<i>FAST</i>  Call before you Underground 1-702-432-6300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION	AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.  CALL BEFORE YOU DO OVERHEAD 1-702-227-2929
--	--	---

[illegible]



ENGINEERS\ SURVEYORS

gcvengineering.com

1555 S. RAINBOW BLVD.

LAS VEGAS, NV 89146

T: 702.804.2000

F: 702.804.2299

PROJECT NO:

62025-204

DESIGN: LG/MB

DRAWN: NPD

CHECK: LG/MB

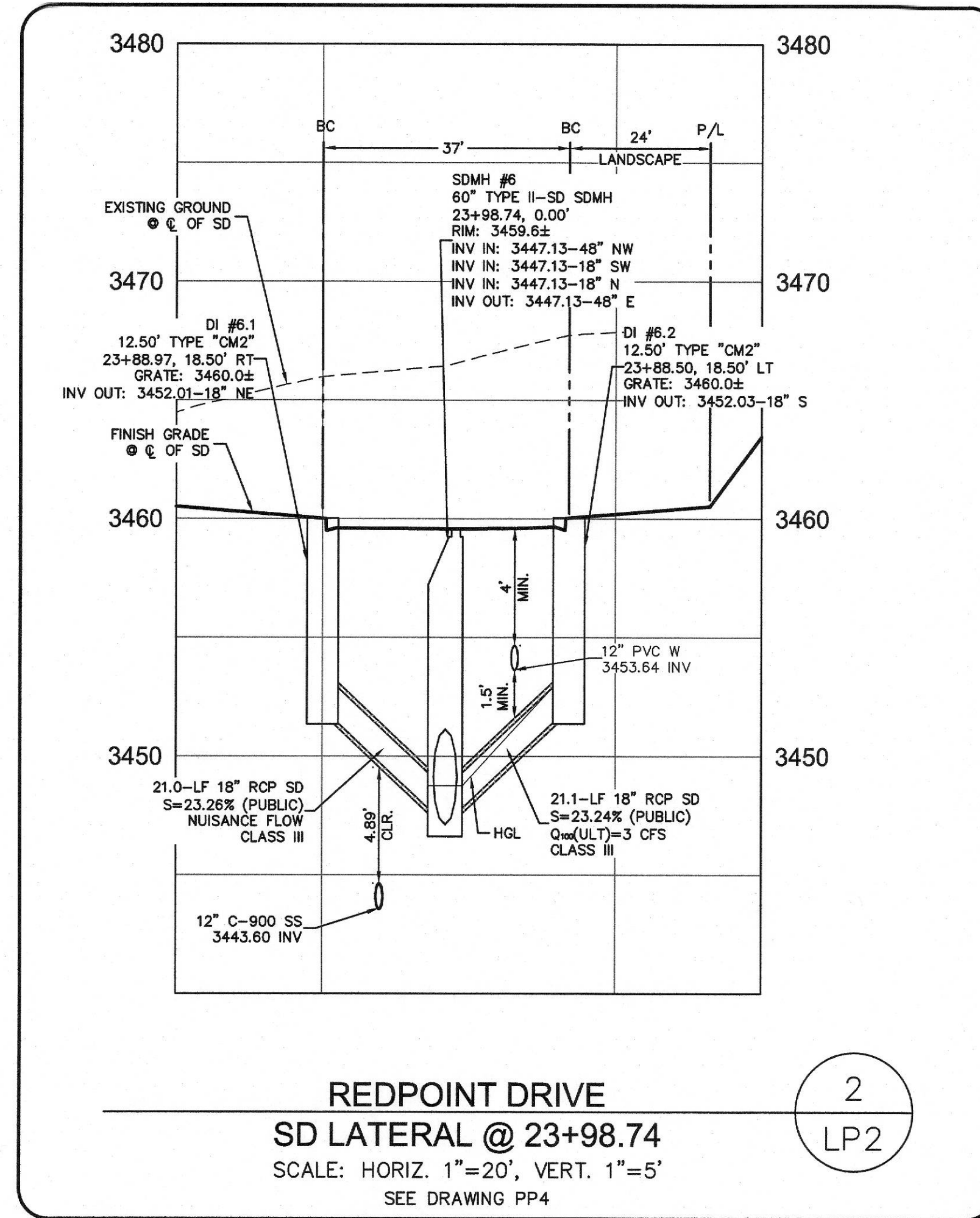
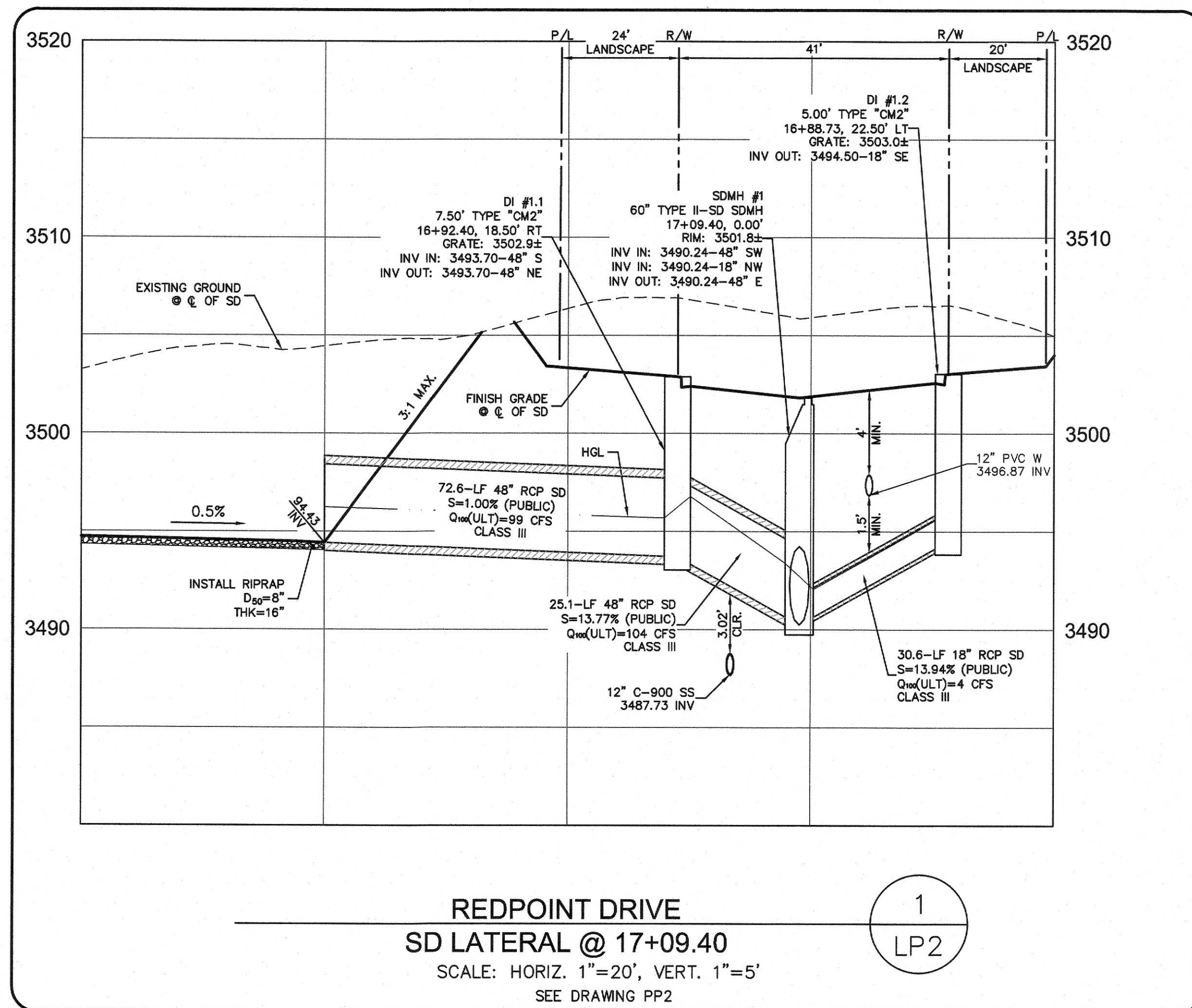
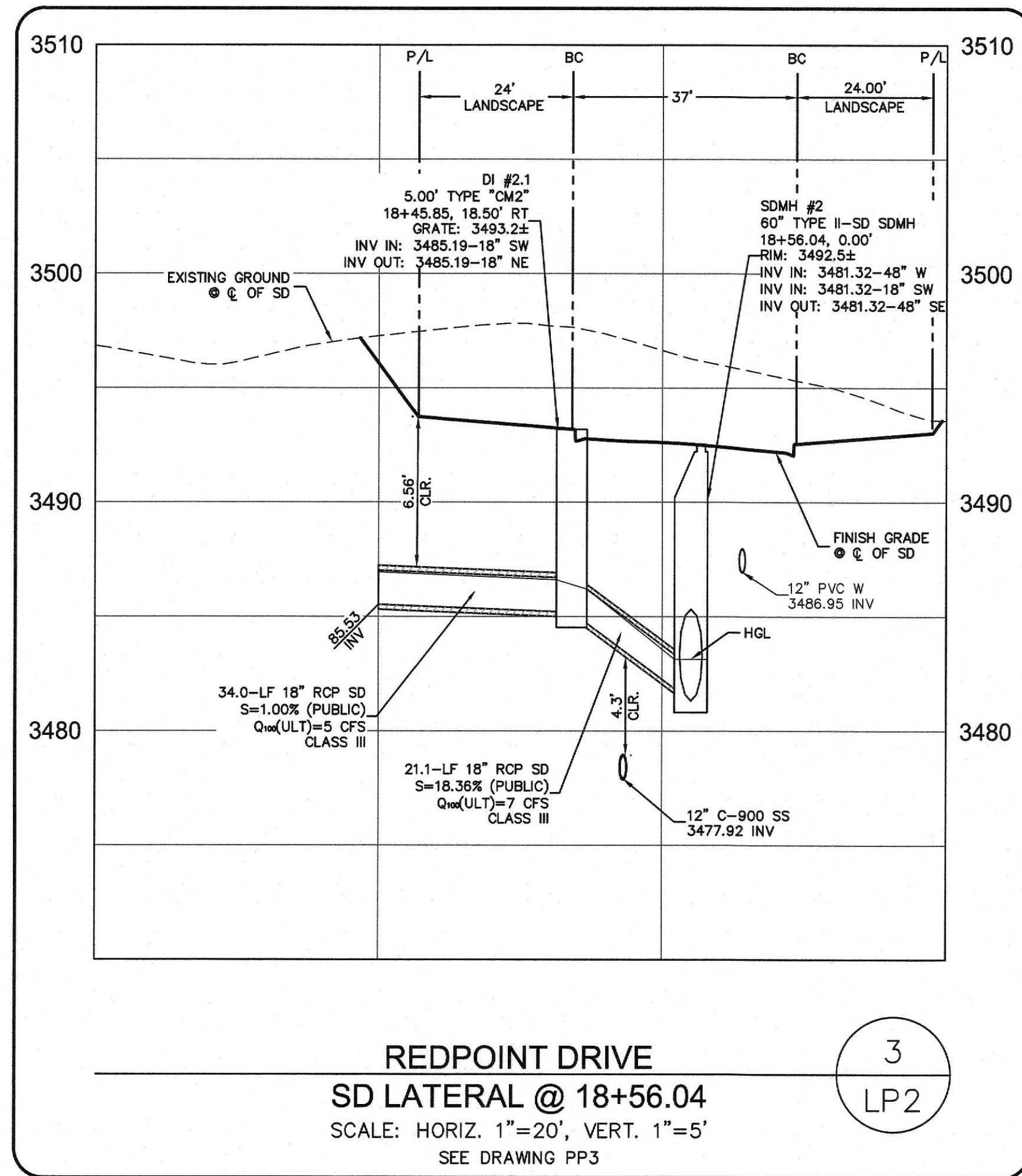
PLOT DATE: 04-09-11

