

DS #: 05243

APN: 137-23-201-001

PROJECT: Shimmah West Village 22 - Kettle Rise Way  
(from Kettle Bend Rd. to Desert Foothills Blvd.)

SUBMITAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:



|                                                                                                 |                                      |                                                                                                   |
|-------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>CITY OF LAS VEGAS</b>                                                                        |                                      | <b>DATE:</b>                                                                                      |
| <b>INTER-OFFICE MEMORANDUM</b>                                                                  |                                      | February 27, 2020                                                                                 |
| <b>TO:</b><br>Land Development Services<br>Department of Building & Safety                      |                                      | <b>FROM:</b><br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |
| <b>SUBJECT:</b>                                                                                 | Drainage Study for:                  | <b>COPIES TO:</b>                                                                                 |
| Summerlin West Village 22 - Kindle Rise Way<br>(from Kettle Bend Rd. to Desert Foothills Blvd.) |                                      | VTN Nevada                                                                                        |
| <b>Cross Streets:</b>                                                                           | Kettle Bend Road and Kindle Rise Way | The Howard Hughes Company, LLC                                                                    |
| <b>File Number:</b>                                                                             | F:\Depot\DSMemos\DS5243A.doc         | Bart Anderson, P.E., DevCo                                                                        |
| <b>Parcel Number:</b>                                                                           | 137-23-201-001                       | CCRFCD                                                                                            |
| <b>Zoning Action:</b>                                                                           | N/A                                  |                                                                                                   |
| <b>FEMA Flood Zone</b>                                                                          | YES NO X                             |                                                                                                   |
| <b>Proposed Storm Drain</b>                                                                     | YES X NO                             |                                                                                                   |

| HISTORY                    | DATE RECEIVED | DATE REVIEWED         | COMMENTS           | REVIEW FEES     | FEES PAID<br>Payment Trn # |
|----------------------------|---------------|-----------------------|--------------------|-----------------|----------------------------|
| 1 <sup>st</sup> Submittal  | 2/5/2020      | 2/19/2020 & 2/26/2020 | See Comments Below | \$400.00        | 3735112: \$400             |
| <b>TOTAL FEES (LDDRS):</b> |               |                       |                    | <b>\$400.00</b> | ----                       |

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

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



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

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

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

4. The WSPG model used concrete roughness coefficient of 0.015 is not acceptable. Per the Manual, the concrete roughness coefficient shall be 0.013. Review and revise accordingly.
5. Provide a headwater elevation calculation for the RCB inlet using a model such as HY-8.
6. **Sheet MUTSD:** The graphic scale of 1"=20' is wrong which should be 1"=40'. Review and revise accordingly.
7. **Sheet UT1:** Provide a nuisance inlet on each side of *Kindle Rise Way* at approximate Station 17+00.
8. **Sheet UT2:** Provide a transition structure between the 6'x7'-RCB and the 8'x8'-RCB. UT2 calls out a transition structure shown on sheet S1. Sheet S1 is not provided. Detail structural designed transition structure shall be provided in the next submittal.
9. **Sheet UT2:** A connection detail between an existing and a new box must be provided at Station 11+22.50 in *Kindle Rise Way*.
10. All special structures including the transition structure and mainline storm drain connection require details and structural calculations to be reviewed by the *City of Las Vegas Building & Safety Department*. Approval by the *Building Department* must be obtained prior to the final approval of the subject drainage study.
11. **Sheet UT2:** Provide a nominal inlet at the south side of *Kindle Rise Way* at approximate Station 11+50.
12. In all pertinent lateral plan & profile sheets, label the depth of the proposed drop inlets. All storm drain inlets that are more than 10'-deep require a special structural detail and calculations. Submit structural design and calculations to *City Building & Safety Department* for review and approval prior to the final approval of the drainage study.
13. The *City of Las Vegas* requires 2" of sacrificial concrete for velocities above 25 ft/s. Revise all pertinent plans accordingly.
14. 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.

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

**END OF REMARKS**  
HDR/AYS

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

# Technical Drainage Study for

## Summerlin West Village 22

### Kindle Rise Way

### - Kettle Bend Road to Desert Foothills Drive

*Prepared for:*

Howard Hughes Company, LLC

*Submitted to:*

City of Las Vegas

Public Works



HYDROLOGIC CRITERIA AND DRAINAGE MANUAL  
**DRAINAGE STUDY INFORMATION FORM**

Name of Development: Summerlin West Village 22 Kindle Rise Way-Kettle Bend to Desert Foothills Date: 02/5/2020

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

East/West: Kindle Rise Way

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

c) APN: 137-23-201-001

Name of Owner: The Howard Hughes Company, LLC

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

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

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

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

Firm: VTN Nevada

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

Type of Land Development/Land Disturbance Process:

|                          |                  |                          |                          |                                     |                              |
|--------------------------|------------------|--------------------------|--------------------------|-------------------------------------|------------------------------|
| <input type="checkbox"/> | Rezoning         | <input type="checkbox"/> | Subdivision Map          | <input type="checkbox"/>            | Clearing and Grading Only    |
| <input type="checkbox"/> | Parcel Map       | <input type="checkbox"/> | Planned Unit Development | <input checked="" type="checkbox"/> | Other (Please specify below) |
| <input type="checkbox"/> | Large Parcel Map | <input type="checkbox"/> | Building Permit          |                                     | Storm Drain, Grading         |

1. Total Owned Land Area: At Site: +/- 1.21 Acres Being Developed/Disturbed: +/-1.21 Acres

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes\*\* ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes\*\* ☐ No

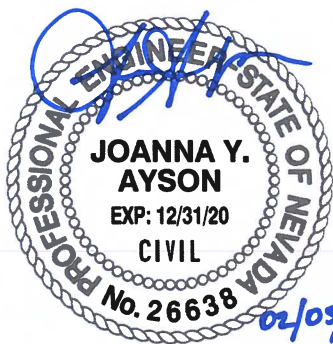
4. Proposed type of development (Residential, Commercial, Etc.): Roadway

5. Approximate upstream land area which drains to the subject site: +/- 200 acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: SWPA MPU(DS 4926), Summerlin V22-Kettle Bend Road(DS 5204);Summerlin V21-Summerlin Parkway Extension(DS 5159);MDS Summerlin V22(DS 5005)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing 8'x8' RCB located east of the project site in Kettle Bend Road.

8. Briefly describe your proposed schedule for the subject project: As soon as possible



Engineer's Seal

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

**\*New Required Field**

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

| Local Entity File No. | Revision | Date |
|-----------------------|----------|------|
|                       |          |      |
|                       |          |      |
|                       |          |      |

REFERENCE:

STANDARD FORM 1





# 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 (CCRFCF) 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 CCRFCF Hydrologic Criteria and Drainage Design Manual (Design Manual).

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

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

| I. GENERAL REQUIREMENT |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Yes                    | No |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| N/A                    |    | A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| N/A                    |    | Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| X                      |    | <p>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.</p> <p><u>  <i>QX</i>  </u> by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.</p> |

| 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.                                                                                                                                                                                                                                                                                                                          |
| X                            |    | Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.                                                                                                                                                                            |
| X                            |    | On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)                                                                                                                                                                        |
| N/A                          |    | This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.                                                                                                                                  |
| N/A                          |    | Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.                                                                                                                                                                                            |

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

### 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.

February 5, 2020

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

**Subject: Technical Drainage Study for Summerlin West Village 22 Kindle Rise Way  
– Kettle Bend to Desert Foothills**

Mr. Sung:

This letter certifies that all items on the **Technical Drainage Study for Summerlin West Village 22 Kindle Rise Way – Kettle Bend to Desert Foothills** electronic submittal matches the paper version bound into the study.

Respectfully submitted,

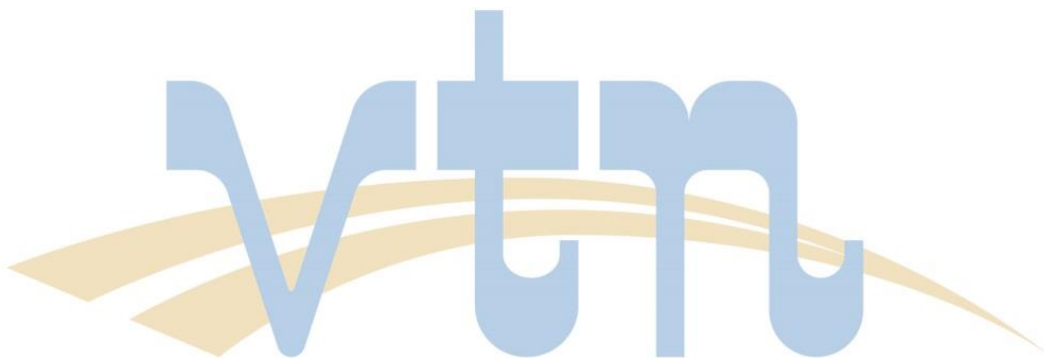


Joanna Ayson, P.E.

**TECHNICAL DRAINAGE STUDY**  
**FOR**  
**SUMMERLIN WEST VILLAGE 22**  
**KINDLE RISE WAY**  
**(KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE)**  
**W.O. # 7861-MISC-15**

Prepared for:  
**THE HOWARD HUGHES COMPANY, LLC**

Submitted To:  
**CITY OF LAS VEGAS**  
**DEPARTMENT OF PUBLIC WORKS**





February 5, 2020  
W.O. #7861-MISC-15

City of Las Vegas  
Land Development Services  
Department of Building Safety

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

**SUBJECT: TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22 KINDLE RISE  
WAY**

Mr. Sung,

Transmitted herewith for your review is one (1) copy of the *Technical Drainage Study for Summerlin West Village 22 Kindle Rise Way*. The site is a  $\pm$  1.21-acre development located within a portion of Section 23, Township 20 South, Range 59 East, M.D.M., Clark County, Nevada.

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

Respectfully Submitted,

VTN Nevada



Rachel Raymond, E.I.



Joanna Ayson, P.E.

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## I. INTRODUCTION

### A. STUDY OVERVIEW AND PURPOSE

The Howard Hughes Company is proposing to construct Kindle Rise Way between Kettle Bend Road and Desert Foothills Drive. The proposed project will include approximately 750-linear feet of roadway improvements and flood protection infrastructure. This *Technical Drainage Study for Summerlin Village 22 Kindle Rise Way – Kettle Bend Road to Desert Foothills Drive* serves to analyze the drainage conditions for the proposed improvements and to determine adequate flood protection for the project. The methodology presented in this study is in accordance with the criteria set forth in the Clark County Regional Flood Control District (CCRFCDD) *Hydrologic Criteria and Drainage Design Manual* (HCDDM) (Hereinafter referred to as the Manual).

### B. LOCATION

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

### C. DESCRIPTION

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

### D. FLOODPLAIN INFORMATION

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

### E. MASTER PLANNING INFORMATION

The proposed site is delineated on the referenced Figures F-22 and W-4 from the 2018 Clark County Regional Flood Control District (CCRFCDD) Las Vegas Valley Flood Control Master Plan Update (MPU) (Refer to *Figures 4A and 4B, MPU Facilities Map and MPU Hydrologic Map*). The referenced MPU facility map suggests that a portion of 2018 CCRFCDD Facility APBE 0154 will be constructed with this project. APBE 0154 is described as an 8’x6’ RCB.

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

storm drain layout within the SWPA, and the information presented in the latest Master Study supersedes the information in the 2018 CCRFCD MPU. Facility 0154 was revised to an 6'x10' RCB to a 8'x8' RCB in the latest Master Study. However, the facilities presented in the Overall Master Study were based on normal depth and conceptual information only, and this study provides a more detailed hydraulic analysis of the facility to determine the most appropriate facility size. Drainage patterns in this project are consistent with the Master Study and therefore the improvements proposed in this project will not adversely impact existing or proposed CCRFCD facilities.

## **F. REFERENCED HYDROLOGY STUDIES**

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

- *Drainage Study for Summerlin West Planning Area Master Plan Update* (referred to as the Overall Master Study), approved by the City of Las Vegas (CLV) March 13, 2019 (DS4926), Update #2 conditionally approved by CLV on January 21, 2020.
- *Update #2 Master Conceptual Drainage Study for Village 22* (referred to as the Village 22 Master Study), conditionally approved by CLV on December 12, 2019 (DS5005)
- *Technical Drainage Study for Kettle Bend Road (Sunset Run Drive to Krestel Creek Road)* (referred to as the Kettle Bend Study), originally submitted to CLV on October 15, 2019 and currently under review (DS5204).
- *Technical Drainage Study for Summerlin Parkway Extension* (referred to as the Summerlin Parkway Study), conditionally approved by CLV on July 18, 2019 (DS5159).

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

## **II. HYDROLOGIC ANALYSIS**

### **A. METHOD OF ANALYSIS**

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

### **B. RAINFALL CRITERIA**

The project site is outside in the McCarran Airport Rainfall Area as shown by Figure 513 of the *Manual*. A precipitation coverage map for the existing and interim condition is provided in Appendix A (Refer to *Figure 5B: Precipitation Map*). The provided map depicts rainfall depths adjusted per the 2006 MPU Atlas 2. The calculated rainfall depths range between 3.37-inches to 3.42-inches. For ultimate condition, rainfall depths have been referenced from the Master Study. Pertinent reference material has been included in Appendix D.

### C. RUNOFF COMPUTATION

The SCS Soil Survey of Las Vegas, Nevada, was used to identify soil types and their corresponding hydrologic soil groups. The land uses or land covers for onsite and offsite basins include Desert Shrub in Poor Condition and Impervious Paved Roads/Streets. For the given soil type and land use, CN values were determined from using the appropriate columns of Table 602 of the *Manual*. Soil information and CN calculations for existing condition basins have been included in Appendix B.

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

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

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

### D. PEAK FLOWS

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

| TABLE 1<br>INTERIM CONDITION HEC-1 SUMMARY TABLE    |              |               |
|-----------------------------------------------------|--------------|---------------|
| BASIN ID<br>(CONTRIBUTING BASINS)                   | AREA<br>(ac) | Q100<br>(CFS) |
| OFF1                                                | 29.37        | 42            |
| STF2*                                               | 1.21         | 5             |
| OFF2                                                | 170.46       | 201           |
| REF**                                               | -            | 461           |
| COFF2 (OFF2+ REF**)                                 | -            | 662           |
| *Referenced from V22 MCDS by VTN (DS# 5005)         |              |               |
| ** Referenced from Kettle Ridge Drive TDS by Atkins |              |               |



| TABLE 2<br>ULTIMATE CONDITION<br>HEC-1 SUMMARY TABLE |           |      |
|------------------------------------------------------|-----------|------|
| BASIN ID                                             | AREA (ac) | Q100 |
| STF2*                                                | 1.21      | 5    |
| *Referenced from V22 MCDS by VTN (DS# 5005)          |           |      |

### III. ONSITE & OFFSITE BASIN ANALYSIS

#### A. EXISTING CONDITION ANALYSIS

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

#### B. INTERIM CONDITION ANALYSIS

(Refer to *Figure 7: Interim Condition Basin Map* in Appendix A.)

Interim Condition assumes that the proposed Kindle Rise Way improvements and the referenced Kettle Bend Road improvements are fully constructed. The referenced Kettle Bend Road project included the construction of a temporary channel to divert 461-cfs of offsite flow away from the Gowan System and towards the Beltway Channel System. The diversion is intended to allocate additional capacity to the Gowan System to allow the development of a portion of Village 22 prior to the construction of the Grand Park Detention Basin (GPDB).

The existing Kettle Bend Road channel directed flow to the 8x8 RCB in Kindle Rise Way. Since Kindle Rise Way is being extended with this project, the existing channel will be filled, and a replacement channel will be constructed upstream to direct the offsite flow to the new storm drain inlet location. This will allow flow patterns to remain consistent with existing condition and will ensure that portions of Village 22 may still be constructed prior to the completion of the GPDB.

#### 1. OFFSITE DRAINAGE BASIN DESCRIPTION

An existing channel along the former Desert Foothills Drive alignment conveys flows northerly through the project between the roadway and the storm drain sump inlet.

Offsite basin OFF1 was delineated to determine the flow being conveyed by the offsite channel. Flow in the channel will pass through the project, and eventually leave the channel and flow easterly towards Kettle Bend Road. The flow from OFF1 (42 cfs) will be collected by an existing 30" RCP which was designed to accept 36 cfs in the ultimate condition. The existing 30" RCP and the storm drain system in Kettle Bend has been modeled to show that the additional 6 cfs will not adversely impact the stub (refer to WSPG model KBQR.wsw). The storm drain in Kettle Bend Road is expected to convey up to 127 cfs downstream in the ultimate condition. The interim condition flow in the Kettle Bend storm drain system including the additional 6 cfs is less than anticipated ultimate condition flow of 127 cfs, therefore the downstream facilities will not be adversely impacted. Hydraulic calculations have been included in Appendix C.

Basin OFF2 was delineated to quantify the flow rate impacting the proposed interim channel in addition to the 461 cfs of flow impacting the channel from the north. The total flow of 662-cfs given by COFF3 (OFF3+461 cfs) is conveyed by the channel and enters the proposed 6'x7' RCB storm drain.

## **2. ONSITE DRAINAGE BASIN DESCRIPTION**

The interim condition onsite basin STF2 has been referenced from the Village 22 Master Study and is consistent with Ultimate Condition. A total of 5 cfs (STF2) is generated by the proposed street and will be collected by onsite drop inlets and conveyed to Kettle Bend Road.

## **C. ULTIMATE CONDITION ANALYSIS**

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

Ultimate condition assumes that the proposed improvements and offsite areas are fully developed. Onsite drainage patterns are consistent with the referenced Village 22 Master Study. Offsite drainage patterns are consistent with the Overall Master Study. Hydrologic calculations have been included in Appendix B. Pertinent reference material is included in Appendix D.

## **1. OFFSITE DRAINAGE BASIN DESCRIPTION**

The proposed RCB within Kindle Rise is a CCRFCD facility, therefore the Overall Master Study has been referenced for flow conveyed by the facility in Ultimate Condition. The Overall Master Study states that 548-cfs of offsite tributary flow enters the storm drain from upstream in the ultimate condition, which is less than interim condition. No additional offsite flow enters the site.

## 2. ONSITE DRAINAGE BASIN DESCRIPTION

The ultimate condition onsite basin STF2 is consistent with the interim condition and has been referenced from the Village 22 Master Study.

## IV. INTERIM CHANNEL

As discussed in Section III.B of this report, a temporary channel intended to replace the channel constructed Kettle Bend Road will be constructed with this project. The channel will divert offsite flow to the proposed 6'x7' RCB in Kindle Rise Way and will allow the development of several parcels within Village 22 prior to the construction of the detention basin. A normal depth calculation for the channel is provided in Appendix C. The following table summarizes the hydraulic parameters of the interim channel.

| TABLE 3<br>INTERIM CONDITION SWALE SUMMARY TABLE    |               |       |                         |                         |                        |                    |        |                |
|-----------------------------------------------------|---------------|-------|-------------------------|-------------------------|------------------------|--------------------|--------|----------------|
| Swale                                               | Q100<br>(cfs) | Slope | Normal<br>Depth<br>(ft) | Freeboard<br>Req'd (ft) | Total<br>Depth<br>(ft) | Velocity<br>(ft/s) | Riprap | Side<br>Slopes |
| SW1 (OFF4, REF**)                                   | 662           | 1.00% | 4.65                    | 1.38                    | 6.03                   | 7.52               | 8"     | 3:1/3:1        |
| ** Referenced from Kettle Ridge Drive TDS by Atkins |               |       |                         |                         |                        |                    |        |                |

Based on the results above, the proposed offsite grading will consist of a D50=8" riprap lined trapezoidal channels. The proposed offsite channels will have a minimum of 1-foot of freeboard above the calculated water surface elevation. Riprap and freeboard calculations have been included in Appendix C.

## V. STREET FLOW

A street hydraulic analysis has been provided to determine the normal depth and velocity of the anticipated storm flows within the proposed street. No parcel flows will be discharged into Summerlin streets as surface flow. In addition, it is assumed that no surface flows will enter the proposed street in any condition.

The results of the street flow analysis are summarized in Table 6. Refer to Figure 8 for the location of the cross section used in the analysis. Street hydraulic calculations are included in Appendix C.

| TABLE 4<br>ULTIMATE CONDITION STREET FLOW ANALYSIS SUMMARY |               |       |                    |               |       |                    |
|------------------------------------------------------------|---------------|-------|--------------------|---------------|-------|--------------------|
| Street<br>Section                                          | Q100<br>(cfs) | Slope | Velocity<br>(ft/s) | Depth<br>(ft) | V x D | Tributary<br>Basin |
| ST1 MAX                                                    | 5             | 9.13% | 4.20               | 0.24          | 1.01  | STF2*              |
| ST1 MIN                                                    | 5             | 1.45% | 2.09               | 0.29          | 0.61  | STF2*              |
| *Referenced from SWPA MPU by VTN (DS# 4926)                |               |       |                    |               |       |                    |

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

## **VI. STORM DRAIN FACILITIES**

### **A. CLARK COUNTY REGIONAL FLOOD CONTROL STORM DRAIN**

The storm drain mainline proposed with this project is a CCRFCD facility and consists of a 6'x7' RCB that transitions to an 8'x8' RCB and discharges into the existing 8'x8' RCB in Kettle Bend Road. The mainline has been modeled in WSPG for both the 100-year interim and ultimate condition storm events. The model also includes the existing downstream storm drain in Kettle Bend Road extending from Kindle Rise Way to Sunset Run Drive.

The interim and ultimate condition flow rates within the proposed Kindle Rise storm drain are 662-cfs and 548-cfs, respectively. The interim condition flow rate is within the allowable 701-cfs established in the Kettle Bend Study, therefore the flow discharged by this project to Kettle Bend Road will not adversely impact downstream facilities or properties.

According to the Master Study, the existing 8'x8' RCB storm drain in Kettle Bend Road will convey up to 763 cfs in the Ultimate Condition (refer to Facility SD-F3 on Figure A.6.5), which is 215 cfs greater than the 548-cfs conveyed by the Kindle Rise storm drain SD-F2. The difference in flow between the two storm drain segments is due to incoming lateral flows in Kettle Bend Road. To simplify the modeling, the total difference of 215 cfs has been modeled at the junction immediately downstream of the Kettle Bend Road and Kindle Rise Way intersection. Because this lateral is upstream of all other incoming lateral flows, this method of modeling is considered conservative. The incoming lateral flow from the drop inlet in Kindle Rise has not been modeled because it is less than 10% of the mainline flow (2.5-cfs).

According to the Kettle Bend Study, an interim offsite flow rate of 66 cfs (Basin OFF1) will enter the storm drain in Kettle Bend by 3 lateral junctions. Similar to the method used to model the Kettle Bend storm drain in ultimate condition, the interim junction flow of 66-cfs has been added to the most upstream junction for modeling purposes.

Concrete with strength of 7000 psi as well as an additional 1-inch sacrificial concrete on the invert slab will be used for storm drain where velocities exceed 25 feet per second. This requirement is consistent with the approved methodology presented in the Village 22 Master Study. The segments of storm drain requiring the high strength and sacrificial concrete have been labeled on the plans between Station 11+22.50 and 16+07.72.

## VII. CONCLUSIONS

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

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

## REFERENCES

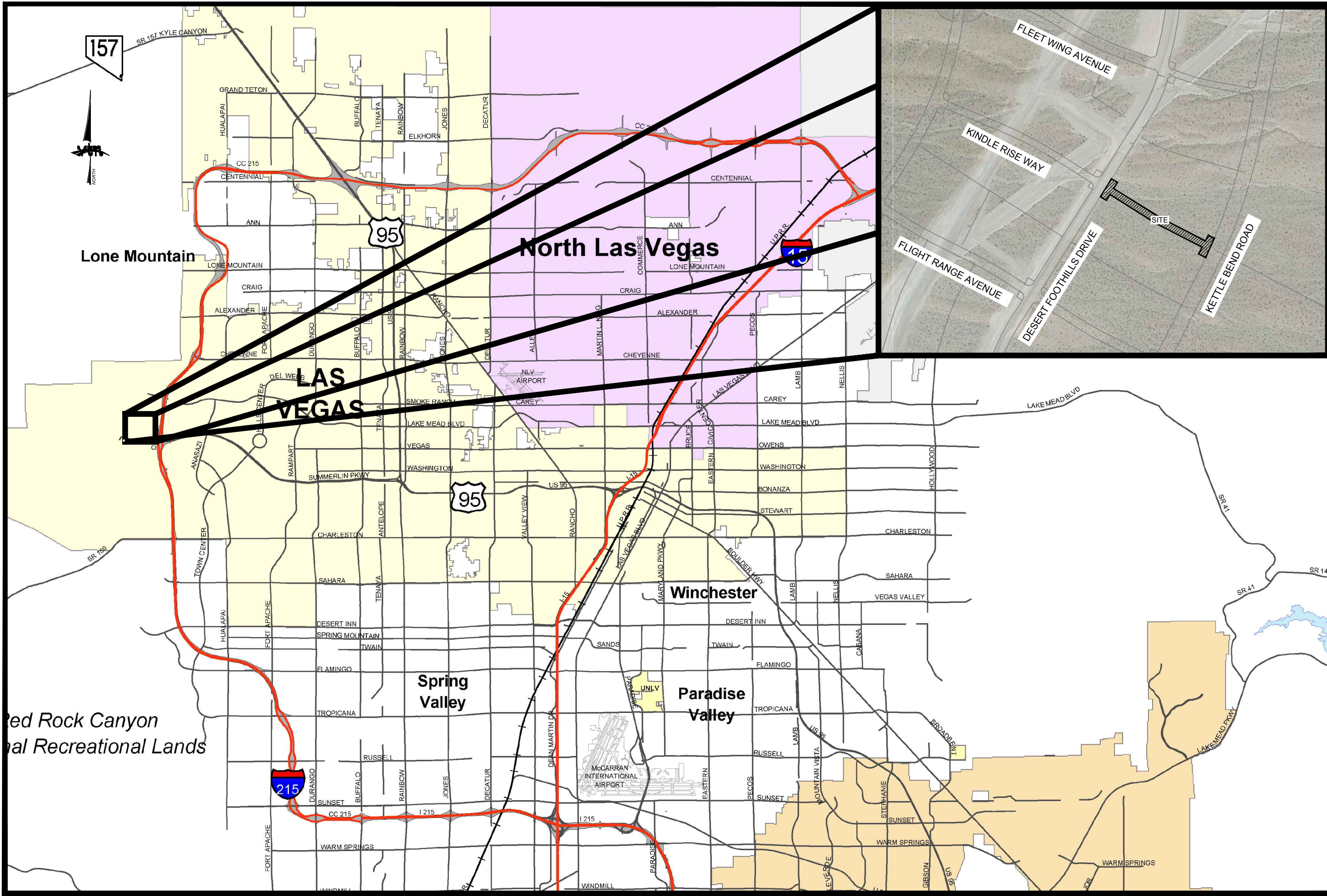
1. *Hydrologic Criteria and Drainage Design Manual*, Clark County Regional Flood Control District, 1999.
2. *CCRFCD Las Vegas Valley Flood Control Master Plan Update*, 2008 and 2013.
3. *Flood Insurance Rate Map*, Community Panel Number 32003C2545F, Clark County, Nevada and Incorporated Areas, effective date November 16, 2011, and is a digital duplication of the FIRM Map derived from the Clark County GIS database.
4. *Soil Survey of Las Vegas, Nevada, Part of Clark County*, by the United States Department of Agriculture, Soil Conservation Service.
5. *Drainage Study for Summerlin West Planning Area Master Plan Update*, approved by the City of Las Vegas (CLV) March 13, 2019 (DS4926), Update #2 submitted on October 28, 2019.
6. *Technical Drainage Study for Summerlin Parkway Extension*, submitted to CLV on July 18, 2019 (DS5159).
7. *Update #2 Master Conceptual Drainage Study for Village 22* (referred to as the Village 22 Master Study), conditionally approved by CLV on December 12, 2019 (DS5005).
8. *Technical Drainage Study for Kettle Bend Road (Sunset Run Drive to Kestrel Creek Road)*, submitted to CLV on October 15, 2019 (DS5204).



# **APPENDIX**

# **APPENDIX A**

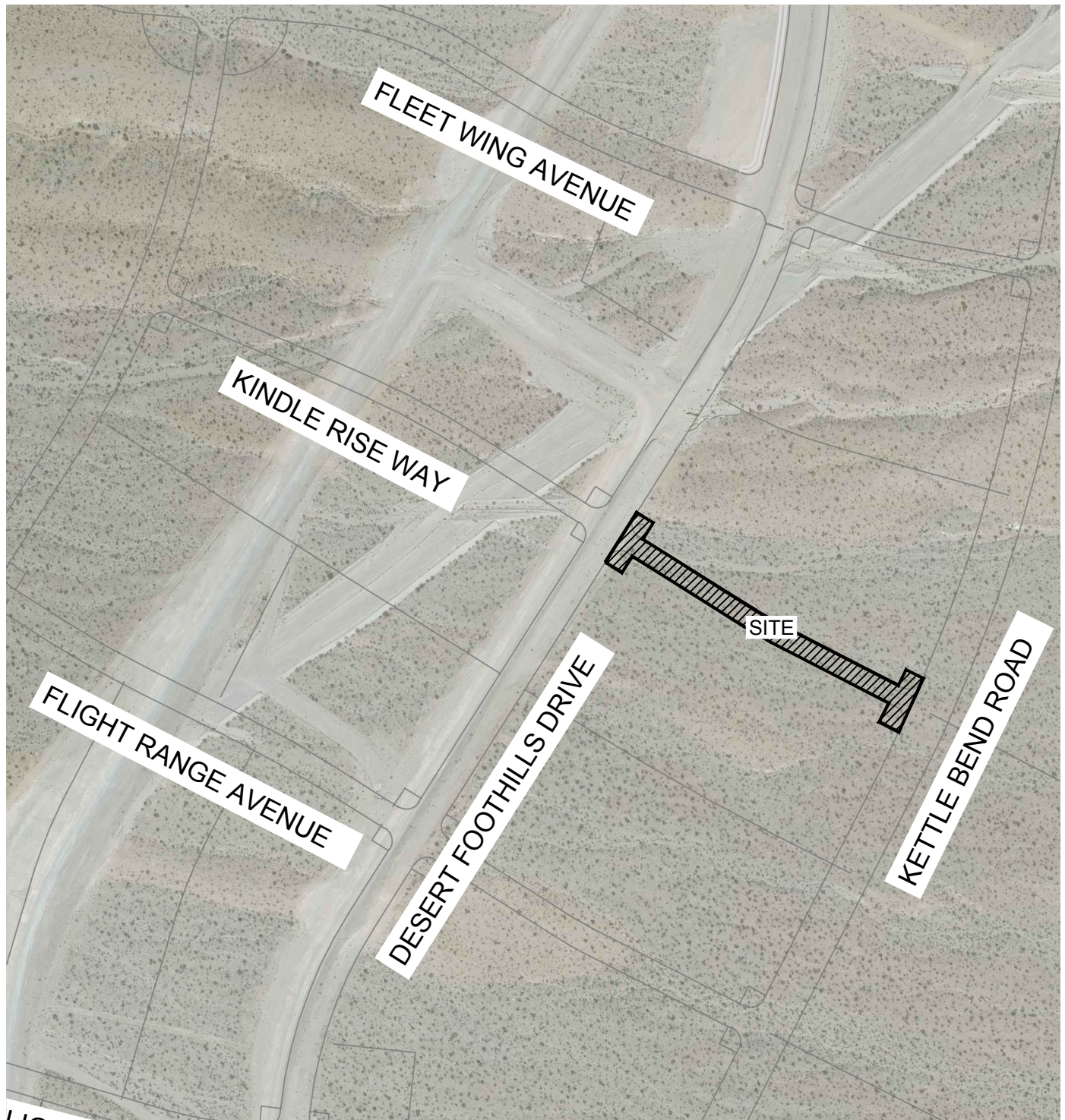
## **FIGURES**



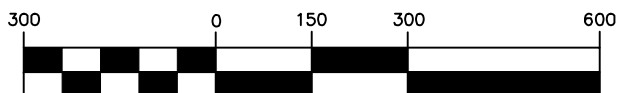
**FIGURE 1: VICINITY MAP**  
**SUMMERLIN WEST VILLAGE 22**  
**KINDLE RISE WAY**  
**(KETTLE BEND TO DESERT FOOTHILLS)**

|        |                |
|--------|----------------|
| W.O.#: | 7861- MISC- 15 |
| DATE:  | 11/21/2019     |
| BY:    | RBR            |
| SCALE: | N/A            |
| SHEET  | 1 OF 1         |





# GRAPHIC SCALE



1" = 300'



**vtm**  
 2727 SOUTH RAINBOW BOULEVARD  
 LAS VEGAS, NV 89146-5148

**SUMMERLIN WEST VILLAGE 22  
 KINDLE RISE WAY  
 (KETTLE BEND TO DESERT FOOTHILLS)**

**SITE DESCRIPTION MAP  
 FIGURE 2**

|                        |                |
|------------------------|----------------|
| SCALE                  | HORZ. 1"= 300' |
|                        | VERT. N/A      |
| W.O. NO.7861- MISC- 15 |                |
| DRAWN BY: RBR          |                |
| DATE: 11/21/2019       |                |
| SHEET 1 OF 1           |                |

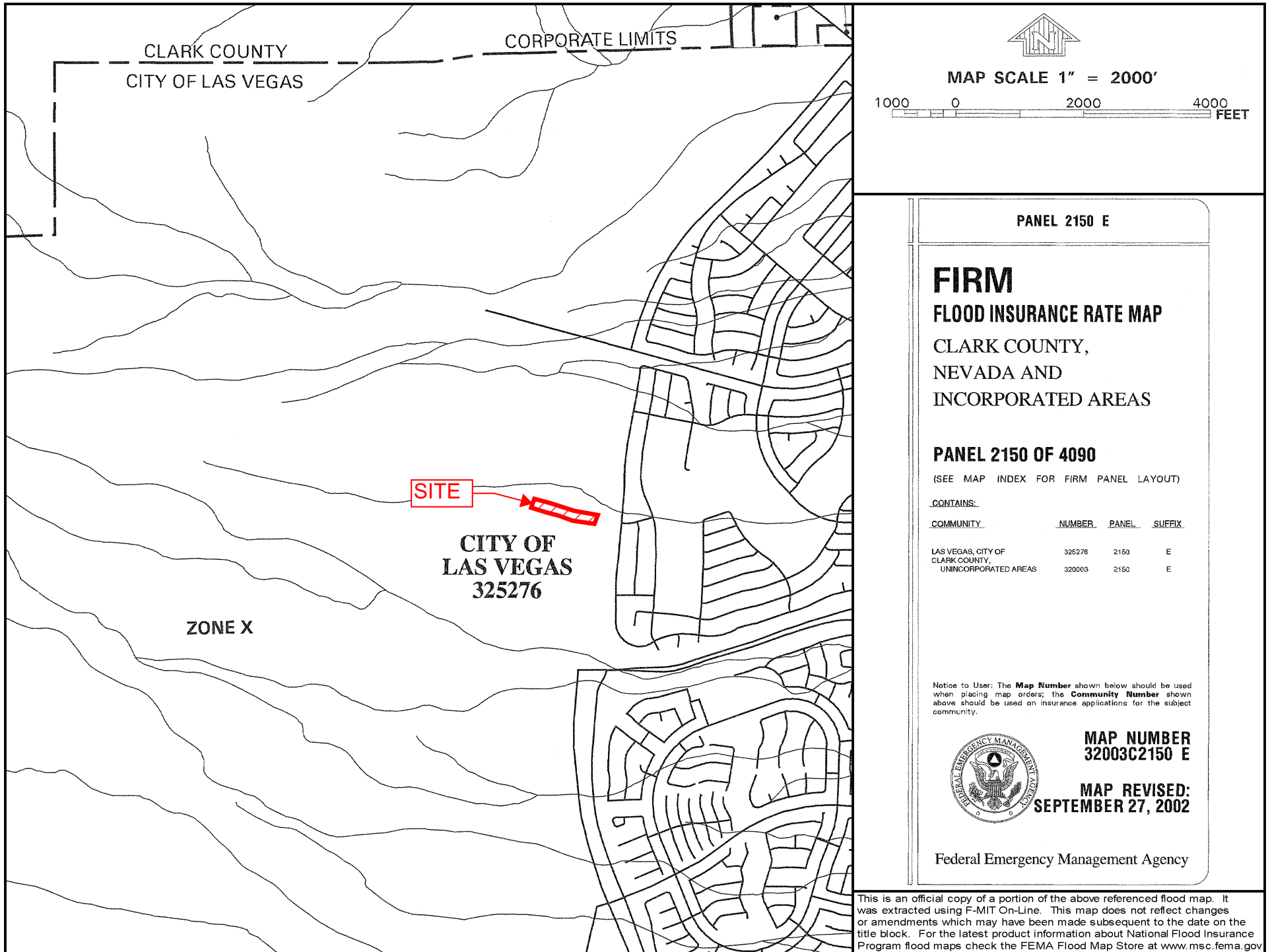


FIGURE 3



| ID / Mile | Status | Facility Description                       | Length (ft.) | Flow (cfs) | HEC-1 Node | HEC-1 Model | Tributary Area (sq.mi.) | Channel Slope (%) ** |
|-----------|--------|--------------------------------------------|--------------|------------|------------|-------------|-------------------------|----------------------|
| APAD      |        | ANGEL PARK - ALTA DRIVE BRANCH             |              |            |            |             |                         |                      |
| 0203      | E      | 2: 7' X 5.5' RCB                           | 1104         | 2200       | CSWAA-1    | GOW3A       | 6.95                    | 5.28                 |
| 0225      | E      | 2: 7' X 5.5' RCB OUTLET                    | 360          | 2137       | SUM5DB     | GOW3A       | 6.73                    | 3.40                 |
| APBE      |        | ANGEL PARK - BELTWAY BRANCH                |              |            |            |             |                         |                      |
| 0022      | E      | CONC CHNL 20"W 7'D 2:1 SS                  | 1556         | 3366       | CCSWFH15   | GOW3A       | 3.39                    | 1.81                 |
| 0051      | E      | CONC CHNL 20"W 7'D 2:1 SS                  | 1583         | 3366       | CCSWFH15   | GOW3A       | 3.39                    | 2.77                 |
| 0081      | E      | 8' X 8' RCBC @ FAR HILLS                   | 777          | 1048       | CSWFH-15   | GOW3A       | 0.59                    | 2.32                 |
| 0094      | E      | CONC CHNL 10"W 5'D 2:1 SS                  | 1465         | 1048       | CSWFH-15   | GOW3A       | 0.59                    | 1.88                 |
| 0122      | E      | CONC CHNL 10"W 4'D 2:1 SS                  | 1685         | 1048       | CSWFH-15   | GOW3A       | 0.59                    | 0.80                 |
| 0154      | P0     | 8' X 6' RCB                                | 5012         | 781        | CSWFH-12   | GOW3A       | 0.41                    | 1.30                 |
| 0249      | P0     | 6' X 5' RCB                                | 2858         | 606        | CSWFH-11   | GOW3A       | 0.31                    | 3.00                 |
| APCH      |        | ANGEL PARK - CARRIAGE HILL BRANCH          |              |            |            |             |                         |                      |
| 0000      | E      | 8' X 6' RCB                                | 152          | 399        | CSWFH-14   | GOW3A       | 0.21                    | 0.87                 |
| 0003      | P0     | 72" RCP                                    | 1685         | 399        | CSWFH-14   | GOW3A       | 0.21                    | 2.00                 |
| 0031      | P0     | 60" RCP                                    | 2008         | 206        | SWFH-13    | GOW3A       | 0.10                    | 1.38                 |
| APD2      |        | ANGEL PARK - DESERT FOOTHILLS 2 BRANCH     |              |            |            |             |                         |                      |
| 0002      | E      | 7' X 6' RCB                                | 883          | 674        | SWAA-2     | GOW3A       | 0.68                    | 1.08                 |
| APDF      |        | ANGEL PARK - DESERT FOOTHILLS BRANCH       |              |            |            |             |                         |                      |
| 0000      | P0     | 10' X 6' RCB                               | 1788         | 1428       | CSWFH-9    | GOW3B       | 0.80                    | 3.55                 |
| 0026      | P0     | 8' X 6' RCB                                | 1813         | 968        | CSWFH-8    | GOW3A       | 1.80                    | 2.00                 |
| 0073      | P0     | 6' X 4' RCB                                | 1922         | 486        | CSWFH-4    | GOW3A       | 1.52                    | 4.40                 |
| 0123      | P0     | 42" RCP                                    | 1076         | 141        | GPDB       | GOW3A       | 1.29                    | 6.00                 |
| 0125      | P0     | 130 AC-FT GRAND PARK DETENTION BASIN       |              | 1543       | CSWFH-3    | GOW3A       | 1.29                    |                      |
| 0127      | P0     | 6' X 6' RCB                                | 2977         | 853        | SWFH-1     | GOW3A       | 0.69                    | 3.80                 |
| 0128      | P0     | 5' X 4' RCB                                | 2197         | 509        | SWFH-2     | GOW3A       | 0.37                    | 5.70                 |
| APFH      |        | ANGEL PARK - FAR HILLS BRANCH              |              |            |            |             |                         |                      |
| 0000      | E      | 2: 8' X 8' RCB                             | 1070         | 2494       | CCSWFH14   | GOW3B       | 1.51                    | 3.50                 |
| 0019      | E      | 2: 8' X 8' RCB                             | 250          | 2149       | CCSWFH-9   | GOW3B       | 1.30                    | 4.19                 |
| 0024      | E      | 16' X 8' RCAP                              | 1951         | 2149       | CCSWFH-9   | GOW3B       | 1.30                    | 5.10                 |
| 0061      | E      | 8' X 6' RCB                                | 1435         | 839        | CSWFH-7    | GOW3A       | 0.50                    | 2.00                 |
| 0089      | E      | 8' X 6' RCB                                | 2946         | 839        | CSWFH-7    | GOW3A       | 0.50                    | 2.00                 |
| 0144      | P0     | 5' X 4' RCB                                | 2497         | 456        | SWFH-6     | GOW3A       | 0.28                    | 5.50                 |
| APM5      |        | DETENTION BASIN #5                         |              |            |            |             |                         |                      |
| 0000      | E      | 384 AC-FT DETENTION BASIN #5               |              | 6856       | SUM5IN     | GOW3A       | 6.73                    |                      |
| 0008      | P0     | CONC CHNL 50"W 4.5'D 2:1 SS                | 2102         | 3634       | CODB54-7   | GOW3A       | 4.13                    | 5.20                 |
| 0009      | P0     | CONC CHNL 50"W 4'D 2:1 SS                  | 4180         | 3485       | CDB55-7    | GOW3A       | 2.60                    | 5.80                 |
| 0047      | E      | DIVERSION BERM WITH GABION BANK PROTECTION | 1000         | 3634       | CODB54-7   | GOW3A       | 4.13                    | 1.30                 |
| 0056      | P0     | CONC CHNL 80"W 4'D 2:1 SS                  | 264          | 3634       | CODB54-7   | GOW3A       | 4.13                    | 1.30                 |
| 0057      | P0     | CONC CHNL 50"W 3'D 2:1 SS                  | 9922         | 1664       | CDB54-4    | GOW3A       | 0.81                    | 6.80                 |
| 0059      | P0     | CONC CHNL 100"W 3'D 2:1 SS                 | 9075         | 2606       | CDB54-7    | GOW3A       | 3.31                    | 7.00                 |
| 0212      | P0     | CONC CHNL 30"W 3'D 2:1 SS                  | 6695         | 1092       | DB55-1     | GOW3A       | 0.64                    | 7.50                 |
| 0213      | P0     | CONC CHNL 50"W 3'D 2:1 SS                  | 6522         | 1729       | CDB55-6    | GOW3A       | 1.30                    | 7.30                 |
| APSP      |        | ANGEL PARK - SUMMERLIN PARKWAY             |              |            |            |             |                         |                      |
| 0183      | E      | CONC CHNL 10"W 6'D 2:1 SS                  | 1680         | 884        | C11B-1     | GOW3A       | 0.84                    | 1.70                 |
| GOB3      |        | GOWAN LONE MOUNTAIN SYST. 3 BELTWAY        |              |            |            |             |                         |                      |
| 0000      | E      | 66" RCP                                    | 1370         | 341        | SV22-1     | GOW3A       | 0.18                    | 4.50                 |
| GOBE      |        | GOWAN LONE MOUNTAIN SYST. BELTWAY          |              |            |            |             |                         |                      |
| 0000      | E      | 20' X 10' RCBC @ ACCESS RD                 | 30           | 1044       | CSV22      | GOW3A       | 0.67                    | 5.67                 |
| 0001      | E      | CONC CHNL 20"W 5'D 2:1 SS                  | 1100         | 1044       | CSV22      | GOW3A       | 0.67                    | 6.50                 |
| 0021      | E      | CONC CHNL 11"W 6.8'D 0:1 SS                | 2143         | 1044       | CSV22      | GOW3A       | 0.67                    | 6.50                 |
| 0058      | E      | CONC CHNL 15"W 7.5'D 0:1 SS                | 487          | 1044       | CSV22      | GOW3A       | 0.67                    | 3.93                 |
| 0065      | E      | CONC CHNL 17"W 7.5'D 0:1 SS                | 844          | 1044       | CSV22      | GOW3A       | 0.67                    | 0.76                 |
| 0088      | E      | 2: 10' X 9' RCBC @ LAKE MEAD               | 400          | 782        | SV22-2     | GOW3A       | 0.49                    | 0.50                 |
| 0096      | E      | CONC CHNL 20"W 9'D 2:1 SS                  | 627          | 782        | SV22-2     | GOW3A       | 0.49                    | 0.50                 |
| 0108      | E      | CONC CHNL 20"W 6'D 2:1 SS                  | 1021         | 782        | SV22-2     | GOW3A       | 0.49                    | 0.50                 |
| 0127      | E      | CONC CHNL 20"W 6'D 2:1 SS                  | 638          | 782        | SV22-2     | GOW3A       | 0.49                    | 0.50                 |
| 0139      | E      | CONC CHNL 10"W 5.5'D 2:1 SS                | 1500         | 782        | SV22-2     | GOW3A       | 0.49                    | 1.02                 |
| GOL3      |        | GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3        |              |            |            |             |                         |                      |
| 0010      | E      | CONC CHNL 20"W 10'D 0:1 SS                 | 3037         | 3277       | CRCLMT1R   | GOW3A       | 7.31                    | 2.78                 |
| 0068      | E      | TRANSITION STRUCTURE                       | 100          | 3277       | CRCLMT1R   | GOW3A       | 7.31                    | 3.50                 |
| 0070      | E      | 20' X 6' RCBC @ CLIFF SHADOWS              | 350          | 1271       | CRCSV22    | GOW3A       | 4.99                    | 2.44                 |
| 0077      | E      | CONC CHNL 20"W 6'D 0:1 SS                  | 1229         | 1271       | CRCSV22    | GOW3A       | 4.99                    | 6.11                 |

| ID / Mile | Status | Facility Description                 | Length (ft.) | Flow (cfs) | HEC-1 Node | HEC-1 Model | Tributary Area (sq.mi.) | Channel Slope (%) ** |
|-----------|--------|--------------------------------------|--------------|------------|------------|-------------|-------------------------|----------------------|
| GOL3      |        | GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3  |              |            |            |             |                         |                      |
| 0100      | E      | CONC CHNL 20"W 10'D 0:1 SS           | 200          | 1271       | CRCSV22    | GOW3A       | 4.99                    | 5.67                 |
| 0115      | E      | 96" RCP OUTLET                       | 670          | 666        | DET26      | GOW3A       | 4.31                    | 0.29                 |
| 0128      | E      | 305 AC-FT VILLAGE 26 DETENTION BASIN |              | 3615       | VIL26IN    | GOW3A       | 4.31                    |                      |
| 0137      | E      | CONC CHNL 20"W 7.5'D 0:1 SS          | 2720         | 3615       | VIL26IN    | GOW3A       | 4.31                    | 6.50                 |
| 0188      | E      | CONC CHNL 20"W 8'D 0:1 SS            | 563          | 3615       | VIL26IN    | GOW3A       | 4.31                    | 3.91                 |
| 0197      | E      | 14' X 14" RCB                        | 880          | 3615       | VIL26IN    | GOW3A       | 4.31                    | 0.88                 |
| 0214      | E      | Dual 10' X 14" RCB                   | 124          | 3615       | VIL26IN    | GOW3A       | 4.31                    | 0.57                 |
| 0216      | P0     | CONC CHNL 50"W 4'D 2:1 SS            | 4060         | 3524       | CSV26-1    | GOW3A       | 4.02                    | 6.08                 |
| 0289      | P0     | CONC CHNL 50"W 3.5'D 2:1 SS          | 6215         | 2281       | 30         | GOW3A       | 2.44                    | 7.95                 |
| 0290      | E      | NATURAL WASH 363"W                   | 4850         | 1410       | SV26-1     | GOW3A       | 1.59                    | 22.50                |
| 0370      | E      | NATURAL WASH 450"W                   | 7000         | 2281       | 30         | GOW3A       | 2.44                    | 8.50                 |
| GOL4      |        | GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4  |              |            |            |             |                         |                      |
| 0000      | E      | 14' X 8" RCB                         | 554          | 2243       | CLMT1R     | GOW3A       | 2.33                    | 2.50                 |
| 0010      | E      | 2: 9' X 8" RCB                       | 820          | 2243       | CLMT1R     | GOW3A       | 2.33                    | 4.74                 |
| 0025      | E      | SOIL CEMENT CHNL 60"W 8'D 3-4:1 SS   | 320          | 2243       | CLMT1R     | GOW3A       | 2.33                    | 2.00                 |
| 0026      | E      | SOIL CEMENT CHNL 42"W 8'D 3-4:1 SS   | 700          | 2243       | CLMT1R     | GOW3A       | 2.33                    | 1.00                 |

\*The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.