PLOT TIME: 10:21:36

ANDREW PARK-MURRAY

F:\PROJECTS\600 (20025-204)\DWG\PRODUCTION\62025-204.DWG, P1.DWG

DRAWING PP4	THE HOWARD HUGHES COMPANY, LLC
	VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS (SKY VISTA DRIVE TO FOX HILL DRIVE)
	PLAN AND PROFILE 4



APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVAL DATE: _____

CLV#:

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS
(SKY VISTA DRIVE TO FOX HILL DRIVE)

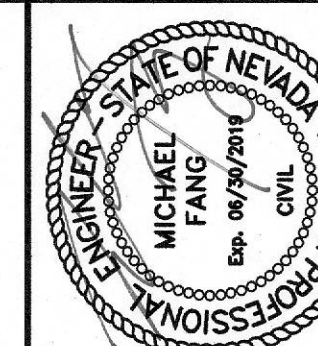
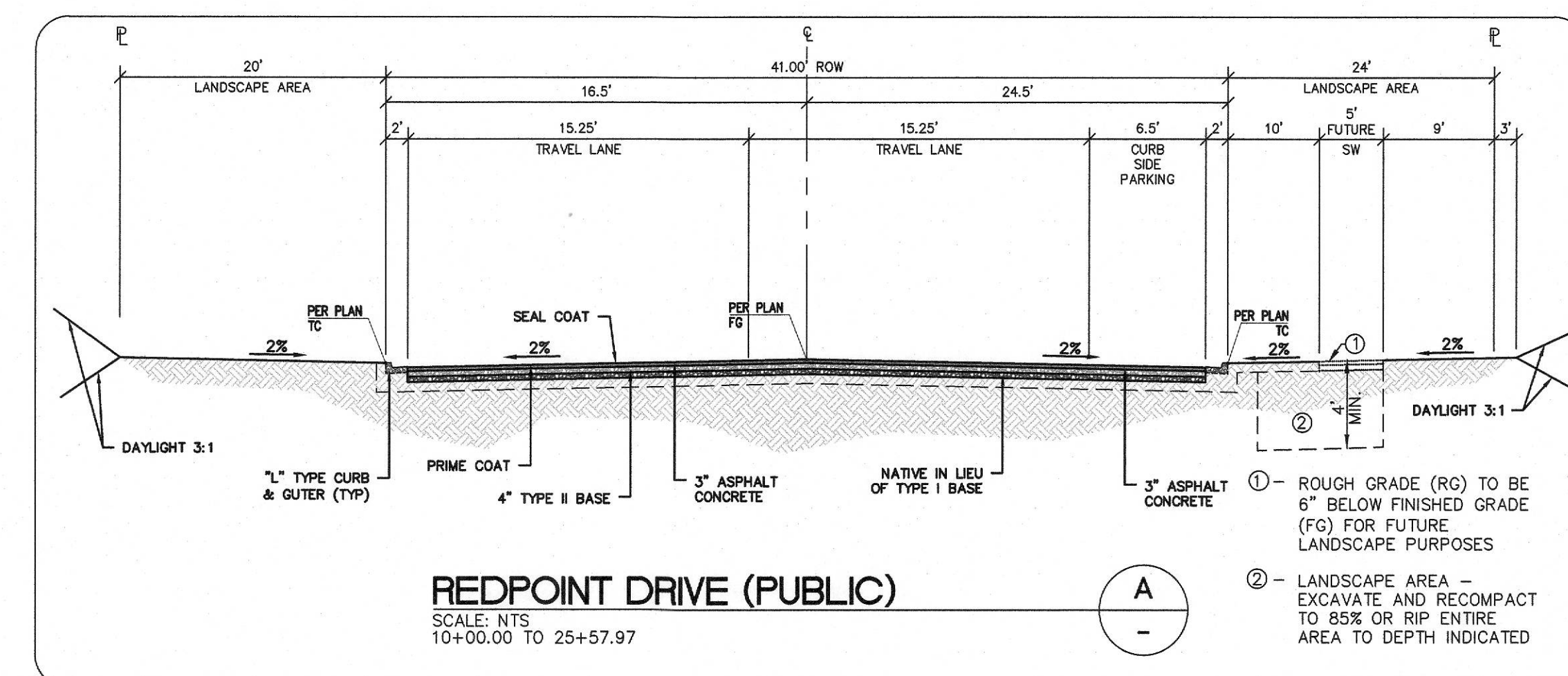
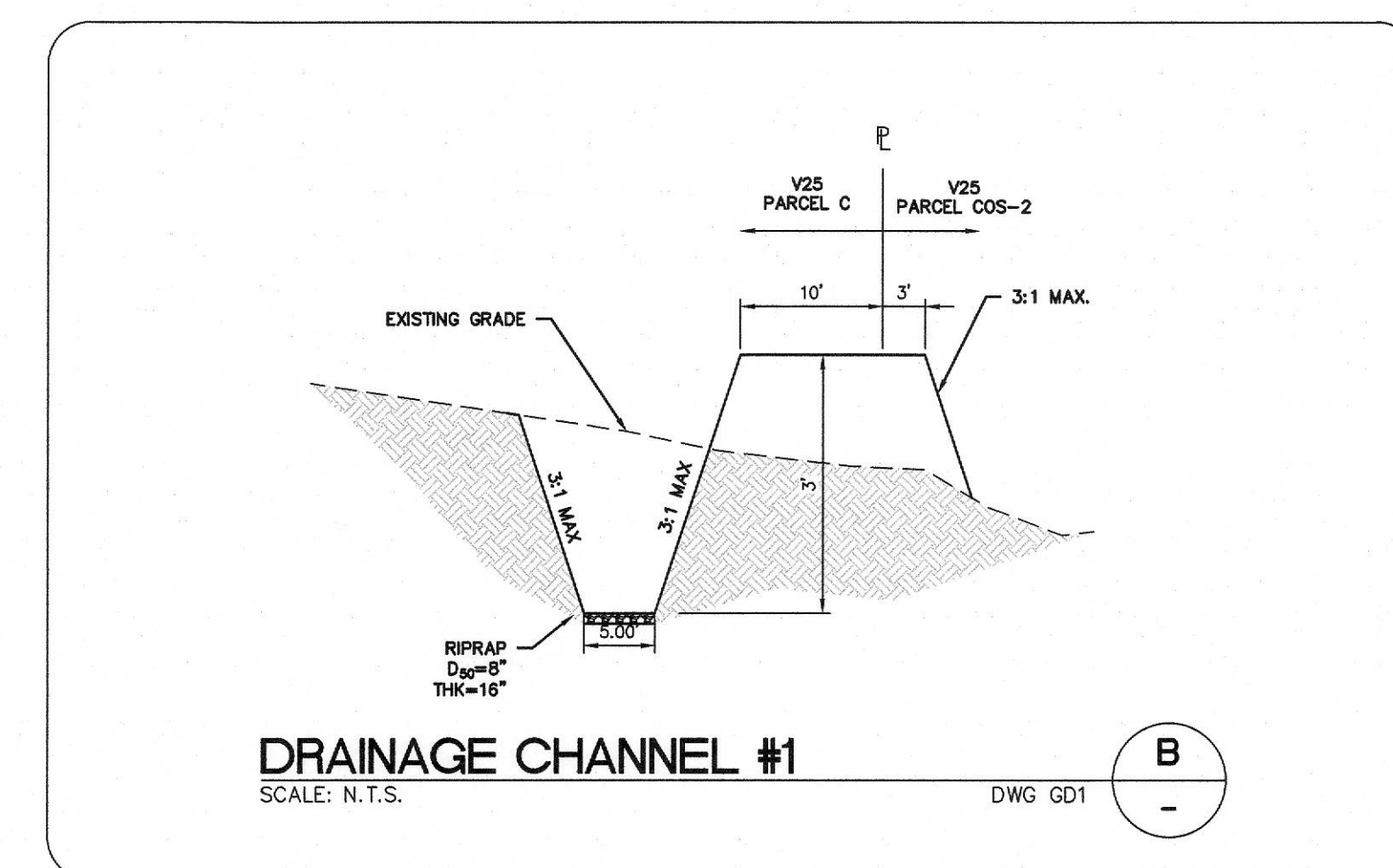
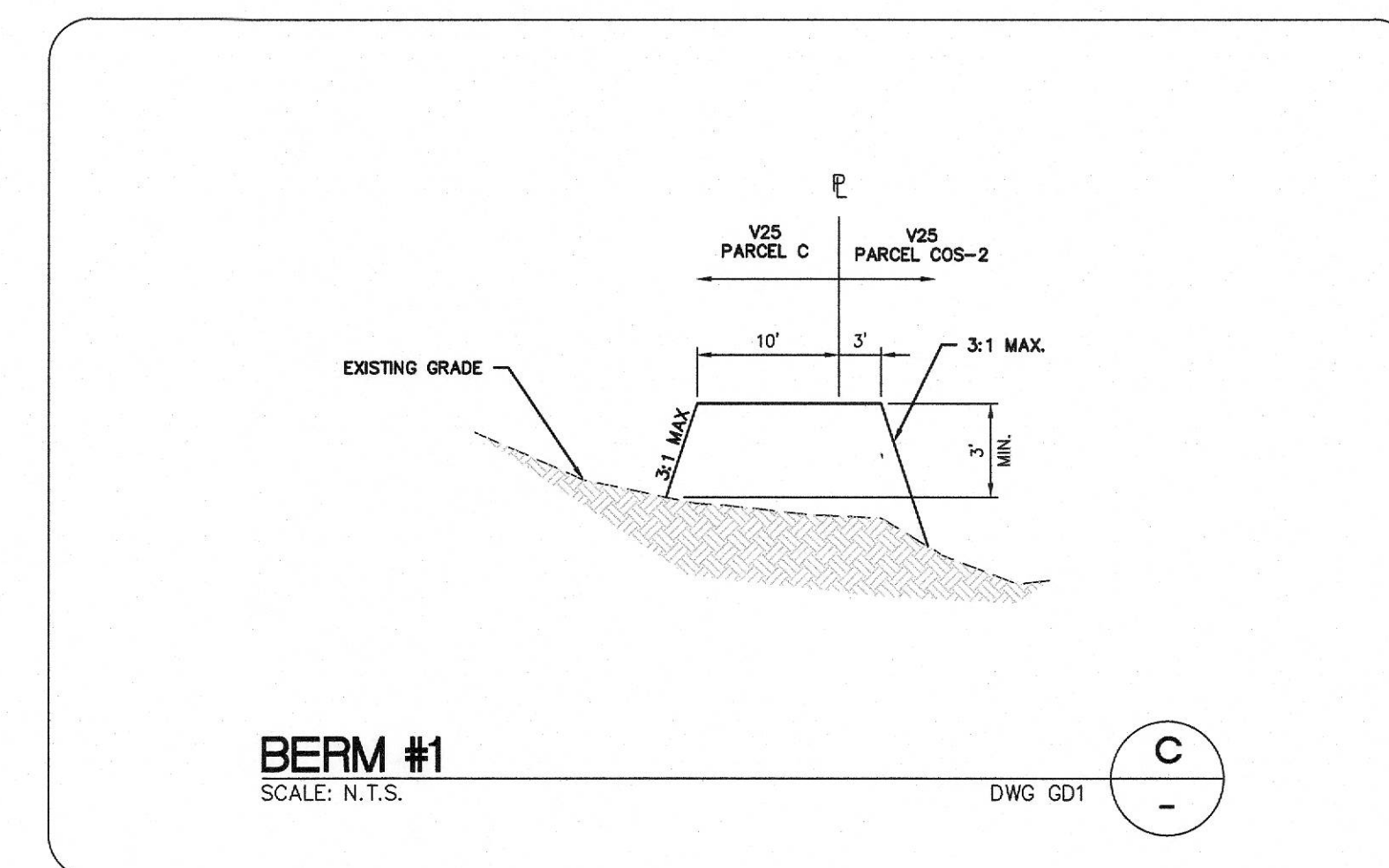
LATERAL PROFILES 2

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

DRAWING
LP2

15 OF 23 SHTS

FOR AGENCY REVIEW - NOT FOR CONSTRUCTION

[illegible][illegible]

PROJECT NO.
62025-204

DESIGN: LG/MB
DRAWN: NPD
CHECK: LG/MB
PLOT DATE: 04-09-19
PLOT TIME: 10:28:58

GCV
ENGINEERS \ SURVEYORS

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LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcvengineering.com

PRODUCTS (602) 204-UNIVERSITY PRODUCTION (602) 204-0671, J1 (194)

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 25 REDPOINT DRIVE IMPROVEMENTS (SKY VISTA DRIVE TO FOX HILL DRIVE)
TYPICAL DETAILS & SECTIONS

DRAWING
DT1
17 OF 23 SHTS