\*\*As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.

^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e. HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).



2018 LAS VEGAS VALLEY  
FLOOD CONTROL  
MASTER PLAN UPDATE

FACILITY INVENTORY  
FIGURE F-22

| L<br>E<br>G<br>E<br>N<br>D | ID (Facility Identifier)                                | AABB |      |                                    |    |                      |    | Construction Features                               |       |                                       |      |
|----------------------------|---------------------------------------------------------|------|------|------------------------------------|----|----------------------|----|-----------------------------------------------------|-------|---------------------------------------|------|
|                            | Parent Stream Name                                      |      |      | Existing Facility.....             | E  | Bottom Width.....    | W  | Cast in Place Concrete Pipe.....                    | CIPCP | Reinforced Concrete Arch Culvert..... | RCAC |
|                            | Stream Name                                             |      |      | Proposed or Modified Facility..... | P  | Depth.....           | D  | Corrugated Metal Arch Pipe Culvert.....             | CMAP  | Reinforced Concrete Box.....          | RCB  |
|                            | Mile                                                    |      | 0000 | Contingency Level                  |    | Side Slope, H:V..... | SS | Corrugated Metal Pipe Culvert.....                  | CMPC  | Reinforced Concrete Box Culvert.....  | RCBC |
|                            | Distance Above Confluence<br>with Parent Stream (Miles) |      |      | Category A.....                    | P  |                      |    | High Density Polyethylene.....                      | HDPE  | Reinforced Concrete Pipe.....         | RCP  |
|                            | Miles in Hundredths                                     |      |      | Category B.....                    | P0 |                      |    | Horizontal Elliptical Reinforced Concrete Pipe..... | HERCP | Reinforced Concrete Pipe Culvert..... | RCPC |
|                            |                                                         |      |      |                                    |    |                      |    | Reinforced Concrete Arch Pipe.....                  | RCAP  | Storm Sewer Pipe.....                 | SSP  |







2018  
LAS VEGAS VALLEY  
FLOOD CONTROL  
MASTER PLAN UPDATE

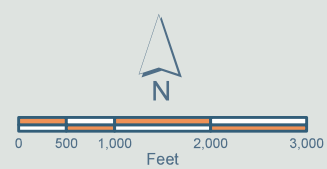
FIGURE F-22  
FLOOD CONTROL FACILITIES

LEGEND

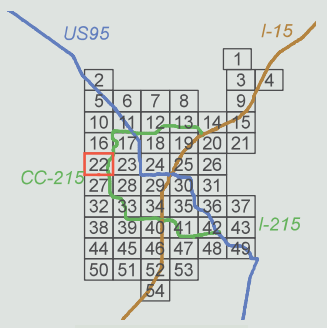
- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Detention Basin
- Culvert or Bridge Crossing
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

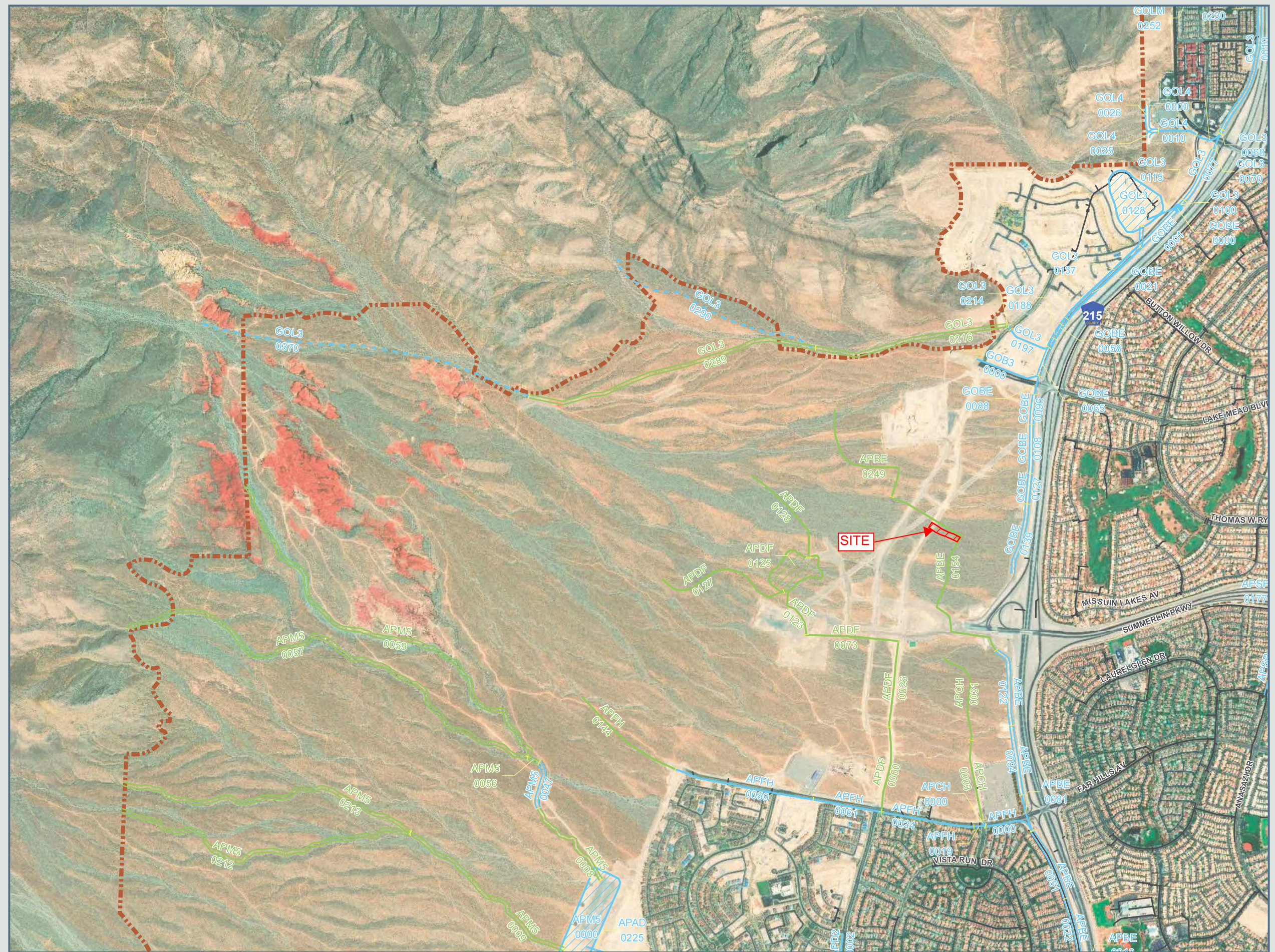
- | Category A | Category B |
|------------|------------|
| Channel    | Channel    |
| Stormdrain | Stormdrain |
| Crossing   | Crossing   |



Scale: 1 inch = 2,000 feet  
AerialSource: Esri World Imagery 2017



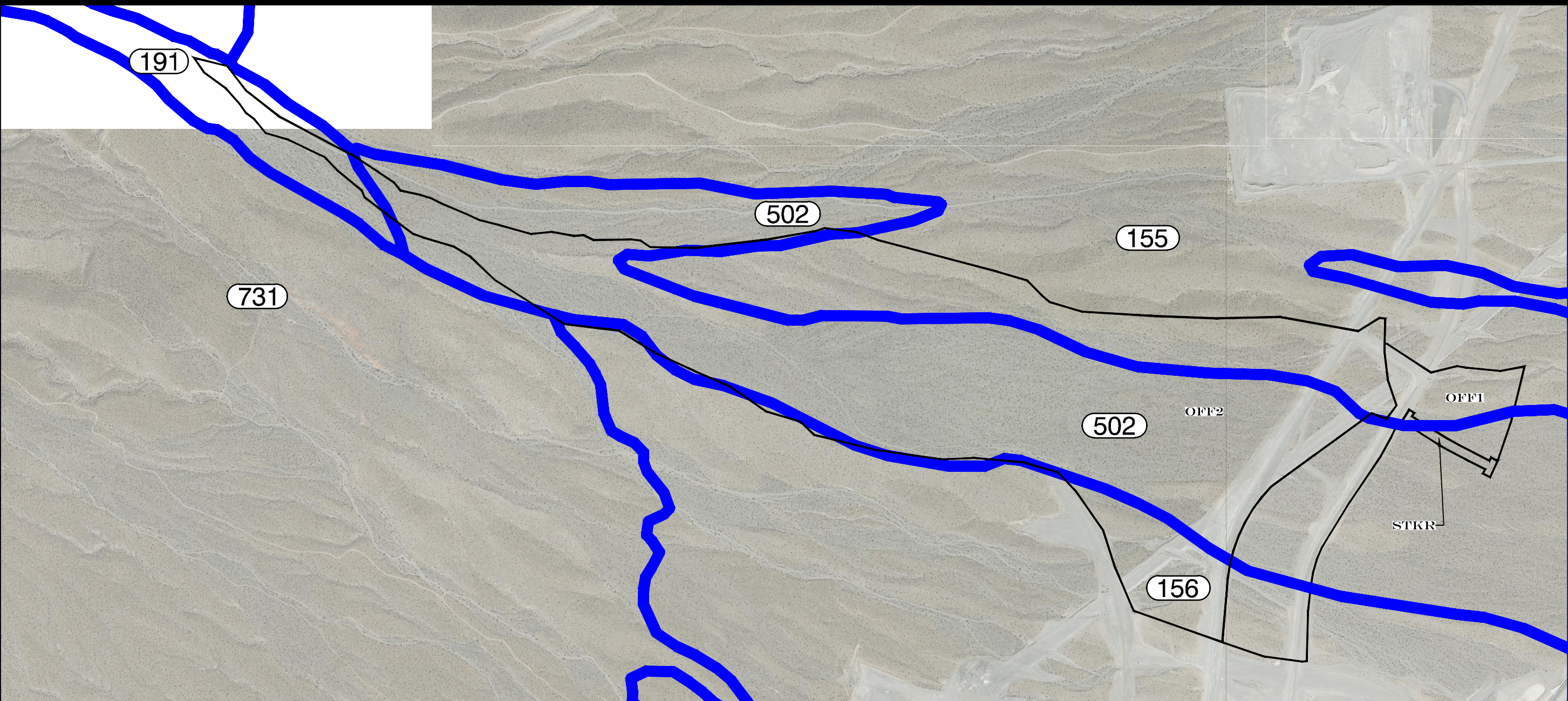
ATKINS  
Member of the SNC-Lavalin Group











LEGEND

-  SITE BOUNDARY
- 300** SOIL NUMBER
-  SOIL BOUNDARY

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

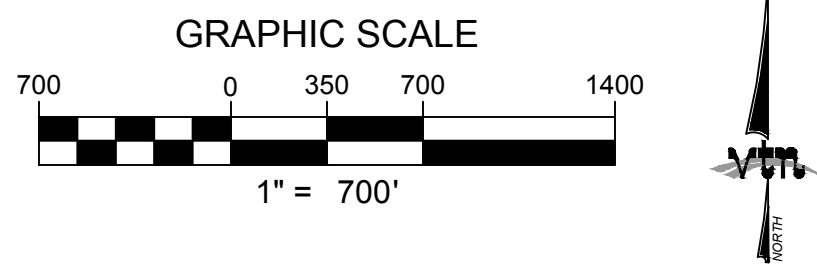
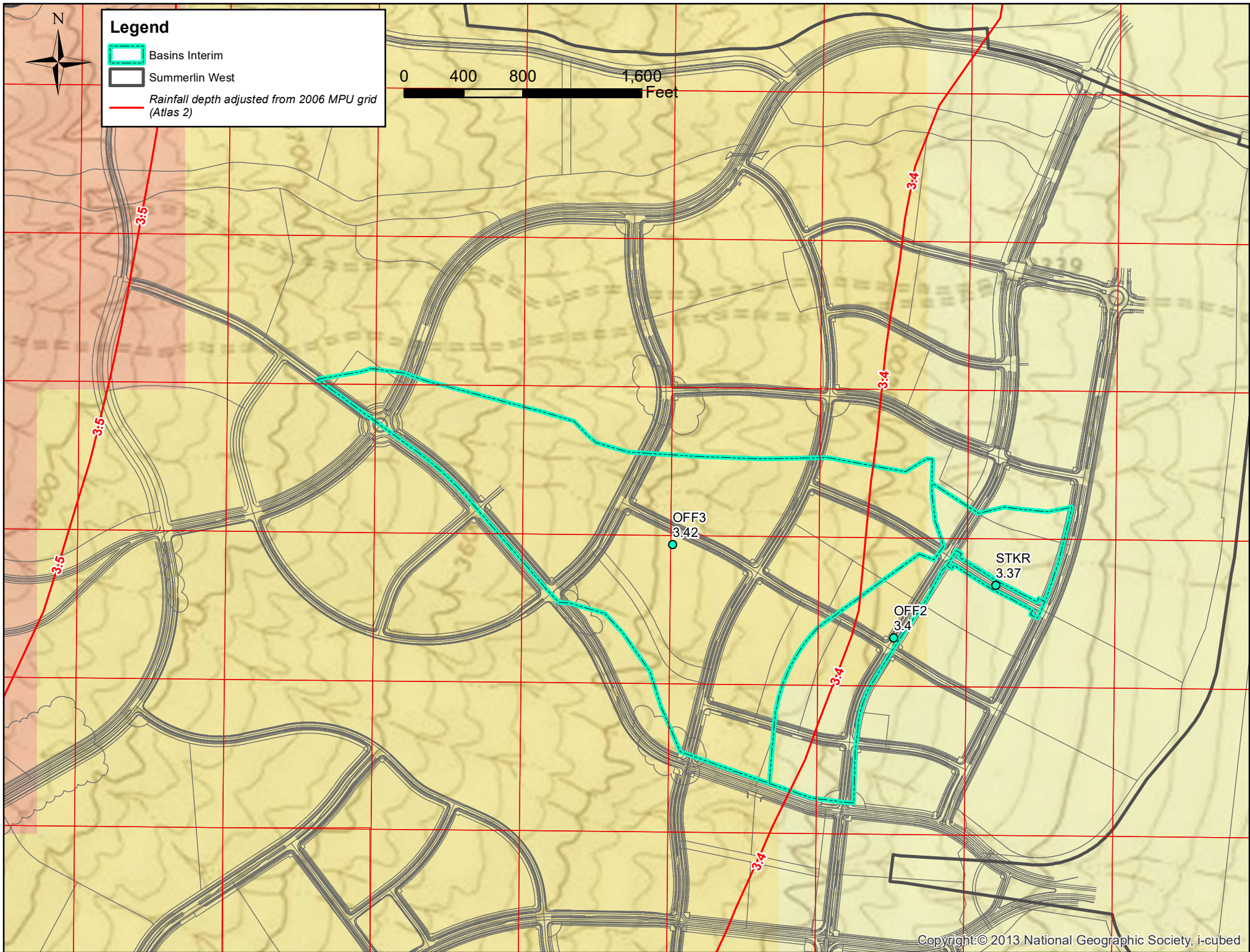


FIGURE 5: INTERIM CONDITION SOIL MAP  
KINDLE RISE WAY  
(KETTLE BEND TO DESERT FOOTHILLS)

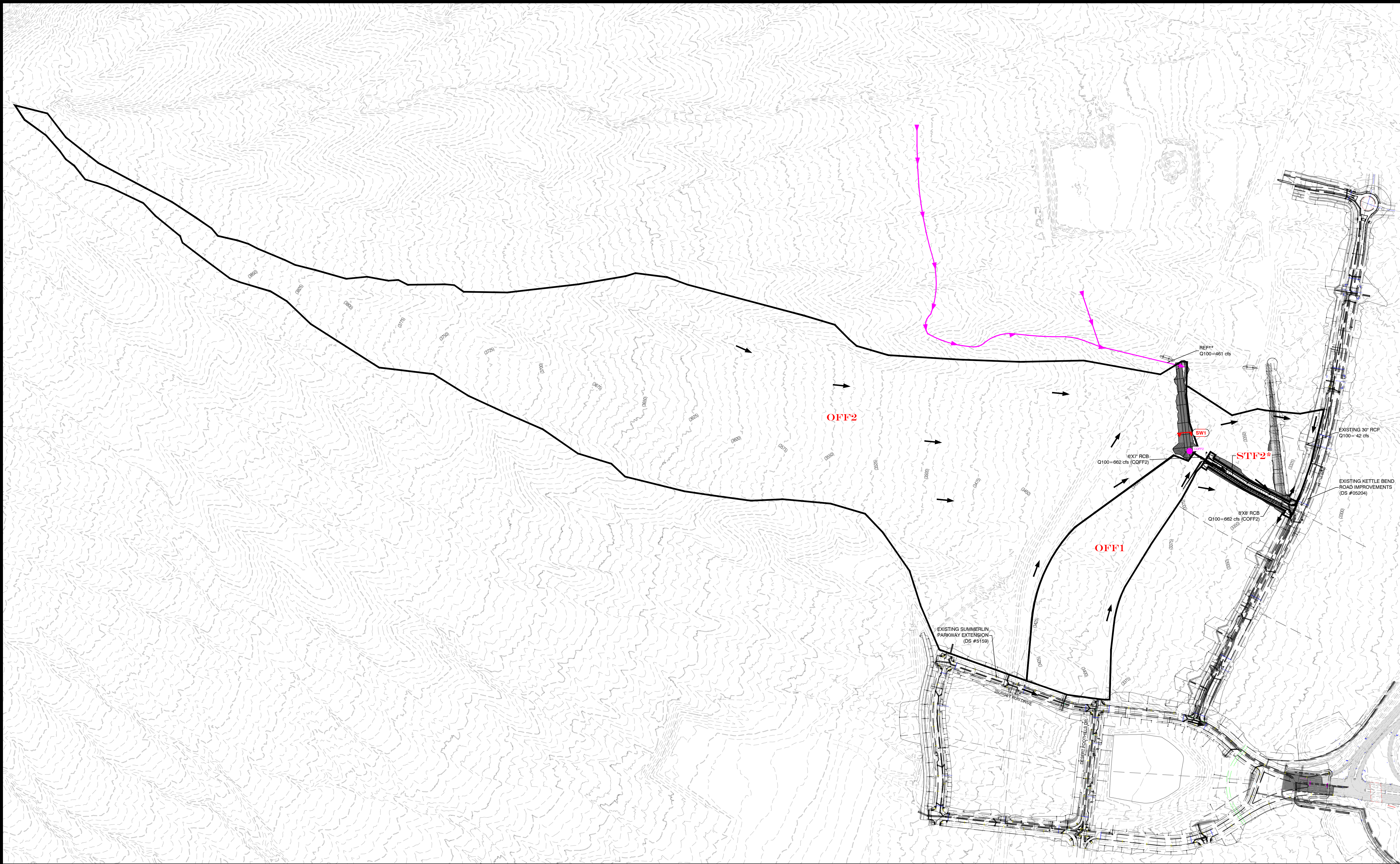
|        |              |
|--------|--------------|
| W.O.#: | 7861-MISC-15 |
| DATE:  | JANUARY 2020 |
| BY:    |              |
| SCALE: | 1"=700'      |
| SHEET  | 1 OF 1       |

H:\7861\Kindle Rise Way - Kettle Bend to Desert Foothills\Drainage\A Figures\Figure 5 - Soil Map.dwg;rachair, Jan 31, 2020 - 9:02am



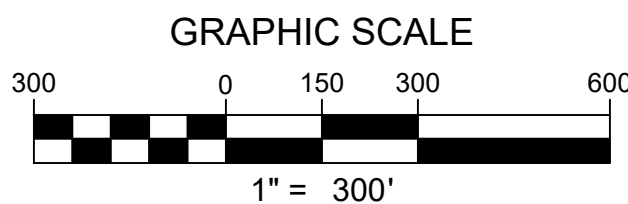






LEGEND

- BASIN BOUNDARY
- BASIN DESIGNATION
- FLOW ARROW
- FLOW CONCENTRATION POINT
- ATKINS INTERIM FLOWLINE
- CROSS SECTION DESIGNATION



| INTERIM CONDITION 1 HEC-1 SUMMARY TABLE             |           |            |
|-----------------------------------------------------|-----------|------------|
| BASIN ID (CONTRIBUTING BASINS)                      | AREA (ac) | Q100 (CFS) |
| OFF1                                                | 29.37     | 42         |
| STF2*                                               | 1.21      | 5          |
| OFF2                                                | 170.46    | 201        |
| REF**                                               | -         | 461        |
| COFF2 (OFF2+ REF**)                                 | -         | 662        |
| *Referenced from V22 MCDs by VTN (DS# 5005)         |           |            |
| ** Referenced from Kettle Ridge Drive TDS by Atkins |           |            |

| INTERIM CONDITION SWALE SUMMARY TABLE               |            |       |                   |                      |                  |                 |        |             |
|-----------------------------------------------------|------------|-------|-------------------|----------------------|------------------|-----------------|--------|-------------|
| Swale                                               | Q100 (cfs) | Slope | Normal Depth (ft) | Freeboard Req'd (ft) | Total Depth (ft) | Velocity (ft/s) | Riprap | Side Slopes |
| SW1 (OFF4, REF**)                                   | 662        | 1.00% | 4.65              | 1.38                 | 6.03             | 7.52            | 8"     | 3:1/3:1     |
| ** Referenced from Kettle Ridge Drive TDS by Atkins |            |       |                   |                      |                  |                 |        |             |

DRAWN BY:  
RBR

DESIGNED BY:  
JVA

CHECKED BY:

PROJECT NO:  
7881-MISC-15

12/30/2019

12/30/2019

SCALE: 1" = 300' HORIZ.  
N/A VERT.

HOWARD HUGHES COMPANY, LLC  
10845 GRIFFITH PEAK DRIVE, SUITE 180  
LAS VEGAS, NEVADA 89135  
702.791-4000

**FIGURE 7- INTERIM CONDITION BASIN MAP**  
**SUMMERLIN WEST VILLAGE 22**  
**KINDLE RISE WAY (KETTLE BEND**  
**TO DESERT FOOTHILLS)**

SHEET  
**FIG 7**  
1 OF 1 SHEETS  
DRAWING NO.

REVISION  
DATE  
BY

2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5148  
PH: (702) 873-7550 FAX: (702) 382-2587 WEB: WWW.VTNNV.COM  
CONSULTING ENGINEERS & PLANNERS • LAND SURVEYORS

F:\7881\Kindle Rise Way - Kettle Bend to Desert Foothills\Drawings\A Figures\Figure 7- Interim Condition Map.dwg, Feb 04, 2020





# **APPENDIX B**

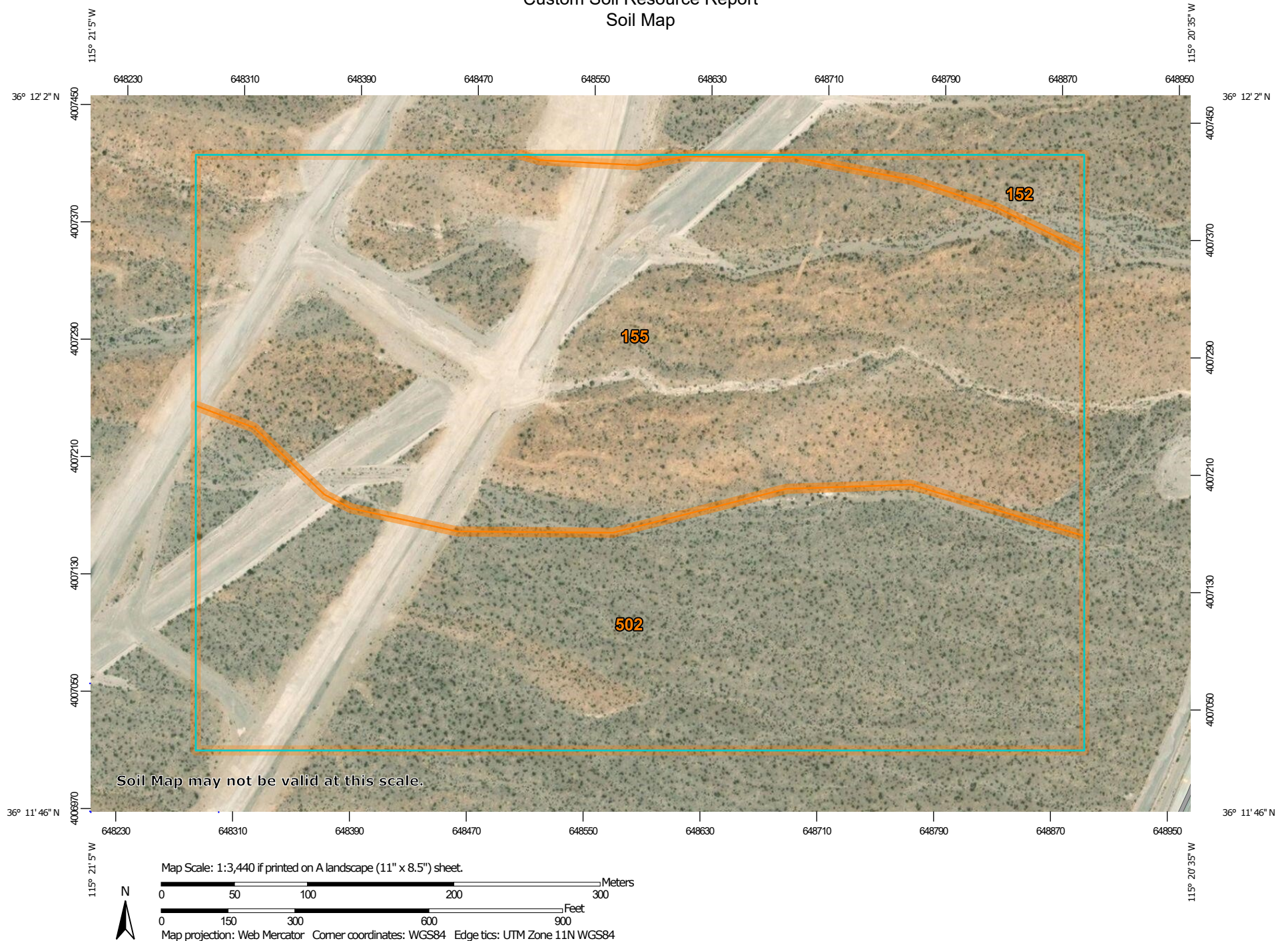
## **HYDROLOGIC**

## **CALCULATIONS**



## **SOIL INFORMATION**

# Custom Soil Resource Report Soil Map





# Custom Soil Resource Report

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

### Water Features

 Streams and Canals

### Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

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

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

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

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

## MAP LEGEND

## MAP INFORMATION

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



## Map Unit Legend

| Map Unit Symbol                    | Map Unit Name                                                       | Acres in AOI | Percent of AOI |
|------------------------------------|---------------------------------------------------------------------|--------------|----------------|
| 152                                | Cave gravelly fine sandy loam,<br>0 to 4 percent slopes             | 1.5          | 2.4%           |
| 155                                | Cave gravelly fine sandy loam,<br>4 to 15 percent slopes            | 34.2         | 55.8%          |
| 502                                | Canutio-Cave gravelly fine<br>sandy loams, 2 to 8 percent<br>slopes | 25.6         | 41.8%          |
| <b>Totals for Area of Interest</b> |                                                                     | <b>61.3</b>  | <b>100.0%</b>  |

## Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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



## Las Vegas Valley Area, Nevada, Part of Clark County

### 152—Cave gravelly fine sandy loam, 0 to 4 percent slopes

#### Map Unit Setting

*National map unit symbol:* hr9v  
*Elevation:* 2,000 to 4,800 feet  
*Mean annual precipitation:* 4 to 12 inches  
*Mean annual air temperature:* 57 to 70 degrees F  
*Frost-free period:* 180 to 280 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Cave and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Cave

##### Setting

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

##### Typical profile

*H1 - 0 to 12 inches:* gravelly fine sandy loam  
*H2 - 12 to 36 inches:* indurated  
*H3 - 36 to 60 inches:* very gravelly sandy loam

##### Properties and qualities

*Slope:* 0 to 4 percent  
*Depth to restrictive feature:* 4 to 20 inches to petrocalcic  
*Natural drainage class:* Well drained  
*Runoff class:* Very high  
*Capacity of the most limiting layer to transmit water (Ksat):* Very low (0.00 to 0.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 40 percent  
*Gypsum, maximum in profile:* 5 percent  
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 12.0  
*Available water storage in profile:* Very low (about 1.2 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7s  
*Hydrologic Soil Group:* D  
*Other vegetative classification:* LIMY 3-5" P.Z. (030XB019NV\_3)  
*Hydric soil rating:* No

## **155—Cave gravelly fine sandy loam, 4 to 15 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* hr9w  
*Elevation:* 2,000 to 4,800 feet  
*Mean annual precipitation:* 4 to 12 inches  
*Mean annual air temperature:* 57 to 70 degrees F  
*Frost-free period:* 180 to 280 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Cave and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Cave**

#### **Setting**

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

#### **Typical profile**

*H1 - 0 to 15 inches:* gravelly fine sandy loam  
*H2 - 15 to 60 inches:* indurated

#### **Properties and qualities**

*Slope:* 4 to 15 percent  
*Depth to restrictive feature:* 4 to 20 inches to petrocalcic  
*Natural drainage class:* Well drained  
*Runoff class:* Very high  
*Capacity of the most limiting layer to transmit water (Ksat):* Very low (0.00 to 0.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 40 percent  
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)  
*Available water storage in profile:* Very low (about 1.5 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7s  
*Hydrologic Soil Group:* D  
*Other vegetative classification:* LIMY 3-5" P.Z. (030XB019NV\_3)  
*Hydric soil rating:* No



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

### Map Unit Setting

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

### Map Unit Composition

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

### Description of Canutio

#### Setting

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

#### Typical profile

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

#### Properties and qualities

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

#### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 7c  
*Hydrologic Soil Group:* A  
*Other vegetative classification:* LIMY 3-5" P.Z. (030XB019NV\_3)  
*Hydric soil rating:* No

## Description of Cave

### Setting

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

### Typical profile

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

### Properties and qualities

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

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7s  
*Hydrologic Soil Group:* D  
*Other vegetative classification:* LIMY 3-5" P.Z. (030XB019NV\_3)  
*Hydric soil rating:* No

## Minor Components

### Arizo

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

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- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>



## Custom Soil Resource Report

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United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

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## RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS<sup>1</sup>)

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

<sup>1</sup>Average runoff condition, and  $I_a = 0.2S$ .

<sup>2</sup>Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: >70% ground cover.

<sup>3</sup>Curve numbers for group A have been developed only for desert shrub.

| Revision | Date |
|----------|------|
|          |      |
|          |      |
|          |      |
|          |      |

## RUNOFF CURVE NUMBERS (URBAN AREAS<sup>1</sup>)

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

**See Table 602A**

### *Developing urban areas*

|                                                                            |    |    |    |    |
|----------------------------------------------------------------------------|----|----|----|----|
| Newly graded areas (pervious areas only, no vegetation) <sup>5</sup> ..... | 77 | 86 | 91 | 94 |
|----------------------------------------------------------------------------|----|----|----|----|

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

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

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

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

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

| Revision | Date |
|----------|------|
|          |      |
|          |      |
|          |      |
|          |      |



## CURVE NUMBERS FOR SOILS

| Soil # 155- Cave gravelly fine sandy loam, 4 to 15 percent slopes |             |       |                       |                         |
|-------------------------------------------------------------------|-------------|-------|-----------------------|-------------------------|
| Soil                                                              | Percent     | Group | Existing <sub>1</sub> | Impervious <sub>2</sub> |
| Cave                                                              | 100%        | D     | 88                    | 98                      |
| <b>Total</b>                                                      | <b>100%</b> |       | <b>88</b>             | <b>98</b>               |

| Soil # 156 Vace - Wechech association |             |       |                       |                         |
|---------------------------------------|-------------|-------|-----------------------|-------------------------|
| Soil                                  | Percent     | Group | Existing <sub>1</sub> | Impervious <sub>2</sub> |
| Vace and Similar                      | 45%         | D     | 88                    | 98                      |
| Wechech and Similar                   | 25%         | D     | 88                    | 98                      |
| Wechech, steep, and similar           | 15%         | D     | 88                    | 98                      |
| Weiser                                | 8%          | B     | 77                    | 98                      |
| Irongold                              | 4%          | D     | 88                    | 98                      |
| Commski                               | 2%          | B     | 77                    | 98                      |
| Threelakes                            | 1%          | A     | 63                    | 98                      |
| <b>Total</b>                          | <b>100%</b> |       | <b>87</b>             | <b>98</b>               |

| Soil # 191- Dalian very cobbly fine sandy loam, 2 to 8 percent slopes |             |       |                       |                         |
|-----------------------------------------------------------------------|-------------|-------|-----------------------|-------------------------|
| Soil                                                                  | Percent     | Group | Existing <sub>1</sub> | Impervious <sub>2</sub> |
| Dalian                                                                | 100%        | A     | 63                    | 98                      |
| <b>Total</b>                                                          | <b>100%</b> |       | <b>63</b>             | <b>98</b>               |

| Soil #502 Canutio- Cave gravelly fine sandy loams, 2 to 8 percent slopes |             |       |                       |                         |
|--------------------------------------------------------------------------|-------------|-------|-----------------------|-------------------------|
| Soil                                                                     | Percent     | Group | Existing <sub>1</sub> | Impervious <sub>2</sub> |
| Canutio                                                                  | 55%         | A     | 63                    | 98                      |
| Cave                                                                     | 40%         | D     | 88                    | 98                      |
| Arizo                                                                    | 5%          | A     | 63                    | 98                      |
| <b>Total</b>                                                             | <b>100%</b> |       | <b>73</b>             | <b>98</b>               |

Notes:

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

## Curve Number Calculations for Basins

| Basin              | Type | Soil | Existing <sub>1</sub> | Impervious <sub>2</sub> | CN Value |
|--------------------|------|------|-----------------------|-------------------------|----------|
| UNDEVELOPED BASINS |      |      |                       |                         |          |
| OFF1               | 155  | 33%  | 100%                  |                         | 75.7     |
|                    | 156  | 23%  | 100%                  |                         |          |
|                    | 502  | 44%  | 100%                  |                         |          |
| OFF2               | 155  | 27%  | 100%                  |                         | 78.1     |
|                    | 156  | 9%   | 100%                  |                         |          |
|                    | 191  | 2%   | 100%                  |                         |          |
|                    | 502  | 62%  | 100%                  |                         |          |

## **LAG TIME CALCULATIONS**

# TRAVEL TIME CALCULATIONS

DEVELOPMENT: **Kindle Rise Way**

W.O. # **7861-MISC-15**

CALCULATED BY: **RBR**

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

|                                                     |         |                  |         |
|-----------------------------------------------------|---------|------------------|---------|
| C1 applies to the first 500 feet of travel distance |         |                  |         |
| C2 applies to the remaining travel distance         |         |                  |         |
| <b>Non-urban</b>                                    |         | <b>Urbanized</b> |         |
| C1=14.8                                             | C2=29.4 | C1=20.2          | C2=30.6 |

|                    |                |                   |                  |                  | First 500 feet |             | Remaining Travel Distance |             |
|--------------------|----------------|-------------------|------------------|------------------|----------------|-------------|---------------------------|-------------|
| Basin              | Length<br>(ft) | High Elev<br>(ft) | Low Elev<br>(ft) | Slope<br>(ft/ft) | C1             | V1<br>(fps) | C2                        | V2<br>(fps) |
| UNDEVELOPED BASINS |                |                   |                  |                  |                |             |                           |             |
| OFF1               | 2980           | 3396              | 3324             | 0.024            | 14.8           | 2.3         | 29.4                      | 4.6         |
| OFF2               | 9960           | 3956              | 3375             | 0.058            | 14.8           | 3.6         | 29.4                      | 7.1         |



# STANDARD FORM 4

DEVELOPMENT: Kindle Rise Way

CONDITION: Interim

W.O. # 7861-MISC-15

CALCULATED BY: RBR

|                                                                                                    |                                           |
|----------------------------------------------------------------------------------------------------|-------------------------------------------|
| V1 applies to the first 500 feet of travel distance<br>V2 applies to the remaining travel distance |                                           |
|                                                                                                    |                                           |
| <b>Non-Urban:</b>                                                                                  | <b>Urban</b>                              |
| $V1 = 148 * S^{1/2}$ $V2 = 294 * S^{1/2}$                                                          | $V1 = 202 * S^{1/2}$ $V2 = 306 * S^{1/2}$ |

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

$$T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39$$

$$T_c = T_i + T_t$$

| SUB-BASIN DATA     |      |       |          |           | INITIAL/OVERLAND TIME (Ti) |         |         | TRAVEL TIME (Tt) |         |             |             |              | Tc CHECK (URBANIZED BASINS) |              | FINAL Tc | LAG TIME | REMARKS |
|--------------------|------|-------|----------|-----------|----------------------------|---------|---------|------------------|---------|-------------|-------------|--------------|-----------------------------|--------------|----------|----------|---------|
| DESIG.             | Cn   | K     | AREA Ac. | AREA Mi^2 | LENGTH Ft                  | SLOPE % | Ti Min. | LENGTH Ft        | SLOPE % | V1 fps (9a) | V2 fps (9b) | Tt Min. (10) | TOTAL LENGTH (11)           | Tc Min. (12) | Min.     | TLAG Hr. |         |
| (1)                | (2)  | (3)   | (4)      | (5)       | (6)                        | (7)     | (8)     | (9)              | (10)    | (11)        | (12)        | (13)         | (14)                        | (15)         | (16)     | (17)     |         |
| UNDEVELOPED BASINS |      |       |          |           |                            |         |         |                  |         |             |             |              |                             |              |          |          |         |
| OFF1               | 75.7 | 0.609 | 29.37    | 0.0459    | 494                        | 6.1     | 10.75   | 2980             | 2.4     | 2.3         | 4.6         | 12.67        | 3474                        | 29.30        | 23.42    | 0.234    |         |
| OFF2               | 78.1 | 0.641 | 170.46   | 0.2663    | 500                        | 1.2     | 17.30   | 9960             | 5.8     | 3.6         | 7.1         | 24.54        | 10460                       | 68.11        | 41.84    | 0.418    |         |

**INTERIM CONDITION  
HEC-1 ANALYSIS**

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 03FEB20 TIME 11:02:14 *
*
*****

```

```

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

```

```

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

```

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

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

1 HEC-1 INPUT PAGE 1

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

\*DIAGRAM

\*\*\* FREE \*\*\*

```

1 ID INTERIM CONDITION HYDROLOGIC MODEL
2 ID INPUT FILE DATE = DECEMBER 18, 2019
3 ID DESIGN STORM = 100-YEAR 6-HR STORM
4 ID STORM DISTRIBUTION = SDN #3
5 ID MODELED BY VTN (RBR)
6 ID
7 ID *****
8 ID * SUMMERLIN WEST VILLAGE 22 *
9 ID * KINDLE RISE WAY *
10 ID *****
11 ID
12 ID
13 ID
14 ID 10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
15 IT 5 0 0 300
16 IN 5 0 0
17 IO 5 0 0
18 JR PREC 1.00
*

```

```

19 KK OFF1
20 KM OFFSITE BASIN
21 BA 0.0459
22 PB 3.37
23 PC 0 0.02 0.057 0.07 0.087 0.108 0.124 0.13 0.13 0.130
24 PC 0.13 0.13 0.13 0.133 0.14 0.142 0.148 0.158 0.172 0.181
25 PC 0.19 0.197 0.199 0.2 0.201 0.204 0.214 0.229 0.241 0.249
26 PC 0.251 0.256 0.27 0.278 0.281 0.283 0.295 0.322 0.352 0.409
27 PC 0.499 0.59 0.71 0.744 0.781 0.812 0.819 0.835 0.851 0.856
28 PC 0.86 0.868 0.876 0.888 0.91 0.926 0.937 0.95 0.97 0.976
29 PC 0.982 0.985 0.987 0.989 0.99 0.993 0.993 0.994 0.995 0.998
30 PC 0.998 0.999 1
31 LS 0 75.7
32 UD 0.234
*

```

```

33 KK OFF2
34 KM OFFSITE BASIN
35 BA 0.2663
36 PB 3.34
37 LS 0 78.1
38 UD 0.418
39 ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

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

19 OFF1

```



33 . OFF2

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

1\*\*\*\*\*  
\*  
\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \*  
\* JUN 1998 \*  
\* VERSION 4.1 \*  
\* RUN DATE 03FEB20 TIME 11:02:14 \*  
\*  
\*\*\*\*\*

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

INTERIM CONDITION HYDROLOGIC MODEL  
INPUT FILE DATE = DECEMBER 18, 2019  
DESIGN STORM = 100-YEAR 6-HR STORM  
STORM DISTRIBUTION = SDN #3  
MODELED BY VTN (RBR)

\*\*\*\*\*  
\* SUMMERLIN WEST VILLAGE 22 \*  
\* KINDLE RISE WAY \*  
\*\*\*\*\*

10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

17 IO OUTPUT CONTROL VARIABLES  
IPRNT 5 PRINT CONTROL  
IPL0T 0 PLOT CONTROL  
QSCAL 0. HYDROGRAPH PLOT SCALE  
  
IT HYDROGRAPH TIME DATA  
NMIN 5 MINUTES IN COMPUTATION INTERVAL  
IDATE 1 0 STARTING DATE  
ITIME 0000 STARTING TIME  
NQ 300 NUMBER OF HYDROGRAPH ORDINATES  
NDDATE 2 0 ENDING DATE  
NDTIME 0055 ENDING TIME  
ICENT 19 CENTURY MARK  
  
COMPUTATION INTERVAL .08 HOURS  
TOTAL TIME BASE 24.92 HOURS  
  
ENGLISH UNITS  
DRAINAGE AREA SQUARE MILES  
PRECIPITATION DEPTH INCHES  
LENGTH, ELEVATION FEET  
FLOW CUBIC FEET PER SECOND  
STORAGE VOLUME ACRE- FEET  
SURFACE AREA ACRES  
TEMPERATURE DEGREES FAHRENHEIT  
  
JP MULTI-PLAN OPTION  
NPLAN 1 NUMBER OF PLANS  
  
JR MULTI-RATIO OPTION  
RATIOS OF PRECIPITATION  
1.00

1

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

| OPERATION     | STATION | AREA | PLAN | RATIOS APPLIED TO PRECIPITATION |      |
|---------------|---------|------|------|---------------------------------|------|
|               |         |      |      | RATIO 1                         |      |
|               |         |      |      | 1.00                            |      |
| HYDROGRAPH AT |         |      |      |                                 |      |
| +             | OFF1    | .05  | 1    | FLOW                            | 42.  |
|               |         |      |      | TIME                            | 3.67 |
| HYDROGRAPH AT |         |      |      |                                 |      |
| +             | OFF2    | .27  | 1    | FLOW                            | 201. |
|               |         |      |      | TIME                            | 3.92 |

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

# **APPENDIX C**

## **HYDRAULIC CALCULATIONS**

**INTERIM CHANNEL  
NORMAL DEPTH CALCULATIONS**



## Worksheet for SW1- INT

### Project Description

|                 |                 |
|-----------------|-----------------|
| Friction Method | Manning Formula |
| Solve For       | Normal Depth    |

### Input Data

|                       |         |             |
|-----------------------|---------|-------------|
| Roughness Coefficient | 0.037   |             |
| Channel Slope         | 1.00000 | %           |
| Left Side Slope       | 3.00    | ft/ft (H:V) |
| Right Side Slope      | 3.00    | ft/ft (H:V) |
| Bottom Width          | 5.00    | ft          |
| Discharge             | 662.00  | ft³/s       |

### Results

|                  |             |       |
|------------------|-------------|-------|
| Normal Depth     | 4.65        | ft    |
| Flow Area        | 88.08       | ft²   |
| Wetted Perimeter | 34.40       | ft    |
| Hydraulic Radius | 2.56        | ft    |
| Top Width        | 32.89       | ft    |
| Critical Depth   | 4.22        | ft    |
| Critical Slope   | 0.01568     | ft/ft |
| Velocity         | 7.52        | ft/s  |
| Velocity Head    | 0.88        | ft    |
| Specific Energy  | 5.53        | ft    |
| Froude Number    | 0.81        |       |
| Flow Type        | Subcritical |       |

### GVF Input Data

|                  |      |    |
|------------------|------|----|
| Downstream Depth | 0.00 | ft |
| Length           | 0.00 | ft |
| Number Of Steps  | 0    |    |

### GVF Output Data

|                     |          |      |
|---------------------|----------|------|
| Upstream Depth      | 0.00     | ft   |
| Profile Description |          |      |
| Profile Headloss    | 0.00     | ft   |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity   | Infinity | ft/s |
| Normal Depth        | 4.65     | ft   |
| Critical Depth      | 4.22     | ft   |
| Channel Slope       | 1.00000  | %    |

---

## Worksheet for SW1- INT

---

### GVF Output Data

Critical Slope 0.01568 ft/ft

### Messages

#### Notes

Q100= 739 cfs (REF\*\* + OFF2)  
n=0.040 for 12" riprap

## Cross Section for SW1- INT

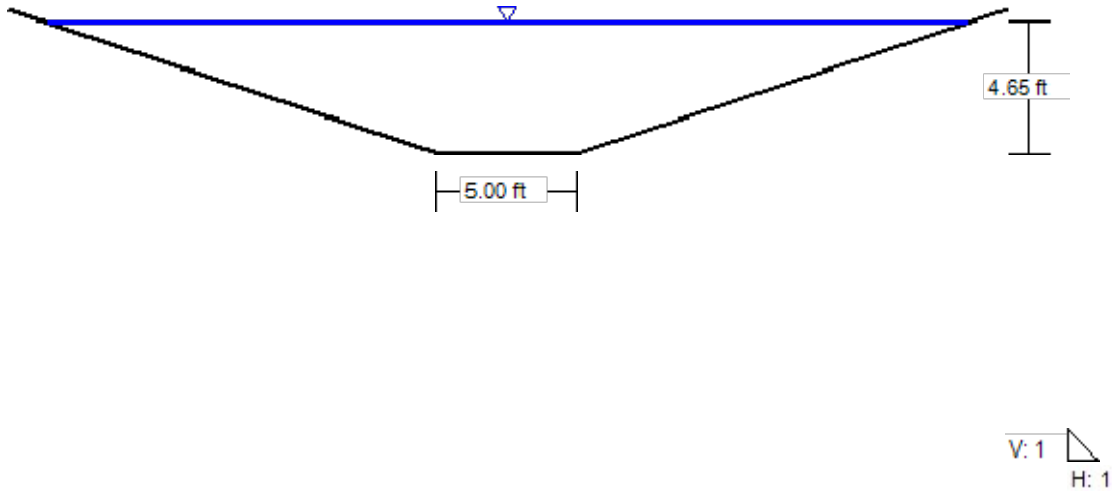
### Project Description

Friction Method                      Manning Formula  
Solve For                              Normal Depth

### Input Data

|                       |                           |
|-----------------------|---------------------------|
| Roughness Coefficient | 0.037                     |
| Channel Slope         | 1.00000 %                 |
| Normal Depth          | 4.65 ft                   |
| Left Side Slope       | 3.00 ft/ft (H:V)          |
| Right Side Slope      | 3.00 ft/ft (H:V)          |
| Bottom Width          | 5.00 ft                   |
| Discharge             | 662.00 ft <sup>3</sup> /s |

### Cross Section Image





## **STREET NORMAL DEPTH CALCULATIONS**

## Worksheet for ST1 MAX 41' ROW- ULT

### Project Description

Friction Method                      Manning Formula  
Solve For                              Normal Depth

### Input Data

Channel Slope                                              9.13000    %  
Discharge                                                5.00    ft<sup>3</sup>/s  
Section Definitions

| Station (ft) | Elevation (ft) |
|--------------|----------------|
| 0+00.00      | 0.58           |
| 0+04.00      | 0.50           |
| 0+04.50      | 0.50           |
| 0+04.50      | 0.00           |
| 0+06.00      | 0.13           |
| 0+06.00      | 0.17           |
| 0+20.50      | 0.29           |
| 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           |
| 0+41.00      | 0.58           |

### Roughness Segment Definitions

| Start Station   | Ending Station  | Roughness Coefficient |
|-----------------|-----------------|-----------------------|
| (0+00.00, 0.58) | (0+06.00, 0.13) | 0.013                 |
| (0+06.00, 0.13) | (0+35.00, 0.13) | 0.016                 |
| (0+35.00, 0.13) | (0+41.00, 0.58) | 0.013                 |

### Options

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

---

## Worksheet for ST1 MAX 41' ROW- ULT

---

### Results

|                  |                 |         |                 |
|------------------|-----------------|---------|-----------------|
| Normal Depth     |                 | 0.24    | ft              |
| Elevation Range  | 0.00 to 0.58 ft |         |                 |
| Flow Area        |                 | 1.19    | ft <sup>2</sup> |
| Wetted Perimeter |                 | 21.38   | ft              |
| Hydraulic Radius |                 | 0.06    | ft              |
| Top Width        |                 | 20.80   | ft              |
| Normal Depth     |                 | 0.24    | ft              |
| Critical Depth   |                 | 0.31    | ft              |
| Critical Slope   |                 | 0.00805 | ft/ft           |
| Velocity         |                 | 4.20    | ft/s            |
| Velocity Head    |                 | 0.27    | ft              |
| Specific Energy  |                 | 0.52    | ft              |
| Froude Number    |                 | 3.09    |                 |
| 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        | 0.24     | ft    |
| Critical Depth      | 0.31     | ft    |
| Channel Slope       | 9.13000  | %     |
| Critical Slope      | 0.00805  | ft/ft |

## Cross Section for ST1 MAX 41' ROW- ULT

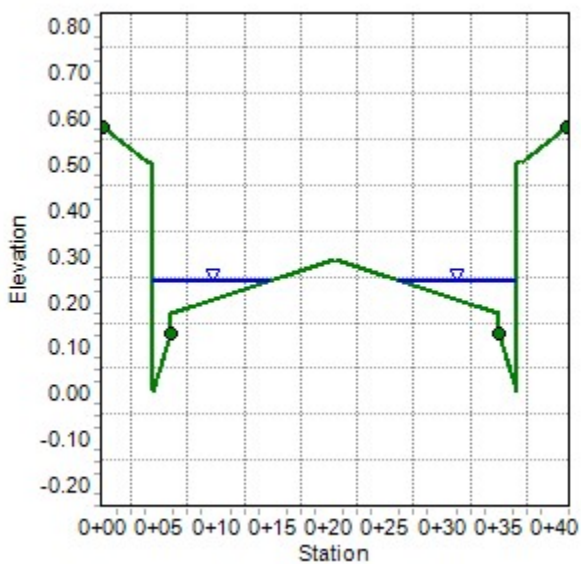
### Project Description

|                 |                 |
|-----------------|-----------------|
| Friction Method | Manning Formula |
| Solve For       | Normal Depth    |

### Input Data

|               |         |                    |
|---------------|---------|--------------------|
| Channel Slope | 9.13000 | %                  |
| Normal Depth  | 0.24    | ft                 |
| Discharge     | 5.00    | ft <sup>3</sup> /s |

### Cross Section Image





## Project Description

Normal Depth

## Section Definitions

## Roughness Segment Definitions

## Pavlovskii's Method

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## Worksheet for ST1 MIN 41' ROW- ULT

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### Results

|                  |                 |         |                 |
|------------------|-----------------|---------|-----------------|
| Normal Depth     |                 | 0.29    | ft              |
| Elevation Range  | 0.00 to 0.58 ft |         |                 |
| Flow Area        |                 | 2.40    | ft <sup>2</sup> |
| Wetted Perimeter |                 | 32.52   | ft              |
| Hydraulic Radius |                 | 0.07    | ft              |
| Top Width        |                 | 31.85   | ft              |
| Normal Depth     |                 | 0.29    | ft              |
| Critical Depth   |                 | 0.31    | ft              |
| Critical Slope   |                 | 0.00821 | ft/ft           |
| Velocity         |                 | 2.09    | ft/s            |
| Velocity Head    |                 | 0.07    | ft              |
| Specific Energy  |                 | 0.36    | ft              |
| Froude Number    |                 | 1.34    |                 |
| 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        | 0.29     | ft    |
| Critical Depth      | 0.31     | ft    |
| Channel Slope       | 1.45000  | %     |
| Critical Slope      | 0.00821  | ft/ft |

## Cross Section for ST1 MIN 41' ROW- ULT

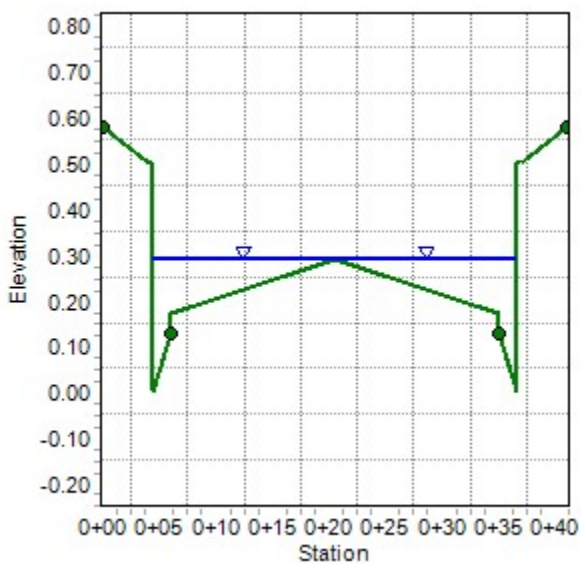
### Project Description

|                 |                 |
|-----------------|-----------------|
| Friction Method | Manning Formula |
| Solve For       | Normal Depth    |

### Input Data

|               |         |                    |
|---------------|---------|--------------------|
| Channel Slope | 1.45000 | %                  |
| Normal Depth  | 0.29    | ft                 |
| Discharge     | 5.00    | ft <sup>3</sup> /s |

### Cross Section Image



## **FREEBOARD CALCULATIONS**



## FREEBOARD CALCULATIONS

DEVELOPMENT Kindle Rise Way (Kettle Bend to Desert Foothills)

W.O. # 7861-MISC-15

CALCULATED BY

RBR

### EQUATIONS\*

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

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

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

NOTES: Equations are referenced from pages 769 and 773 of the CCRFCD HC&DDM

Minimum Freeboard is 1 ft.

| Section / Description | Super/Sub critical flow | Channel Velocity (fps) | Flow Depth (ft) | Freeboard Required (ft) | Required Channel Depth (ft) | Actual Channel Depth (ft) |
|-----------------------|-------------------------|------------------------|-----------------|-------------------------|-----------------------------|---------------------------|
| SW1                   | SUB                     | 7.52                   | 4.65            | 1.38                    | 6.03                        | 10.00                     |
|                       |                         |                        |                 |                         |                             |                           |
|                       |                         |                        |                 |                         |                             |                           |
|                       |                         |                        |                 |                         |                             |                           |
|                       |                         |                        |                 |                         |                             |                           |
|                       |                         |                        |                 |                         |                             |                           |
|                       |                         |                        |                 |                         |                             |                           |

## **RIPRAP CALCULATIONS**

## RIP-RAP CALCULATIONS

DEVELOPMENT Kindle Rise (Kettle Bend to Desert Foothills)

Work Order # 7861-MISC-15

CALCULATED BY RBR

### EQUATIONS

$$V = \frac{3(d_{50})^{0.5}(S_s - 1)}{S^{0.17}}$$

$$n = 0.0395(D_{50})^{1/6}$$

Where : V = Velocity, in fps; d<sub>50</sub> = Mean Rock Size, in feet; S = Channel Slope; & S<sub>s</sub> = Specific Gravity

NOTES: Equations are referenced from pages 746 and 747 of the CCRFCD HC&DDM

Minimum rip rap size utilized is D<sub>50</sub> = 0.5 ft

| Section              | Q <sub>100</sub><br>(cfs) | Max. Velocity<br>(fps) | Slope<br>(ft/ft) | Specific<br>Gravity | D <sub>50</sub><br>(ft) | n-value |
|----------------------|---------------------------|------------------------|------------------|---------------------|-------------------------|---------|
| Offsite Channel- INT | 662                       | 7.52                   | 0.0100           | 2.65                | 0.5                     | 0.035   |
|                      |                           |                        |                  |                     |                         |         |
|                      |                           |                        |                  |                     |                         |         |

## **DROP INLET CALCULATIONS**



# Drop Inlet Interception

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

Inlet ID: SDDI#1  
 Drainage Condition: Ultimate 100-Year Storm  
 Flow Summary: STF2  
 Inlet Description: 5" Modified Type C

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

| Input:                             | Variable:       | Input: |
|------------------------------------|-----------------|--------|
| Street Flow (cfs)                  | Q               | 5.0    |
| Longitudinal Slope (ft/ft)         | S <sub>o</sub>  | 0.0145 |
| Manning's Coefficient              | n               | 0.016  |
| Street Flow Velocity (fps)         | V               | 2.09   |
| Street Flow Depth (ft)             | D               | 0.29   |
| Street Cross Slope (ft/ft)         | S <sub>x</sub>  | 0.02   |
| Grate Width (ft)                   | W               | 1.5    |
| Grate Depression (in)              | D <sub>g</sub>  | 2      |
| Length of Grate (ft)               | L <sub>g</sub>  | 2.5    |
| Length of Curb Opening (ft)        | L <sub>c</sub>  | 5      |
| Clogging Factor - Grate (%)        | CF <sub>g</sub> | 50%    |
| Clogging Factor - Curb (%)         | CF <sub>c</sub> | 50%    |
| Effective Grate Length (ft)        | L <sub>ge</sub> | 1.25   |
| Effective Curb Opening Length (ft) | L <sub>ce</sub> | 2.5    |

| Output (Grate):                             | Equation:                                                                                                                   | Output (Grate): |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------|
| R <sub>f</sub> - Frontal Flow Factor        | $1 - 0.09 \cdot (V - V_x)$ if $V > V_x$ ; else 1                                                                            | 1.00            |
| V <sub>o</sub> - Splash Over Velocity (fps) | $p + q \cdot L_{ge} - r \cdot L_{ge}^2 + sy \cdot L_{ge}^3$ ; where $p=0.30$ , $q=4.85$ , $r=1.31$ , $sy=0.15$ (vane grate) | 4.61            |
| E - grate Flow Ratio                        | $Q_w / Q_s$                                                                                                                 | 1.10            |
| Q <sub>w</sub> - Frontal Flow (cfs)         | $Q [1 - (1 - (W/T))^{2.67}]$                                                                                                | 2.62            |
| Q <sub>s</sub> - Side Flow (cfs)            | $Q - Q_w$                                                                                                                   | 2.38            |
| T - Side Flow Spread (ft)                   | $(D - D_g) / S_x$                                                                                                           | 6.17            |
| R <sub>s</sub> - Side Flow Factor           | $1 / (1 + (0.15 \cdot V^{1.8}) / (S_x \cdot L_{ge}^{2.3}))$                                                                 | 0.06            |
| Q <sub>gi</sub> - Intercepted Flow (cfs)    | $(R_f \cdot E + R_s \cdot (1 - E)) \cdot Q$                                                                                 | 5.0             |

| Output (Curb):                                                  | Equation:                                                                   | Output (Curb): |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------|----------------|
| S <sub>e</sub> - Equivalent Cross Slope (ft/ft)                 | $S_x + S_g \cdot E$                                                         | 0.14           |
| Q <sub>sx</sub> - Remaining Flow After Grate Interception (cfs) | $Q - Q_{gi}$                                                                | 0.00           |
| S <sub>g</sub> - Gutter Cross Slope (ft/ft)                     | $D_g / W$                                                                   | 0.11           |
| L <sub>t</sub> - Effective Interception Length (ft)             | $0.60 \cdot Q_{sx}^{0.42} \cdot S_o^{0.30} [1 / (n \cdot S_e)]^{0.6}$       | 0.00           |
| Q <sub>ci</sub> - Intercepted Flow (cfs)                        | $(1 - (1 - L_{ce} / L_t)^{1.8}) \cdot Q_{sx}$ or $Q_{sx}$ if $L_t < L_{ce}$ | 0.0            |

| Output (Combination):        | Equation:                                | Output (Combination): |
|------------------------------|------------------------------------------|-----------------------|
| Total Intercepted Flow (cfs) | Intercepted (Grate) + Intercepted (Curb) | 5.0                   |
| Bypass Flow (cfs)            | Street Flow - Total Intercepted Flow     | 0.0                   |

**WSPG  
INTERIM CONDITION  
MAINLINE MODEL**

|                                 |         |         |   |      |         |        |         |        |      |  |  |
|---------------------------------|---------|---------|---|------|---------|--------|---------|--------|------|--|--|
| T1 KINDLE RISE                  |         |         |   |      |         |        |         |        |      |  |  |
| T2 MAINLINE - INTERIM CONDITION |         |         |   |      |         |        |         |        |      |  |  |
| T3 KINDLE RISE TO EX SUNSET RUN |         |         |   |      |         |        |         |        |      |  |  |
| SO                              | 1000.00 | 3309.53 | 3 | .015 |         |        |         |        |      |  |  |
| R                               | 1136.70 | 3310.04 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 1173.70 | 3310.22 | 3 | .015 |         |        | 10.63   | 0.00   | 0    |  |  |
| R                               | 1207.70 | 3310.39 | 3 | .015 |         |        | 2.88    | 0.00   | 0    |  |  |
| R                               | 1263.30 | 3310.67 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 1336.40 | 3311.03 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 1423.90 | 3311.47 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 1560.70 | 3312.15 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 1726.00 | 3312.98 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 1795.10 | 3313.33 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 1853.20 | 3313.62 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 2086.00 | 3314.78 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 2158.70 | 3315.14 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| JX                              | 2158.70 | 3315.14 | 3 | 1    | .015    | 66.000 | 3315.65 | 45.0   | .000 |  |  |
| R                               | 2394.80 | 3316.33 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 2464.60 | 3316.68 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 2468.60 | 3316.70 | 3 | .015 |         |        | 0.00    | -15.00 | 0    |  |  |
| R                               | 2472.60 | 3316.72 | 3 | .015 |         |        | 0.00    | -15.00 | 0    |  |  |
| R                               | 2509.60 | 3316.90 | 3 | .015 |         |        | 0.00    | -15.00 | 0    |  |  |
| R                               | 2513.60 | 3316.92 | 3 | .015 |         |        | 0.00    | -12.00 | 0    |  |  |
| R                               | 2517.60 | 3316.94 | 3 | .015 |         |        | 0.00    | -15.00 | 0    |  |  |
| R                               | 2545.90 | 3317.08 | 3 | .015 |         |        | 0.00    | -15.00 | 0    |  |  |
| R                               | 2631.10 | 3317.51 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 2730.30 | 3319.78 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 2760.30 | 3321.71 | 3 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| TS                              | 2867.50 | 3328.61 | 4 | .015 |         |        |         |        |      |  |  |
| R                               | 2867.50 | 3328.61 | 4 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| R                               | 2928.10 | 3332.46 | 4 | .015 |         |        | 0.00    | 2.00   | 0    |  |  |
| R                               | 3117.00 | 3344.62 | 4 | .015 |         |        | 0.09    | 0.00   | 0    |  |  |
| R                               | 3381.30 | 3350.70 | 4 | .015 |         |        | 0.00    | 0.00   | 0    |  |  |
| SH                              | 3381.30 | 3350.70 | 4 | .015 |         |        |         |        |      |  |  |
| CD                              | 1       | 4       | 0 | 0.00 | 2.50    | 0.00   | 0.00    | 0.00   |      |  |  |
| CD                              | 3       | 3       | 0 | 0.00 | 8.00    | 8.00   | 0.00    | 0.00   |      |  |  |
| CD                              | 4       | 3       | 0 | 0.00 | 7.00    | 6.00   | 0.00    | 0.00   |      |  |  |
| Q                               |         |         |   |      | 662.000 | .0     |         |        |      |  |  |

KINDLE RISE  
MAINLINE - INTERIM CONDITION  
KINDLE RISE TO EX SUNSET RUN

| Station                                                  | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|----------------------------------------------------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem                                                   | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1000.000                                                 | 3309.530    | 6.359      | 3315.889   | 728.00  | 14.31     | 3.18     | 3319.07        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -                                                        | -           | -          | -          | -       | -         | .0056    | .05            | 6.36       | 1.00           | 7.85           | .015           | .00             | .00 | BOX            |
| 9.634                                                    | .0037       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1009.634                                                 | 3309.566    | 6.670      | 3316.236   | 728.00  | 13.64     | 2.89     | 3319.13        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -                                                        | -           | -          | -          | -       | -         | .0050    | .20            | 6.67       | .93            | 7.85           | .015           | .00             | .00 | BOX            |
| 40.605                                                   | .0037       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1050.239                                                 | 3309.718    | 6.995      | 3316.713   | 728.00  | 13.01     | 2.63     | 3319.34        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -                                                        | -           | -          | -          | -       | -         | .0045    | .39            | 7.00       | .87            | 7.85           | .015           | .00             | .00 | BOX            |
| 86.461                                                   | .0037       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1136.700                                                 | 3310.040    | 7.288      | 3317.329   | 728.00  | 12.49     | 2.42     | 3319.75        | .10        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -                                                        | -           | -          | -          | -       | -         | .0045    | .17            | 7.39       | .81            | 7.05           | .015           | .00             | .00 | BOX            |
| 37.000                                                   | .0049       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1173.700                                                 | 3310.220    | 7.249      | 3317.469   | 728.00  | 12.55     | 2.45     | 3319.92        | .03        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -                                                        | -           | -          | -          | -       | -         | .0045    | .15            | 7.28       | .82            | 6.98           | .015           | .00             | .00 | BOX            |
| 34.000                                                   | .0050       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1207.700                                                 | 3310.390    | 7.205      | 3317.595   | 728.00  | 12.63     | 2.48     | 3320.07        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -                                                        | -           | -          | -          | -       | -         | .0046    | .26            | 7.20       | .83            | 6.95           | .015           | .00             | .00 | BOX            |
| 55.600                                                   | .0050       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |

KINDLE RISE  
MAINLINE - INTERIM CONDITION  
KINDLE RISE TO EX SUNSET RUN

| Station   | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|-----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem    | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1263.300  | 3310.670    | 7.137      | 3317.807   | 728.00  | 12.75     | 2.52     | 3320.33        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0047    | .35            | 7.14       | .84            | 7.02           | .015           | .00             | .00 | BOX            |
| 73.100    | .0049       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1336.400  | 3311.030    | 7.094      | 3318.124   | 728.00  | 12.83     | 2.56     | 3320.68        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0048    | .42            | 7.09       | .85            | 6.96           | .015           | .00             | .00 | BOX            |
| 87.500    | .0050       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1423.900  | 3311.470    | 7.034      | 3318.504   | 728.00  | 12.94     | 2.60     | 3321.10        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0049    | .67            | 7.03       | .86            | 6.99           | .015           | .00             | .00 | BOX            |
| 136.800   | .0050       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1560.700  | 3312.150    | 7.007      | 3319.157   | 728.00  | 12.99     | 2.62     | 3321.78        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0049    | .82            | 7.01       | .86            | 6.96           | .015           | .00             | .00 | BOX            |
| 165.300   | .0050       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1726.000  | 3312.980    | 6.974      | 3319.954   | 728.00  | 13.05     | 2.64     | 3322.60        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0050    | .35            | 6.97       | .87            | 6.94           | .015           | .00             | .00 | BOX            |
| 69.100    | .0051       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1795.100  | 3313.330    | 6.959      | 3320.289   | 728.00  | 13.08     | 2.66     | 3322.94        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0050    | .29            | 6.96       | .87            | 6.98           | .015           | .00             | .00 | BOX            |
| 58.100    | .0050       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1853.200  | 3313.620    | 6.966      | 3320.586   | 728.00  | 13.06     | 2.65     | 3323.24        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0050    | 1.16           | 6.97       | .87            | 6.98           | .015           | .00             | .00 | BOX            |
| 232.800   | .0050       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 2086.000  | 3314.780    | 6.983      | 3321.763   | 728.00  | 13.03     | 2.64     | 3324.40        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0050    | .36            | 6.98       | .87            | 7.00           | .015           | .00             | .00 | BOX            |
| 72.700    | .0049       |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 2158.700  | 3315.140    | 6.991      | 3322.131   | 728.00  | 13.02     | 2.63     | 3324.76        | .00        | 6.36           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| -         | -           | -          | -          | -       | -         | .0030    | .00            | 6.99       | .87            | .015           | .00            | .00             | .00 | BOX            |
| JUNCT STR | .0000       |            |            |         |           |          |                |            |                |                |                |                 |     |                |

KINDLE RISE



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FILE: KR-INT.WSW

W S P G W - CIVILDESIGN  
Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 2- 4-2020 Time: 1:23:38

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FILE: KR-INT.WSW

W S P G W - CIVILDESIGN  
Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 2- 4-2020 Time: 1:23:38

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| Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt | No Wth |
|--------|-------|-------|---|-----|-----|--------|-------|----------|----------|---------|---------|--------|
|--------|-------|-------|---|-----|-----|--------|-------|----------|----------|---------|---------|--------|

| Station          | Elev     | (FT)  | Elev     | (CFS)  | (FPS) | Head   | Grd.El. | Elev    | Depth    | Width   | Dia.-FT | or I.D. | ZL    | Prs/Pip |
|------------------|----------|-------|----------|--------|-------|--------|---------|---------|----------|---------|---------|---------|-------|---------|
| L/Elem           | Ch Slope |       |          |        |       | SF Ave | HF      | SE Dpth | Froude N | Norm Dp | "N"     | X-Fall  | ZR    | Type Ch |
| *****            | *****    | ***** | *****    | *****  | ***** | *****  | *****   | *****   | *****    | *****   | *****   | *****   | ***** | *****   |
| 2517.600         | 3316.940 | 3.349 | 3320.289 | 662.00 | 24.71 | 9.48   | 3329.77 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 28.300           | .0050    |       |          |        |       | .0297  | .84     | 3.35    | 2.38     | 6.49    | .015    | .00     | .00   | BOX     |
| 2545.900         | 3317.080 | 3.210 | 3320.290 | 662.00 | 25.78 | 10.32  | 3330.61 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 26.189           | .0050    |       |          |        |       | .0332  | .87     | 3.21    | 2.54     | 6.44    | .015    | .00     | .00   | BOX     |
| 2572.089         | 3317.212 | 3.083 | 3320.295 | 662.00 | 26.84 | 11.19  | 3331.48 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 30.041           | .0050    |       |          |        |       | .0375  | 1.13    | 3.08    | 2.69     | 6.44    | .015    | .00     | .00   | BOX     |
| 2602.130         | 3317.364 | 2.940 | 3320.303 | 662.00 | 28.15 | 12.30  | 3332.61 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 28.970           | .0050    |       |          |        |       | .0428  | 1.24    | 2.94    | 2.89     | 6.44    | .015    | .00     | .00   | BOX     |
| 2631.100         | 3317.510 | 2.803 | 3320.313 | 662.00 | 29.52 | 13.53  | 3333.85 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 13.797           | .0229    |       |          |        |       | .0465  | .64     | 2.80    | 3.11     | 3.60    | .015    | .00     | .00   | BOX     |
| 2644.897         | 3317.826 | 2.766 | 3320.592 | 662.00 | 29.92 | 13.90  | 3334.49 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 45.318           | .0229    |       |          |        |       | .0507  | 2.30    | 2.77    | 3.17     | 3.60    | .015    | .00     | .00   | BOX     |
| 2690.216         | 3318.863 | 2.637 | 3321.500 | 662.00 | 31.38 | 15.29  | 3336.79 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 40.084           | .0229    |       |          |        |       | .0580  | 2.32    | 2.64    | 3.40     | 3.60    | .015    | .00     | .00   | BOX     |
| 2730.300         | 3319.780 | 2.515 | 3322.295 | 662.00 | 32.91 | 16.82  | 3339.11 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| 30.000           | .0643    |       |          |        |       | .0616  | 1.85    | 2.51    | 3.66     | 2.48    | .015    | .00     | .00   | BOX     |
| 2760.300         | 3321.710 | 2.521 | 3324.231 | 662.00 | 32.83 | 16.73  | 3340.96 | .00     | 5.97     | 8.00    | 8.000   | 8.000   | .00   | 0 .0    |
| -                | -        | -     | -        | -      | -     | -      | -       | -       | -        | -       | -       | -       | -     | -       |
| TRANS STR        | .0644    |       |          |        |       | .0565  | 6.06    | 2.52    | 3.64     |         | .015    | .00     | .00   | BOX     |
| FILE: KR-INT.WSW |          |       |          |        |       |        |         |         |          |         |         |         |       |         |

W S P G W - CIVILDESIGN Version 14.05  
Program Package Serial Number: 1513  
WATER SURFACE PROFILE LISTING  
Date: 2- 4-2020 Time: 1:23:38  
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KINDLE RISE  
MAINLINE - INTERIM CONDITION  
KINDLE RISE TO EX SUNSET RUN

| Station          | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt/ or I.D. | ZL    | No Wth Prs/Pip |
|------------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|------------------|-------|----------------|
| L/Elem           | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall           | ZR    | Type Ch        |
| *****            | *****       | *****      | *****      | *****   | *****     | *****    | *****          | *****      | *****          | *****          | *****          | *****            | ***** | *****          |
| 2867.500         | 3328.610    | 3.545      | 3332.155   | 662.00  | 31.13     | 15.04    | 3347.20        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 60.600           | .0635       |            |            |         |           | .0495    | 3.00           | 3.54       | 2.91           | 3.28           | .015           | .00              | .00   | BOX            |
| 2928.100         | 3332.460    | 3.664      | 3336.124   | 662.00  | 30.11     | 14.08    | 3350.20        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 49.567           | .0644       |            |            |         |           | .0450    | 2.23           | 3.67       | 2.77           | 3.26           | .015           | .00              | .00   | BOX            |
| 2977.667         | 3335.651    | 3.818      | 3339.469   | 662.00  | 28.90     | 12.97    | 3352.44        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 40.964           | .0644       |            |            |         |           | .0401    | 1.64           | 3.82       | 2.61           | 3.26           | .015           | .00              | .00   | BOX            |
| 3018.631         | 3338.288    | 4.004      | 3342.292   | 662.00  | 27.55     | 11.79    | 3354.08        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 30.363           | .0644       |            |            |         |           | .0355    | 1.08           | 4.01       | 2.43           | 3.26           | .015           | .00              | .00   | BOX            |
| 3048.993         | 3340.242    | 4.200      | 3344.442   | 662.00  | 26.27     | 10.72    | 3355.16        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 23.360           | .0644       |            |            |         |           | .0314    | .73            | 4.20       | 2.26           | 3.26           | .015           | .00              | .00   | BOX            |
| 3072.353         | 3341.746    | 4.405      | 3346.151   | 662.00  | 25.05     | 9.74     | 3355.89        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 18.367           | .0644       |            |            |         |           | .0279    | .51            | 4.41       | 2.10           | 3.26           | .015           | .00              | .00   | BOX            |
| 3090.720         | 3342.928    | 4.620      | 3347.548   | 662.00  | 23.88     | 8.86     | 3356.41        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 14.611           | .0644       |            |            |         |           | .0247    | .36            | 4.62       | 1.96           | 3.26           | .015           | .00              | .00   | BOX            |
| 3105.331         | 3343.869    | 4.845      | 3348.714   | 662.00  | 22.77     | 8.05     | 3356.77        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 11.669           | .0644       |            |            |         |           | .0219    | .26            | 4.85       | 1.82           | 3.26           | .015           | .00              | .00   | BOX            |
| 3117.000         | 3344.620    | 5.082      | 3349.702   | 662.00  | 21.71     | 7.32     | 3357.02        | .00        | 7.00           | 6.00           | 7.000          | 6.000            | .00   | 0 .0           |
| -                | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -                | -     | -              |
| 94.885           | .0230       |            |            |         |           | .0198    | 1.88           | 5.08       | 1.70           | 4.86           | .015           | .00              | .00   | BOX            |
| FILE: KR-INT.WSW |             |            |            |         |           |          |                |            |                |                |                |                  |       |                |

W S P G W - CIVILDESIGN Version 14.05  
Program Package Serial Number: 1513  
WATER SURFACE PROFILE LISTING  
Date: 2- 4-2020 Time: 1:23:38  
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KINDLE RISE  
MAINLINE - INTERIM CONDITION  
KINDLE RISE TO EX SUNSET RUN

| Station                                                  | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt/or I.D. | ZL    | No Wth Prs/Pip |
|----------------------------------------------------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-------|----------------|
| L/Elem                                                   | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR    | Type Ch        |
| *****                                                    | *****       | *****      | *****      | *****   | *****     | *****    | *****          | *****      | *****          | *****          | *****          | *****           | ***** | *****          |
| 3211.885                                                 | 3346.802    | 5.258      | 3352.061   | 662.00  | 20.98     | 6.84     | 3358.90        | .00        | 7.00           | 6.00           | 7.000          | 6.000           | .00   | 0 .0           |
| - -                                                      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 71.104                                                   | .0230       |            |            |         |           | .0179    | 1.27           | 5.26       | 1.61           | 4.86           | .015           | .00             | .00   | BOX            |
| 3282.989                                                 | 3348.438    | 5.515      | 3353.953   | 662.00  | 20.01     | 6.21     | 3360.17        | .00        | 7.00           | 6.00           | 7.000          | 6.000           | .00   | 0 .0           |
| - -                                                      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 41.569                                                   | .0230       |            |            |         |           | .0159    | .66            | 5.52       | 1.50           | 4.86           | .015           | .00             | .00   | BOX            |
| 3324.558                                                 | 3349.395    | 5.784      | 3355.179   | 662.00  | 19.07     | 5.65     | 3360.83        | .00        | 7.00           | 6.00           | 7.000          | 6.000           | .00   | 0 .0           |
| - -                                                      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 26.074                                                   | .0230       |            |            |         |           | .0141    | .37            | 5.78       | 1.40           | 4.86           | .015           | .00             | .00   | BOX            |
| 3350.632                                                 | 3349.994    | 6.067      | 3356.061   | 662.00  | 18.19     | 5.14     | 3361.20        | .00        | 7.00           | 6.00           | 7.000          | 6.000           | .00   | 0 .0           |
| - -                                                      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 16.389                                                   | .0230       |            |            |         |           | .0126    | .21            | 6.07       | 1.30           | 4.86           | .015           | .00             | .00   | BOX            |
| 3367.021                                                 | 3350.371    | 6.363      | 3356.734   | 662.00  | 17.34     | 4.67     | 3361.40        | .00        | 7.00           | 6.00           | 7.000          | 6.000           | .00   | 0 .0           |
| - -                                                      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 9.656                                                    | .0230       |            |            |         |           | .0112    | .11            | 6.36       | 1.21           | 4.86           | .015           | .00             | .00   | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |       |                |
| 3376.677                                                 | 3350.594    | 6.673      | 3357.267   | 662.00  | 16.53     | 4.24     | 3361.51        | .00        | 7.00           | 6.00           | 7.000          | 6.000           | .00   | 0 .0           |
| - -                                                      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 4.623                                                    | .0230       |            |            |         |           | .0100    | .05            | 6.67       | 1.13           | 4.86           | .015           | .00             | .00   | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |       |                |
| 3381.300                                                 | 3350.700    | 7.000      | 3357.700   | 662.00  | 15.76     | 3.86     | 3361.56        | .00        | 7.00           | 6.00           | 7.000          | 6.000           | .00   | 0 .0           |
| - -                                                      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |

▲

**WSPG  
ULTIMATE CONDITION  
MAINLINE MODEL**

T1 KINDLE RISE  
 T2 MAINLINE 1 - ULTIMATE CONDITION  
 T3 KINDLE RISE MAINLINE TO EX SUNSET RUN DR  
 SO 1000.00 3309.53 3 .015  
 R 1136.70 3310.04 3 .015 0.00 0.00 0  
 R 1173.70 3310.22 3 .015 10.63 0.00 0  
 R 1207.70 3310.39 3 .015 2.88 0.00 0  
 R 1263.30 3310.67 3 .015 0.00 0.00 0  
 R 1336.40 3311.03 3 .015 0.00 0.00 0  
 R 1423.90 3311.47 3 .015 0.00 0.00 0  
 R 1560.70 3312.15 3 .015 0.00 0.00 0  
 R 1726.00 3312.98 3 .015 0.00 0.00 0  
 R 1795.10 3313.33 3 .015 0.00 0.00 0  
 R 1853.20 3313.62 3 .015 0.00 0.00 0  
 R 2086.00 3314.78 3 .015 0.00 0.00 0  
 R 2158.70 3315.14 3 .015 0.00 0.00 0  
 JX 2158.70 3315.14 3 1 .015 215.00 3315.65 45.0 .000  
 R 2394.80 3316.33 3 .015 0.00 0.00 0  
 R 2464.60 3316.68 3 .015 0.00 0.00 0  
 R 2468.60 3316.70 3 .015 0.00 -15.00 0  
 R 2472.60 3316.72 3 .015 0.00 -15.00 0  
 R 2509.60 3316.90 3 .015 0.00 -15.00 0  
 R 2513.60 3316.92 3 .015 0.00 -12.00 0  
 R 2517.60 3316.94 3 .015 0.00 -15.00 0  
 R 2545.90 3317.08 3 .015 0.00 -15.00 0  
 R 2631.10 3317.51 3 .015 0.00 0.00 0  
 R 2730.30 3319.78 3 .015 0.00 0.00 0  
 R 2760.30 3321.71 3 .015 0.00 0.00 0  
 TS 2867.50 3328.61 4 .015  
 R 2867.50 3328.61 4 .015 0.00 0.00 0  
 R 2928.10 3332.46 4 .015 0.00 2.00 0  
 R 3117.00 3344.62 4 .015 0.09 0.00 0  
 R 3381.30 3350.70 4 .015 0.00 0.00 0  
 SH 3381.30 3350.70 4 .015  
 CD 1 4 0 0.00 2.50 0.00 0.00 0.00  
 CD 3 3 0 0.00 8.00 8.00 0.00 0.00  
 CD 4 3 0 0.00 7.00 6.00 0.00 0.00  
 Q 548.000 .0



KINDLE RISE  
MAINLINE 1 - ULTIMATE CONDITION  
KINDLE RISE MAINLINE TO EX SUNSET RUN DR

| Station                                                  | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|----------------------------------------------------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem                                                   | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1000.000                                                 | 3309.530    | 6.562      | 3316.092   | 763.00  | 14.53     | 3.28     | 3319.37        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 9.579                                                    | .0037       |            |            |         |           | .0057    | .05            | 6.56       | 1.00           | 8.00           | .015           | .00             | .00 | BOX            |
| 1009.579                                                 | 3309.566    | 6.882      | 3316.448   | 763.00  | 13.86     | 2.98     | 3319.43        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 39.782                                                   | .0037       |            |            |         |           | .0050    | .20            | 6.88       | .93            | 8.00           | .015           | .00             | .00 | BOX            |
| 1049.361                                                 | 3309.714    | 7.218      | 3316.932   | 763.00  | 13.21     | 2.71     | 3319.64        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 87.339                                                   | .0037       |            |            |         |           | .0045    | .40            | 7.22       | .87            | 8.00           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1136.700                                                 | 3310.040    | 7.532      | 3317.573   | 763.00  | 12.66     | 2.49     | 3320.06        | .10        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 37.000                                                   | .0049       |            |            |         |           | .0045    | .17            | 7.63       | .81            | 7.33           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1173.700                                                 | 3310.220    | 7.500      | 3317.719   | 763.00  | 12.72     | 2.51     | 3320.23        | .03        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 34.000                                                   | .0050       |            |            |         |           | .0046    | .16            | 7.53       | .82            | 7.24           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1207.700                                                 | 3310.390    | 7.460      | 3317.850   | 763.00  | 12.78     | 2.54     | 3320.39        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 55.600                                                   | .0050       |            |            |         |           | .0046    | .26            | 7.46       | .82            | 7.22           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |

KINDLE RISE  
MAINLINE 1 - ULTIMATE CONDITION  
KINDLE RISE MAINLINE TO EX SUNSET RUN DR

| Station                                                  | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|----------------------------------------------------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem                                                   | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1263.300                                                 | 3310.670    | 7.399      | 3318.069   | 763.00  | 12.89     | 2.58     | 3320.65        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 73.100                                                   | .0049       |            |            |         |           | .0047    | .35            | 7.40       | .84            | 7.29           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1336.400                                                 | 3311.030    | 7.362      | 3318.392   | 763.00  | 12.96     | 2.61     | 3321.00        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 87.500                                                   | .0050       |            |            |         |           | .0048    | .42            | 7.36       | .84            | 7.23           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1423.900                                                 | 3311.470    | 7.307      | 3318.777   | 763.00  | 13.05     | 2.65     | 3321.42        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 136.800                                                  | .0050       |            |            |         |           | .0049    | .67            | 7.31       | .85            | 7.26           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1560.700                                                 | 3312.150    | 7.280      | 3319.430   | 763.00  | 13.10     | 2.67     | 3322.09        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 165.300                                                  | .0050       |            |            |         |           | .0049    | .82            | 7.28       | .86            | 7.23           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |

KINDLE RISE  
MAINLINE 1 - ULTIMATE CONDITION  
KINDLE RISE MAINLINE TO EX SUNSET RUN DR

| 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        |
| 1726.000                                                 | 3312.980    | 7.246      | 3320.226   | 763.00  | 13.16     | 2.69     | 3322.92        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |
| 69.100                                                   | .0051       |            |            |         |           | .0050    | .35            | 7.25       | .86            | 7.20           | .015           | .00             | .00 | BOX            |
| ----- WARNING - Flow depth near top of box conduit ----- |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1795.100                                                 | 3313.330    | 7.231      | 3320.561   | 763.00  | 13.19     | 2.70     | 3323.26        | .00        | 6.56           | 8.00           | 8.000          | 8.000           | .00 | 0 .0           |

|                                                          |          |       |          |        |       |      |         |      |      |      |       |       |     |     |     |
|----------------------------------------------------------|----------|-------|----------|--------|-------|------|---------|------|------|------|-------|-------|-----|-----|-----|
| 58.100                                                   | .0050    |       |          |        |       |      | .0050   | .29  | 7.23 | .86  | 7.25  | .015  | .00 | .00 | BOX |
| ----- WARNING - Flow depth near top of box conduit ----- |          |       |          |        |       |      |         |      |      |      |       |       |     |     |     |
| 1853.200                                                 | 3313.620 | 7.237 | 3320.857 | 763.00 | 13.18 | 2.70 | 3323.55 | .00  | 6.56 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| 232.800                                                  | .0050    |       |          |        |       |      | .0050   | 1.16 | 7.24 | .86  | 7.25  | .015  | .00 | .00 | BOX |
| ----- WARNING - Flow depth near top of box conduit ----- |          |       |          |        |       |      |         |      |      |      |       |       |     |     |     |
| 2086.000                                                 | 3314.780 | 7.252 | 3322.032 | 763.00 | 13.15 | 2.69 | 3324.72 | .00  | 6.56 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| 72.700                                                   | .0049    |       |          |        |       |      | .0050   | .36  | 7.25 | .86  | 7.27  | .015  | .00 | .00 | BOX |
| ----- WARNING - Flow depth near top of box conduit ----- |          |       |          |        |       |      |         |      |      |      |       |       |     |     |     |
| 2158.700                                                 | 3315.140 | 7.260 | 3322.400 | 763.00 | 13.14 | 2.68 | 3325.08 | .00  | 6.56 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| JUNCT STR                                                | .0000    |       |          |        |       |      |         |      | 7.26 | .86  |       | .015  | .00 | .00 | BOX |
| ----- WARNING - Flow depth near top of box conduit ----- |          |       |          |        |       |      |         |      |      |      |       |       |     |     |     |

▲ FILE: KR-ULT.WSW

W S P G W - CIVILDESIGN Version 14.05  
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WATER SURFACE PROFILE LISTING

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KINDLE RISE  
MAINLINE 1 - ULTIMATE CONDITION  
KINDLE RISE MAINLINE TO EX SUNSET RUN DR

| *****    |             |            |            |         |           |          |                |            |                |                |                |                 |       |                | ***** |  |
|----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-------|----------------|-------|--|
| 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        |       |  |
| *****    | *****       | *****      | *****      | *****   | *****     | *****    | *****          | *****      | *****          | *****          | *****          | *****           | ***** | *****          |       |  |
| 2158.700 | 3315.140    | 4.981      | 3320.121   | 548.00  | 13.75     | 2.94     | 3323.06        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 25.918   | .0050       |            |            |         |           | .0070    | .18            | 4.98       | 1.09           | 5.55           | .015           | .00             | .00   | BOX            |       |  |
| 2184.618 | 3315.270    | 4.778      | 3320.048   | 548.00  | 14.34     | 3.19     | 3323.24        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 33.694   | .0050       |            |            |         |           | .0079    | .27            | 4.78       | 1.16           | 5.55           | .015           | .00             | .00   | BOX            |       |  |
| 2218.313 | 3315.440    | 4.556      | 3319.996   | 548.00  | 15.04     | 3.51     | 3323.51        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 35.412   | .0050       |            |            |         |           | .0090    | .32            | 4.56       | 1.24           | 5.55           | .015           | .00             | .00   | BOX            |       |  |
| 2253.725 | 3315.619    | 4.344      | 3319.962   | 548.00  | 15.77     | 3.86     | 3323.82        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 35.880   | .0050       |            |            |         |           | .0102    | .36            | 4.34       | 1.33           | 5.55           | .015           | .00             | .00   | BOX            |       |  |
| 2289.605 | 3315.800    | 4.141      | 3319.941   | 548.00  | 16.54     | 4.25     | 3324.19        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 35.695   | .0050       |            |            |         |           | .0115    | .41            | 4.14       | 1.43           | 5.55           | .015           | .00             | .00   | BOX            |       |  |
| 2325.300 | 3315.979    | 3.949      | 3319.928   | 548.00  | 17.35     | 4.67     | 3324.60        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 35.139   | .0050       |            |            |         |           | .0131    | .46            | 3.95       | 1.54           | 5.55           | .015           | .00             | .00   | BOX            |       |  |
| 2360.438 | 3316.157    | 3.765      | 3319.922   | 548.00  | 18.19     | 5.14     | 3325.06        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 34.362   | .0050       |            |            |         |           | .0149    | .51            | 3.76       | 1.65           | 5.55           | .015           | .00             | .00   | BOX            |       |  |
| 2394.800 | 3316.330    | 3.590      | 3319.920   | 548.00  | 19.08     | 5.65     | 3325.57        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |       |  |
| -        | -           | -          | -          | -       | -         | -        | -              | -          | -              | -              | -              | -               | -     | -              |       |  |
| 4.282    | .0050       |            |            |         |           | .0160    | .07            | 3.59       | 1.77           | 5.56           | .015           | .00             | .00   | BOX            |       |  |

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W S P G W - CIVILDESIGN Version 14.05  
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KINDLE RISE  
MAINLINE 1 - ULTIMATE CONDITION  
KINDLE RISE MAINLINE TO EX SUNSET RUN DR

| *****    |             |            |            |         |           |          |                |            |                |                |                |                 |       |                |
|----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-------|----------------|
| 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        |
| *****    | *****       | *****      | *****      | *****   | *****     | *****    | *****          | *****      | *****          | *****          | *****          | *****           | ***** | *****          |
| 2399.083 | 3316.352    | 3.568      | 3319.920   | 548.00  | 19.20     | 5.72     | 3325.64        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |
| 33.250   | .0050       |            |            |         |           | .0172    | .57            | 3.57       | 1.79           | 5.56           | .015           | .00             | .00   | BOX            |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |
| 2432.333 | 3316.518    | 3.402      | 3319.920   | 548.00  | 20.14     | 6.30     | 3326.22        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |
| 32.267   | .0050       |            |            |         |           | .0196    | .63            | 3.40       | 1.92           | 5.56           | .015           | .00             | .00   | BOX            |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |
| 2464.600 | 3316.680    | 3.244      | 3319.924   | 548.00  | 21.12     | 6.92     | 3326.85        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |
| 4.000    | .0050       |            |            |         |           | .0211    | .08            | 3.24       | 2.07           | 5.57           | .015           | .00             | .00   | BOX            |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |
| 2468.600 | 3316.700    | 3.224      | 3319.924   | 548.00  | 21.25     | 7.01     | 3326.93        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00   | 0 .0           |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |
| 4.000    | .0050       |            |            |         |           | .0214    | .09            | 3.22       | 2.09           | 5.57           | .015           | .00             | .00   | BOX            |
|          | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   |                |

|          |          |       |          |        |       |       |         |      |      |      |       |       |     |     |     |
|----------|----------|-------|----------|--------|-------|-------|---------|------|------|------|-------|-------|-----|-----|-----|
| 2472.600 | 3316.720 | 3.205 | 3319.925 | 548.00 | 21.38 | 7.10  | 3327.02 | .00  | 5.26 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 6.492    | .0049    |       |          |        |       | .0219 | .14     | 3.20 | 2.10 | 5.63 | .015  | .00   | .00 | BOX |     |
| 2479.093 | 3316.751 | 3.173 | 3319.924 | 548.00 | 21.59 | 7.24  | 3327.16 | .00  | 5.26 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 30.508   | .0049    |       |          |        |       | .0237 | .72     | 3.17 | 2.14 | 5.63 | .015  | .00   | .00 | BOX |     |
| 2509.600 | 3316.900 | 3.025 | 3319.925 | 548.00 | 22.64 | 7.96  | 3327.89 | .00  | 5.26 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 4.000    | .0050    |       |          |        |       | .0255 | .10     | 3.03 | 2.29 | 5.57 | .015  | .00   | .00 | BOX |     |
| 2513.600 | 3316.920 | 3.006 | 3319.926 | 548.00 | 22.79 | 8.06  | 3327.99 | .00  | 5.26 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 4.000    | .0050    |       |          |        |       | .0260 | .10     | 3.01 | 2.32 | 5.57 | .015  | .00   | .00 | BOX |     |
| 2517.600 | 3316.940 | 2.987 | 3319.927 | 548.00 | 22.93 | 8.17  | 3328.09 | .00  | 5.26 | 8.00 | 8.000 | 8.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 28.300   | .0050    |       |          |        |       | .0280 | .79     | 2.99 | 2.34 | 5.59 | .015  | .00   | .00 | BOX |     |

FILE: KR-ULT.WSW
 W S P G W - CIVILDESIGN Version 14.05
 Program Package Serial Number: 1513
 WATER SURFACE PROFILE LISTING
 Date: 2- 4-2020 Time: 1:22:26

KINDLE RISE  
MAINLINE 1 - ULTIMATE CONDITION  
KINDLE RISE MAINLINE TO EX SUNSET RUN DR

| Station   | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt/or I.D. | ZL   | No Wth Prs/Pip |
|-----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|------|----------------|
| L/Elem    | Ch Slope    |            |            |         | SF Ave    | HF       | SE Dpth        | Froude N   | Norm Dp        | "N"            | X-Fall         | ZR              | Type | Ch             |
| 2545.900  | 3317.080    | 2.853      | 3319.933   | 548.00  | 24.01     | 8.95     | 3328.89        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 3.507     | .0050       |            |            |         |           | .0300    | .11            | 2.85       | 2.51           | 5.55           | .015           | .00             | .00  | BOX            |
| 2549.407  | 3317.098    | 2.836      | 3319.934   | 548.00  | 24.15     | 9.06     | 3328.99        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 28.287    | .0050       |            |            |         |           | .0324    | .92            | 2.84       | 2.53           | 5.55           | .015           | .00             | .00  | BOX            |
| 2577.694  | 3317.240    | 2.704      | 3319.945   | 548.00  | 25.33     | 9.96     | 3329.91        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 27.226    | .0050       |            |            |         |           | .0370    | 1.01           | 2.70       | 2.71           | 5.55           | .015           | .00             | .00  | BOX            |
| 2604.920  | 3317.378    | 2.578      | 3319.956   | 548.00  | 26.57     | 10.96    | 3330.92        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 26.180    | .0050       |            |            |         |           | .0423    | 1.11           | 2.58       | 2.92           | 5.55           | .015           | .00             | .00  | BOX            |
| 2631.100  | 3317.510    | 2.458      | 3319.968   | 548.00  | 27.87     | 12.06    | 3332.03        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 24.699    | .0229       |            |            |         |           | .0469    | 1.16           | 2.46       | 3.13           | 3.14           | .015           | .00             | .00  | BOX            |
| 2655.799  | 3318.075    | 2.394      | 3320.469   | 548.00  | 28.62     | 12.72    | 3333.19        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 39.522    | .0229       |            |            |         |           | .0522    | 2.06           | 2.39       | 3.26           | 3.14           | .015           | .00             | .00  | BOX            |
| 2695.322  | 3318.979    | 2.282      | 3321.262   | 548.00  | 30.02     | 13.99    | 3335.25        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 34.979    | .0229       |            |            |         |           | .0598    | 2.09           | 2.28       | 3.50           | 3.14           | .015           | .00             | .00  | BOX            |
| 2730.300  | 3319.780    | 2.176      | 3321.956   | 548.00  | 31.48     | 15.39    | 3337.34        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 30.000    | .0643       |            |            |         |           | .0639    | 1.92           | 2.18       | 3.76           | 2.17           | .015           | .00             | .00  | BOX            |
| 2760.300  | 3321.710    | 2.176      | 3323.886   | 548.00  | 31.47     | 15.38    | 3339.27        | .00        | 5.26           | 8.00           | 8.000          | 8.000           | .00  | 0              |
| - -       | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| TRANS STR | .0644       |            |            |         |           | .0585    | 6.27           | 2.18       | 3.76           |                | .015           | .00             | .00  | BOX            |

FILE: KR-ULT.WSW
 W S P G W - CIVILDESIGN Version 14.05
 Program Package Serial Number: 1513
 WATER SURFACE PROFILE LISTING
 Date: 2- 4-2020 Time: 1:22:26

KINDLE RISE  
MAINLINE 1 - ULTIMATE CONDITION  
KINDLE RISE MAINLINE TO EX SUNSET RUN DR

| 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             |
| 2867.500 | 3328.610    | 3.039      | 3331.649   | 548.00  | 30.06     | 14.03    | 3345.68        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00  | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 60.600   | .0635       |            |            |         |           | .0510    | 3.09           | 3.04       | 3.04           | 2.84           | .015           | .00             | .00  | BOX            |
| 2928.100 | 3332.460    | 3.136      | 3335.595   | 548.00  | 29.13     | 13.17    | 3348.77        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00  | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 55.130   | .0644       |            |            |         |           | .0461    | 2.54           | 3.14       | 2.90           | 2.83           | .015           | .00             | .00  | BOX            |
| 2983.231 | 3336.009    | 3.282      | 3339.291   | 548.00  | 27.83     | 12.03    | 3351.32        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00  | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -  | - -            |
| 39.567   | .0644       |            |            |         |           | .0408    | 1.61           | 3.28       | 2.71           | 2.83           | .015           | .00             | .00  | BOX            |

|          |          |       |          |        |       |       |         |      |      |      |       |       |     |     |     |
|----------|----------|-------|----------|--------|-------|-------|---------|------|------|------|-------|-------|-----|-----|-----|
| 3022.798 | 3338.556 | 3.442 | 3341.998 | 548.00 | 26.53 | 10.93 | 3352.93 | .00  | 6.37 | 6.00 | 7.000 | 6.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 29.108   | .0644    |       |          |        |       | .0360 | 1.05    | 3.44 | 2.52 | 2.83 | .015  | .00   | .00 | BOX |     |
| 3051.906 | 3340.430 | 3.610 | 3344.040 | 548.00 | 25.30 | 9.94  | 3353.98 | .00  | 6.37 | 6.00 | 7.000 | 6.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 22.326   | .0644    |       |          |        |       | .0318 | .71     | 3.61 | 2.35 | 2.83 | .015  | .00   | .00 | BOX |     |
| 3074.232 | 3341.867 | 3.786 | 3345.653 | 548.00 | 24.12 | 9.04  | 3354.69 | .00  | 6.37 | 6.00 | 7.000 | 6.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 17.552   | .0644    |       |          |        |       | .0281 | .49     | 3.79 | 2.18 | 2.83 | .015  | .00   | .00 | BOX |     |
| 3091.784 | 3342.997 | 3.971 | 3346.968 | 548.00 | 23.00 | 8.21  | 3355.18 | .00  | 6.37 | 6.00 | 7.000 | 6.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 13.992   | .0644    |       |          |        |       | .0249 | .35     | 3.97 | 2.03 | 2.83 | .015  | .00   | .00 | BOX |     |
| 3105.776 | 3343.897 | 4.165 | 3348.063 | 548.00 | 21.93 | 7.47  | 3355.53 | .00  | 6.37 | 6.00 | 7.000 | 6.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 11.224   | .0644    |       |          |        |       | .0220 | .25     | 4.17 | 1.89 | 2.83 | .015  | .00   | .00 | BOX |     |
| 3117.000 | 3344.620 | 4.368 | 3348.989 | 548.00 | 20.91 | 6.79  | 3355.78 | .00  | 6.37 | 6.00 | 7.000 | 6.000 | .00 | 0   | .0  |
| - -      | - -      | - -   | - -      | - -    | - -   | - -   | - -     | - -  | - -  | - -  | - -   | - -   | - - | - - | - - |
| 110.250  | .0230    |       |          |        |       | .0196 | 2.16    | 4.37 | 1.76 | 4.19 | .015  | .00   | .00 | BOX |     |

FILE: KR-ULT.WSW

W S P G W - CIVILDESIGN Version 14.05

PAGE 8

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 2- 4-2020 Time: 1:22:26

KINDLE RISE

MAINLINE 1 - ULTIMATE CONDITION

KINDLE RISE MAINLINE TO EX SUNSET RUN DR

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| 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        |
| *****    | *****       | *****      | *****      | *****   | *****     | *****    | *****          | *****      | *****          | *****          | *****          | *****           | ***** | *****          |
| 3227.251 | 3347.156    | 4.566      | 3351.722   | 548.00  | 20.00     | 6.21     | 3357.94        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 61.387   | .0230       |            |            |         |           | .0174    | 1.07           | 4.57       | 1.65           | 4.19           | .015           | .00             | .00   | BOX            |
| 3288.638 | 3348.569    | 4.789      | 3353.357   | 548.00  | 19.07     | 5.65     | 3359.01        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 37.108   | .0230       |            |            |         |           | .0155    | .57            | 4.79       | 1.54           | 4.19           | .015           | .00             | .00   | BOX            |
| 3325.746 | 3349.422    | 5.022      | 3354.445   | 548.00  | 18.19     | 5.14     | 3359.58        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 23.900   | .0230       |            |            |         |           | .0137    | .33            | 5.02       | 1.43           | 4.19           | .015           | .00             | .00   | BOX            |
| 3349.646 | 3349.972    | 5.268      | 3355.240   | 548.00  | 17.34     | 4.67     | 3359.91        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 15.477   | .0230       |            |            |         |           | .0122    | .19            | 5.27       | 1.33           | 4.19           | .015           | .00             | .00   | BOX            |
| 3365.123 | 3350.328    | 5.525      | 3355.853   | 548.00  | 16.53     | 4.24     | 3360.10        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 9.551    | .0230       |            |            |         |           | .0108    | .10            | 5.52       | 1.24           | 4.19           | .015           | .00             | .00   | BOX            |
| 3374.674 | 3350.548    | 5.794      | 3356.342   | 548.00  | 15.76     | 3.86     | 3360.20        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 5.084    | .0230       |            |            |         |           | .0096    | .05            | 5.79       | 1.15           | 4.19           | .015           | .00             | .00   | BOX            |
| 3379.758 | 3350.665    | 6.077      | 3356.742   | 548.00  | 15.03     | 3.51     | 3360.25        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |
| 1.542    | .0230       |            |            |         |           | .0086    | .01            | 6.08       | 1.07           | 4.19           | .015           | .00             | .00   | BOX            |
| 3381.300 | 3350.700    | 6.375      | 3357.075   | 548.00  | 14.33     | 3.19     | 3360.26        | .00        | 6.37           | 6.00           | 7.000          | 6.000           | .00   | 0              |
| - -      | - -         | - -        | - -        | - -     | - -       | - -      | - -            | - -        | - -            | - -            | - -            | - -             | - -   | - -            |

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**EXISTING KETTLE BEND ROAD STORM DRAIN  
(PARCEL QR STUB TO GOWAN)**



T1 KETTLE BEND ROAD  
 T2 KETTLE BEND (36" RCP)  
 T3 KETTLE BEND - PARCELS Q/R TO GOWAN TRIBUTARY  
 SO 1000.00 3276.77 4 .015 3283.857  
 R 1025.23 3277.61 4 .015 0.00 0.00 0  
 R 1029.23 3277.75 4 .015 0.00 -15.00 0  
 R 1033.23 3277.88 4 .015 0.00 -15.00 0  
 R 1060.68 3278.79 4 .015 0.00 -15.00 0  
 JX 1060.68 3278.79 4 1 1.015 2.00 2.00 3278.79 3278.79 75.0-90.0  
 R 1627.57 3297.66 4 .015 0.00 0.00 0  
 JX 1627.57 3297.66 4 3 .015 6.00 3297.66 90.0  
 R 1675.06 3298.31 3 .015 0.00 0.00 0  
 JX 1675.06 3298.31 3 1 1.015 1.50 1.50 3298.31 3298.31 75.0-75.0  
 R 1873.58 3301.03 3 .015 0.00 -3.00 0  
 R 1949.89 3302.07 3 .015 0.00 0.00 0  
 R 2091.85 3304.01 3 .015 0.00 0.00 0  
 JX 2091.85 3304.01 3 3 .015 2.00 3304.01 4.0  
 R 2095.85 3304.16 2 .015 0.00 13.00 0  
 R 2099.85 3304.32 2 .015 0.00 15.00 0  
 R 2103.85 3304.48 2 .015 0.00 15.00 0  
 R 2107.85 3304.63 2 .015 0.00 15.00 0  
 R 2111.85 3304.79 2 .015 0.00 15.00 0  
 R 2189.71 3307.82 2 .015 0.00 15.00 0  
 SH 2189.71 3307.82 2 .015  
 CD 1 4 0 0.00 2.00 0.00 0.00 0.00  
 CD 2 4 0 0.00 2.50 0.00 0.00 0.00  
 CD 3 4 0 0.00 3.00 0.00 0.00 0.00  
 CD 4 4 0 0.00 3.50 0.00 0.00 0.00  
 Q 42.000 .0

KETTLE BEND ROAD  
KETTLE BEND (36" RCP)  
KETTLE BEND - PARCELS Q/R TO GOWAN TRIBUTARY

| Station        | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|----------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem         | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1000.000       | 3276.770    | 7.087      | 3283.857   | 57.00   | 5.92      | .55      | 3284.40        | .00        | 2.36           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 25.230         | .0333       |            |            |         |           | .0043    | .11            | 7.09       | .00            | 1.45           | .015           | .00             | .00 | PIPE           |
| 1025.230       | 3277.610    | 6.355      | 3283.965   | 57.00   | 5.92      | .55      | 3284.51        | .00        | 2.36           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 4.000          | .0350       |            |            |         |           | .0043    | .02            | 6.35       | .00            | 1.43           | .015           | .00             | .00 | PIPE           |
| 1029.230       | 3277.750    | 6.259      | 3284.009   | 57.00   | 5.92      | .55      | 3284.55        | .00        | 2.36           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 4.000          | .0325       |            |            |         |           | .0043    | .02            | 6.26       | .00            | 1.46           | .015           | .00             | .00 | PIPE           |
| 1033.230       | 3277.880    | 6.173      | 3284.053   | 57.00   | 5.92      | .55      | 3284.60        | .00        | 2.36           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 27.450         | .0332       |            |            |         |           | .0043    | .12            | 6.17       | .00            | 1.45           | .015           | .00             | .00 | PIPE           |
| 1060.680       | 3278.790    | 5.407      | 3284.198   | 57.00   | 5.92      | .55      | 3284.74        | .00        | 2.36           | .00            | 3.500          | .000            | .00 | 0 .0           |
| JUNCT STR      | .0000       |            |            |         |           | .0040    | .00            | 5.41       | .00            | .00            | .015           | .00             | .00 | PIPE           |
| 1060.680       | 3278.790    | 5.554      | 3284.344   | 53.00   | 5.51      | .47      | 3284.82        | .00        | 2.28           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 67.141         | .0333       |            |            |         |           | .0037    | .25            | 5.55       | .00            | 1.39           | .015           | .00             | .00 | PIPE           |
| 1127.821       | 3281.025    | 3.566      | 3284.591   | 53.00   | 5.51      | .47      | 3285.06        | .00        | 2.28           | .00            | 3.500          | .000            | .00 | 0 .0           |
| HYDRAULIC JUMP |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1127.821       | 3281.025    | 1.391      | 3282.416   | 53.00   | 14.87     | 3.43     | 3285.85        | .00        | 2.28           | 3.43           | 3.500          | .000            | .00 | 0 .0           |
| 119.746        | .0333       |            |            |         |           | .0333    | 3.99           | 1.39       | 2.57           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1247.567       | 3285.011    | 1.391      | 3286.402   | 53.00   | 14.87     | 3.43     | 3289.84        | .00        | 2.28           | 3.43           | 3.500          | .000            | .00 | 0 .0           |
| 142.797        | .0333       |            |            |         |           | .0333    | 4.75           | 1.39       | 2.57           | 1.39           | .015           | .00             | .00 | PIPE           |

KETTLE BEND ROAD  
KETTLE BEND (36" RCP)  
KETTLE BEND - PARCELS Q/R TO GOWAN TRIBUTARY

| 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        |
| 1390.363 | 3289.764    | 1.391      | 3291.155   | 53.00   | 14.86     | 3.43     | 3294.59        | .00        | 2.28           | 3.43           | 3.500          | .000            | .00 | 0 .0           |
| 124.838  | .0333       |            |            |         |           | .0312    | 3.89           | 1.39       | 2.57           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1515.202 | 3293.919    | 1.442      | 3295.362   | 53.00   | 14.17     | 3.12     | 3298.48        | .00        | 2.28           | 3.45           | 3.500          | .000            | .00 | 0 .0           |
| 39.120   | .0333       |            |            |         |           | .0274    | 1.07           | 1.44       | 2.40           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1554.321 | 3295.222    | 1.495      | 3296.717   | 53.00   | 13.51     | 2.84     | 3299.55        | .00        | 2.28           | 3.46           | 3.500          | .000            | .00 | 0 .0           |
| 21.979   | .0333       |            |            |         |           | .0241    | .53            | 1.50       | 2.24           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1576.301 | 3295.953    | 1.550      | 3297.503   | 53.00   | 12.88     | 2.58     | 3300.08        | .00        | 2.28           | 3.48           | 3.500          | .000            | .00 | 0 .0           |
| 14.524   | .0333       |            |            |         |           | .0211    | .31            | 1.55       | 2.09           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1590.824 | 3296.437    | 1.608      | 3298.045   | 53.00   | 12.28     | 2.34     | 3300.39        | .00        | 2.28           | 3.49           | 3.500          | .000            | .00 | 0 .0           |
| 10.415   | .0333       |            |            |         |           | .0186    | .19            | 1.61       | 1.95           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1601.240 | 3296.783    | 1.668      | 3298.452   | 53.00   | 11.71     | 2.13     | 3300.58        | .00        | 2.28           | 3.50           | 3.500          | .000            | .00 | 0 .0           |
| 7.718    | .0333       |            |            |         |           | .0164    | .13            | 1.67       | 1.81           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1608.958 | 3297.040    | 1.731      | 3298.771   | 53.00   | 11.17     | 1.94     | 3300.71        | .00        | 2.28           | 3.50           | 3.500          | .000            | .00 | 0 .0           |
| 5.827    | .0333       |            |            |         |           | .0144    | .08            | 1.73       | 1.69           | 1.39           | .015           | .00             | .00 | PIPE           |
| 1614.785 | 3297.234    | 1.797      | 3299.031   | 53.00   | 10.65     | 1.76     | 3300.79        | .00        | 2.28           | 3.50           | 3.500          | .000            | .00 | 0 .0           |

4.372 .0333 .0127 .06 1.80 1.57 1.39 .015 .00 .00 PIPE  
1619.157 3297.380 1.867 3299.247 53.00 10.15 1.60 3300.85 .00 2.28 3.49 3.500 .000 .00 0 .0  
3.281 .0333 .0112 .04 1.87 1.46 1.39 .015 .00 .00 PIPE  
▲ FILE: KBQR.WSW W S P G W - CIVILDESIGN Version 14.05 PAGE 3  
Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 2- 4-2020 Time: 9:59:54

KETTLE BEND ROAD  
KETTLE BEND (36" RCP)

KETTLE BEND - PARCELS Q/R TO GOWAN TRIBUTARY

```
*****
Station | Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt | | No Wth
      | Elev  | (FT)  | Elev  | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
L/Elem | Ch Slope |
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
1622.438 | 3297.489 | 1.940 | 3299.429 | 53.00 | 9.68 | 1.45 | 3300.88 | .00 | 2.28 | 3.48 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
2.361 | .0333 | .0099 | .02 | 1.94 | 1.36 | 1.39 | .015 | .00 | .00 | PIPE
1624.799 | 3297.568 | 2.017 | 3299.585 | 53.00 | 9.23 | 1.32 | 3300.91 | .00 | 2.28 | 3.46 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
1.598 | .0333 | .0087 | .01 | 2.02 | 1.26 | 1.39 | .015 | .00 | .00 | PIPE
1626.397 | 3297.621 | 2.098 | 3299.719 | 53.00 | 8.80 | 1.20 | 3300.92 | .00 | 2.28 | 3.43 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
.912 | .0333 | .0077 | .01 | 2.10 | 1.17 | 1.39 | .015 | .00 | .00 | PIPE
1627.309 | 3297.651 | 2.184 | 3299.835 | 53.00 | 8.39 | 1.09 | 3300.93 | .00 | 2.28 | 3.39 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
.261 | .0333 | .0068 | .00 | 2.18 | 1.08 | 1.39 | .015 | .00 | .00 | PIPE
1627.570 | 3297.660 | 2.278 | 3299.938 | 53.00 | 8.00 | .99 | 3300.93 | .00 | 2.28 | 3.34 | 3.500 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
JUNCT STR | .0000 | .0046 | .00 | 2.28 | 1.00 | .015 | .00 | .00 | PIPE
1627.570 | 3297.660 | 2.965 | 3300.625 | 47.00 | 6.66 | .69 | 3301.31 | .00 | 2.23 | .64 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
23.586 | .0137 | .0059 | .14 | 2.97 | .35 | 1.84 | .015 | .00 | .00 | PIPE
1651.156 | 3297.983 | 2.713 | 3300.696 | 47.00 | 6.99 | .76 | 3301.45 | .00 | 2.23 | 1.76 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
10.818 | .0137 | .0060 | .06 | 2.71 | .63 | 1.84 | .015 | .00 | .00 | PIPE
1661.974 | 3298.131 | 2.554 | 3300.685 | 47.00 | 7.33 | .83 | 3301.52 | .00 | 2.23 | 2.13 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
6.900 | .0137 | .0065 | .04 | 2.55 | .75 | 1.84 | .015 | .00 | .00 | PIPE
1668.874 | 3298.226 | 2.421 | 3300.647 | 47.00 | 7.69 | .92 | 3301.56 | .00 | 2.23 | 2.37 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
1.290 | .0137 | .0069 | .01 | 2.42 | .84 | 1.84 | .015 | .00 | .00 | PIPE
*****
▲ FILE: KBQR.WSW W S P G W - CIVILDESIGN Version 14.05 PAGE 4
Program Package Serial Number: 1513
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WATER SURFACE PROFILE LISTING

Date: 2- 4-2020 Time: 9:59:54

KETTLE BEND ROAD  
KETTLE BEND (36" RCP)

KETTLE BEND - PARCELS Q/R TO GOWAN TRIBUTARY

```
*****
Station | Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt | | No Wth
      | Elev  | (FT)  | Elev  | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
L/Elem | Ch Slope |
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
1670.164 | 3298.243 | 2.390 | 3300.633 | 47.00 | 7.78 | .94 | 3301.57 | .00 | 2.23 | 2.42 | 3.000 | .000 | .00 | 0 | .0
HYDRAULIC JUMP
1670.164 | 3298.243 | 2.079 | 3300.323 | 47.00 | 8.99 | 1.25 | 3301.58 | .00 | 2.23 | 2.77 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
3.106 | .0137 | .0094 | .03 | 2.08 | 1.15 | 1.84 | .015 | .00 | .00 | PIPE
1673.270 | 3298.286 | 2.133 | 3300.419 | 47.00 | 8.74 | 1.19 | 3301.61 | .00 | 2.23 | 2.72 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
1.790 | .0137 | .0086 | .02 | 2.13 | 1.10 | 1.84 | .015 | .00 | .00 | PIPE
1675.060 | 3298.310 | 2.233 | 3300.543 | 47.00 | 8.33 | 1.08 | 3301.62 | .00 | 2.23 | 2.62 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
JUNCT STR | .0000 | .0066 | .00 | 2.23 | 1.00 | .015 | .00 | .00 | PIPE
1675.060 | 3298.310 | 2.766 | 3301.076 | 44.00 | 6.46 | .65 | 3301.72 | .00 | 2.16 | 1.61 | 3.000 | .000 | .00 | 0 | .0
      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -
10.382 | .0137 | .0051 | .05 | 2.77 | .55 | 1.76 | .015 | .00 | .00 | PIPE
1685.442 | 3298.452 | 2.627 | 3301.079 | 44.00 | 6.70 | .70 | 3301.78 | .00 | 2.16 | 1.98 | 3.000 | .000 | .00 | 0 | .0
HYDRAULIC JUMP
1685.442 | 3298.452 | 1.762 | 3300.215 | 44.00 | 10.19 | 1.61 | 3301.83 | .00 | 2.16 | 2.95 | 3.000 | .000 | .00 | 0 | .0
```

|          |          |       |          |       |       |      |         |      |      |      |       |      |     |     |      |
|----------|----------|-------|----------|-------|-------|------|---------|------|------|------|-------|------|-----|-----|------|
| 85.514   | .0137    |       |          |       |       |      | .0137   | 1.17 | 1.76 | 1.49 | 1.76  | .015 | .00 | .00 | PIPE |
| 1770.956 | 3299.624 | 1.762 | 3301.386 | 44.00 | 10.19 | 1.61 | 3303.00 | .00  | 2.16 | 2.95 | 3.000 | .000 | .00 | 0   | .0   |
| 102.624  | .0137    |       |          |       |       |      | .0137   | 1.40 | 1.76 | 1.49 | 1.76  | .015 | .00 | .00 | PIPE |
| 1873.580 | 3301.030 | 1.764 | 3302.794 | 44.00 | 10.18 | 1.61 | 3304.40 | .00  | 2.16 | 2.95 | 3.000 | .000 | .00 | 0   | .0   |
| 76.310   | .0136    |       |          |       |       |      | .0138   | 1.05 | 1.76 | 1.48 | 1.77  | .015 | .00 | .00 | PIPE |

FILE: KBQR.WSW  
 W S P G W - CIVILDESIGN Version 14.05  
 Program Package Serial Number: 1513  
 WATER SURFACE PROFILE LISTING  
 Date: 2- 4-2020 Time: 9:59:54

KETTLE BEND ROAD  
 KETTLE BEND (36" RCP)  
 KETTLE BEND - PARCELS Q/R TO GOWAN TRIBUTARY

| 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        |    |
| 1949.890  | 3302.070    | 1.753      | 3303.823   | 44.00   | 10.26     | 1.63     | 3305.46        | .00        | 2.16           | 2.96           | 3.000          | .000            | .00 | 0              | .0 |
| 59.810    | .0137       |            |            |         |           | .0143    | .86            | 1.75       | 1.50           | 1.76           | .015           | .00             | .00 | PIPE           |    |
| 2009.700  | 3302.887    | 1.722      | 3304.610   | 44.00   | 10.48     | 1.71     | 3306.31        | .00        | 2.16           | 2.97           | 3.000          | .000            | .00 | 0              | .0 |
| 51.560    | .0137       |            |            |         |           | .0157    | .81            | 1.72       | 1.55           | 1.76           | .015           | .00             | .00 | PIPE           |    |
| 2061.261  | 3303.592    | 1.656      | 3305.248   | 44.00   | 10.99     | 1.88     | 3307.12        | .00        | 2.16           | 2.98           | 3.000          | .000            | .00 | 0              | .0 |
| 30.589    | .0137       |            |            |         |           | .0178    | .54            | 1.66       | 1.67           | 1.76           | .015           | .00             | .00 | PIPE           |    |
| 2091.850  | 3304.010    | 1.594      | 3305.604   | 44.00   | 11.53     | 2.06     | 3307.67        | .00        | 2.16           | 2.99           | 3.000          | .000            | .00 | 0              | .0 |
| JUNCT STR | .0000       |            |            |         |           | .0214    | .00            | 1.59       | 1.80           |                | .015           | .00             | .00 | PIPE           |    |
| 2091.850  | 3304.010    | 1.446      | 3305.456   | 42.00   | 14.28     | 3.17     | 3308.62        | .00        | 2.17           | 2.47           | 2.500          | .000            | .00 | 0              | .0 |
| 4.000     | .0375       |            |            |         |           | .0346    | .14            | 1.45       | 2.31           | 1.41           | .015           | .00             | .00 | PIPE           |    |
| 2095.850  | 3304.160    | 1.448      | 3305.608   | 42.00   | 14.25     | 3.15     | 3308.76        | .00        | 2.17           | 2.47           | 2.500          | .000            | .00 | 0              | .0 |
| 4.000     | .0400       |            |            |         |           | .0343    | .14            | 1.45       | 2.30           | 1.38           | .015           | .00             | .00 | PIPE           |    |
| 2099.850  | 3304.320    | 1.453      | 3305.773   | 42.00   | 14.19     | 3.13     | 3308.90        | .00        | 2.17           | 2.47           | 2.500          | .000            | .00 | 0              | .0 |
| 4.000     | .0400       |            |            |         |           | .0339    | .14            | 1.45       | 2.28           | 1.38           | .015           | .00             | .00 | PIPE           |    |
| 2103.850  | 3304.480    | 1.459      | 3305.938   | 42.00   | 14.13     | 3.10     | 3309.04        | .00        | 2.17           | 2.46           | 2.500          | .000            | .00 | 0              | .0 |
| 4.000     | .0375       |            |            |         |           | .0336    | .13            | 1.46       | 2.27           | 1.41           | .015           | .00             | .00 | PIPE           |    |
| 2107.850  | 3304.630    | 1.462      | 3306.092   | 42.00   | 14.08     | 3.08     | 3309.17        | .00        | 2.17           | 2.46           | 2.500          | .000            | .00 | 0              | .0 |
| 4.000     | .0400       |            |            |         |           | .0332    | .13            | 1.46       | 2.26           | 1.38           | .015           | .00             | .00 | PIPE           |    |

FILE: KBQR.WSW  
 W S P G W - CIVILDESIGN Version 14.05  
 Program Package Serial Number: 1513  
 WATER SURFACE PROFILE LISTING  
 Date: 2- 4-2020 Time: 9:59:54

KETTLE BEND ROAD  
 KETTLE BEND (36" RCP)  
 KETTLE BEND - PARCELS Q/R TO GOWAN TRIBUTARY

| 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        |    |
| 2111.850 | 3304.790    | 1.468      | 3306.258   | 42.00   | 14.01     | 3.05     | 3309.31        | .00        | 2.17           | 2.46           | 2.500          | .000            | .00 | 0              | .0 |
| 19.652   | .0389       |            |            |         |           | .0318    | .62            | 1.47       | 2.24           | 1.39           | .015           | .00             | .00 | PIPE           |    |
| 2131.502 | 3305.555    | 1.505      | 3307.060   | 42.00   | 13.59     | 2.87     | 3309.93        | .00        | 2.17           | 2.45           | 2.500          | .000            | .00 | 0              | .0 |
| 19.670   | .0389       |            |            |         |           | .0288    | .57            | 1.51       | 2.13           | 1.39           | .015           | .00             | .00 | PIPE           |    |
| 2151.172 | 3306.320    | 1.567      | 3307.887   | 42.00   | 12.96     | 2.61     | 3310.50        | .00        | 2.17           | 2.42           | 2.500          | .000            | .00 | 0              | .0 |
| 12.797   | .0389       |            |            |         |           | .0255    | .33            | 1.57       | 1.97           | 1.39           | .015           | .00             | .00 | PIPE           |    |
| 2163.969 | 3306.818    | 1.633      | 3308.451   | 42.00   | 12.36     | 2.37     | 3310.82        | .00        | 2.17           | 2.38           | 2.500          | .000            | .00 | 0              | .0 |
| 8.915    | .0389       |            |            |         |           | .0227    | .20            | 1.63       | 1.82           | 1.39           | .015           | .00             | .00 | PIPE           |    |
| 2172.884 | 3307.165    | 1.704      | 3308.869   | 42.00   | 11.78     | 2.16     | 3311.03        | .00        | 2.17           | 2.33           | 2.500          | .000            | .00 | 0              | .0 |
| 6.470    | .0389       |            |            |         |           | .0202    | .13            | 1.70       | 1.68           | 1.39           | .015           | .00             | .00 | PIPE           |    |





# **APPENDIX D**

## **REFERENCE MATERIAL**

**UPDATE #2 TO THE  
MASTERDRAINAGE STUDY FOR  
SUMMERLIN WEST PLANNING AREA  
(CLV DS4926)**

|                                                                                                    |                                                                    |    |                                                                                                   |  |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----|---------------------------------------------------------------------------------------------------|--|
| <b>CITY OF LAS VEGAS</b>                                                                           |                                                                    |    | <b>DATE: Revised</b>                                                                              |  |
| <b>INTER-OFFICE MEMORANDUM</b>                                                                     |                                                                    |    | January 21, 2020                                                                                  |  |
| <b>TO:</b><br>Land Development Services<br>Department of Building & Safety                         |                                                                    |    | <b>FROM:</b><br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |  |
| <b>SUBJECT:</b> Drainage Study for:<br><b>Summerlin West Planning Area Master Plan - Update #2</b> |                                                                    |    | <b>COPIES TO:</b><br>VTN Nevada                                                                   |  |
| <b>Cross Streets:</b>                                                                              | West of I-215 between Lake Mead Boulevard and Charleston Boulevard |    | The Howard Hughes Corporation                                                                     |  |
| <b>File Number:</b>                                                                                | F:\Depot\DSMemos\DS4926L-Rev.doc                                   |    | Bart Anderson, P.E., DevCo                                                                        |  |
| <b>Parcel Number:</b>                                                                              | 137-22-000-017 & more                                              |    | CCRFCFCD                                                                                          |  |
| <b>Zoning Action:</b>                                                                              | N/A                                                                |    | CCPW                                                                                              |  |
| <b>FEMA Flood Zone</b>                                                                             | YES                                                                | NO | <b>X</b>                                                                                          |  |
| <b>Proposed Storm Drain</b>                                                                        | YES                                                                | NO | <b>X</b>                                                                                          |  |

| HISTORY                                  | DATE RECEIVED                  | DATE REVIEWED          | COMMENTS                   | REVIEW FEES       | FEES PAID<br>Payment Trn # |
|------------------------------------------|--------------------------------|------------------------|----------------------------|-------------------|----------------------------|
| 1 <sup>st</sup> Submittal                | 10/9/2017 & 10/25/2017         | 11/8/2017              | Not Approved               | \$400.00          | 490518: \$400              |
| 2 <sup>nd</sup> Submittal                | 12/6/2017                      | 12/20/2017 & 1/10/2018 | Not Approved               | \$400.00          | 492005: \$400              |
| 3 <sup>rd</sup> Submittal                | 2/27/2018                      | 3/24/2018              | Not Approved               | \$400.00          | 493739: \$400              |
| 4 <sup>th</sup> Submittal & Supplement   | 4/23/2018 & 5/22/2018          | 5/22/2018              | See Comments Below         | \$400.00          | 495223: \$400              |
| CCPW & CCRFCFCD                          | 7/30/2018                      | 7/30/2018              | Concurrence Recv'd         | N/C               | N/C                        |
| 5 <sup>th</sup> Submittal                | 1/3/2019<br>(Paid on 1/7/2019) | 1/30/2019              | Not Approved               | \$100.00          | 502286: \$100              |
| 6 <sup>th</sup> Submittal                | 2/19/2019                      | 3/13/2019              | Conditional Approval       | \$400.00          | 503267: \$400              |
| CCPW & CCRFCFCD                          | 4/15/2019                      | 4/17/2019              | Concurrence Recv'd         | N/C               | N/C                        |
| 7 <sup>th</sup> Submittal                | 10/28/2019                     | 12/2/2019              | Not Approved               | \$100.00          | 3625174: \$100             |
| 8 <sup>th</sup> Submittal – Mass Grading | 11/19/2019 & 11/27/2019        | 11/25/2019             | Conditionally Approved     | \$100.00          | 3645141: \$100             |
| 9 <sup>th</sup> Submittal & Supplement   | 12/17/2019 & 1/21/2020         | 1/21/2019              | Conditional Approval       | \$400.00          | 3679639: \$400             |
| Revised Memo                             | 1/23/2020                      | 1/23/2020              | See Comments Below         | N/C               | N/C                        |
|                                          |                                |                        | <b>TOTAL FEES (LDDRS):</b> | <b>\$2,700.00</b> | ----                       |

**REMARKS:**

**9<sup>th</sup> Submittal: Addendum & Supplement to Update #2**

8<sup>th</sup> Submittal: Update for Mass Grading ONLY within V21 and V25

7<sup>th</sup> Submittal: Update #2 to refine the overall drainage basins model

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

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

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

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

1. **This update is acceptable in concept**; however, *City of Las Vegas* will not formally accept the study until the *Clark County Regional Flood Control District (CCRFCD)* has issued a letter of concurrence. The engineer should contact the CCRFCD to confirm that they have begun their review.
2. The subject Update #2 to the Summerlin West Planning Area is premised on the *DB5 Modifications* (ie, Enhancement) for regulating the downstream outflows. A technical drainage study for *DB5 Modifications* must be submitted for review and approval prior to any upstream Villages development with the exception of Villages 21 and 22.

**The following comments are repeated until they are complete:**

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

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

**END OF REMARKS**  
WSP/AYS/PBJ

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







**UPDATE #2**  
**MASTER CONCEPTUAL DRAINAGE STUDY FOR**  
**SUMMERLIN WEST VILLAGE 22**  
**(CLV DS5005)**

|                                                                                                                              |                                           |          |                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------|---------------------------------------------------------------------------------------------------|
| <b>CITY OF LAS VEGAS</b>                                                                                                     |                                           |          | <b>DATE:</b>                                                                                      |
| <b>INTER-OFFICE MEMORANDUM</b>                                                                                               |                                           |          | January 23, 2020                                                                                  |
| <b>TO:</b><br>Land Development Services<br>Department of Building & Safety                                                   |                                           |          | <b>FROM:</b><br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |
| <b>SUBJECT:</b> Drainage Study for:<br><b>Master Conceptual Drainage Study for – Update #2<br/>Summerlin West Village 22</b> |                                           |          | <b>COPIES TO:</b><br>VTN Nevada                                                                   |
| <b>Cross Streets:</b>                                                                                                        | I-215 Western Beltway & Summerlin Parkway |          | Howard Hughes Company, LLC                                                                        |
| <b>File Number:</b>                                                                                                          | F:\Depot\DSMemos\DS5005H.doc              |          | Bart Anderson, P.E., DevCo                                                                        |
| <b>Parcel Number:</b>                                                                                                        | 137-14-401-006, 137-23-101-002            |          | CCRFCFCD                                                                                          |
| <b>Zoning Action:</b>                                                                                                        | MDR-73901                                 |          | CCPW                                                                                              |
| <b>FEMA Flood Zone</b>                                                                                                       | YES                                       | NO       | <b>X</b>                                                                                          |
| <b>Proposed Storm Drain</b>                                                                                                  | YES                                       | <b>X</b> | NO                                                                                                |

| HISTORY                   | DATE RECEIVED         | DATE REVIEWED         | COMMENTS                   | REVIEW FEES       | FEES PAID<br>Payment Trn # |
|---------------------------|-----------------------|-----------------------|----------------------------|-------------------|----------------------------|
| 1 <sup>st</sup> Submittal | 6/12/2018             | 6/28/2018 & 7/13/2018 | Not Approved               | \$400.00          | 49696: \$400               |
| 2 <sup>nd</sup> Submittal | 7/31/2018             | 8/22/2018             | Not Approved               | \$400.00          | 497790: \$400              |
| 3 <sup>rd</sup> Submittal | 11/5/2018             | 11/27/2018            | Conditional Approval       | \$400.00          | 500639: \$400              |
| Memo Revision             | 12/3/2018             | 12/3/2018             | Conditional Approval       | N/C               | N/C                        |
| CCRFCFCD                  | 1/10/2019             | 1/10/2019             | Concurrence Recv'd         | N/C               | N/C                        |
| 4 <sup>th</sup> Submittal | 2/12/2019             | 3/6/2019              | Not Approved               | \$100.00          | 503164: \$100              |
| 5 <sup>th</sup> Submittal | 3/21/2019             | 4/4/2019              | Conditional Approval       | \$400.00          | 3057847: \$400             |
| CCPW & CCRFCFCD           | 4/25/2019 & 5/23/2019 | 5/29/2019             | Concurrence Received       | N/C               | N/C                        |
| 6 <sup>th</sup> Submittal | 11/13/2019            | 12/10/2019            | Conditional Approval       | \$100.00          | 3644006: \$100             |
| Memo Revision             | 12/12/2019            | 12/12/2019            | Conditional Approval       | N/C               | N/C                        |
| CCPW & CCRFCFCD           | 1/13/2020 & 1/16/2020 | 1/23/2020             | Concurrence Recv'd         | N/C               | N/C                        |
|                           |                       |                       | <b>TOTAL FEES (LDDRS):</b> | <b>\$1,800.00</b> |                            |

**REMARKS:**

**6<sup>th</sup> Submittal: Update #2 to address Village 22 Overall Development Plan changes**

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

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

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

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

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

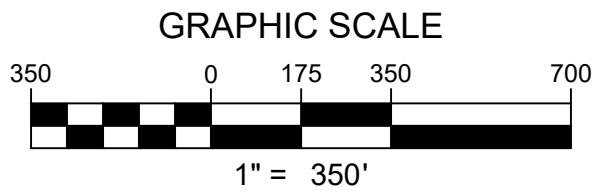
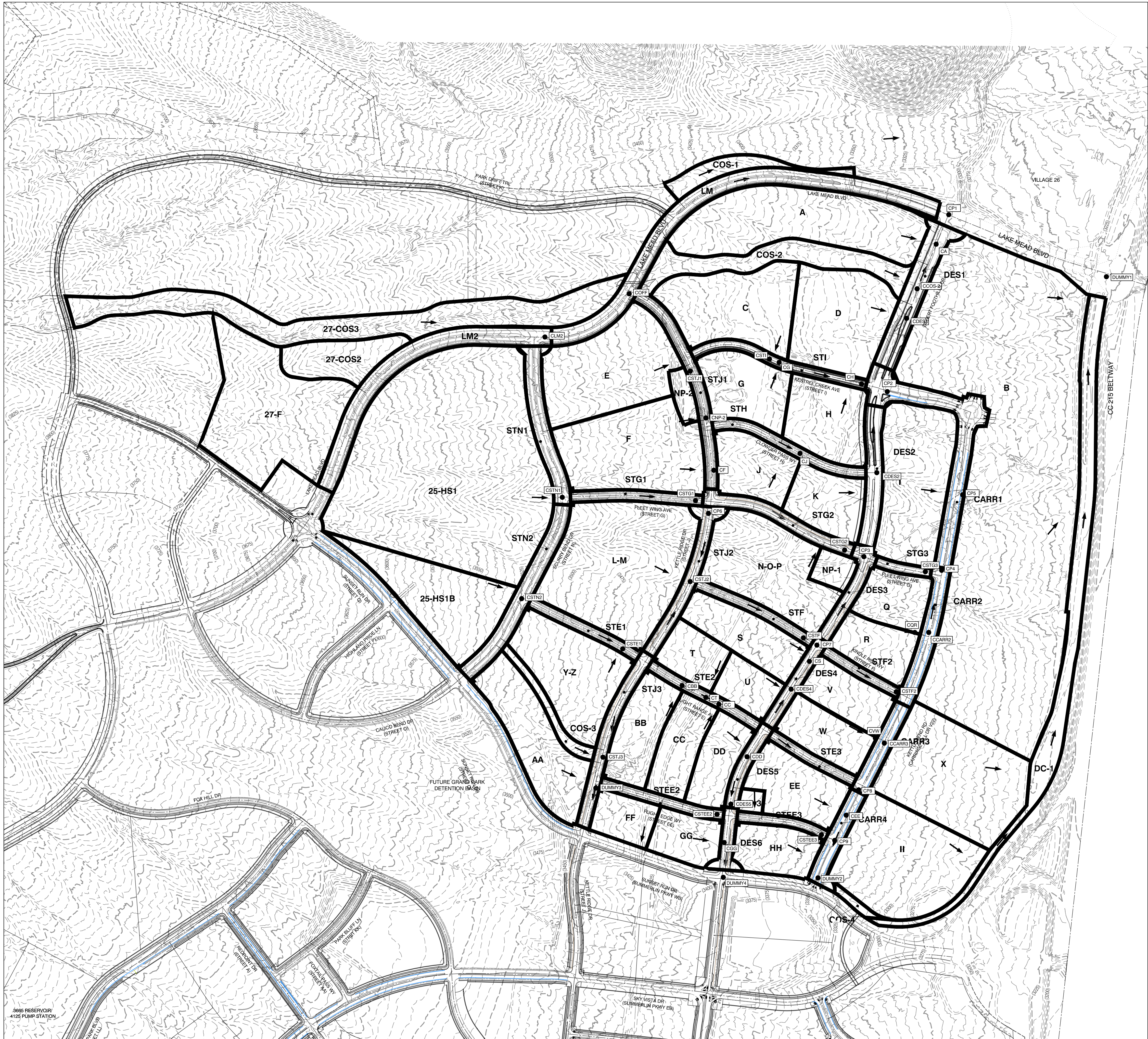
**NOTE:** Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally,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

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

**END OF REMARKS**  
WSP/AYS

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





LEGEND

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

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

THE HOWARD HUGHES COMPANY, LLC

FIGURE 6  
ULTIMATE CONDITION BASIN MAP

DRAWN BY: JVA  
DESIGNED BY: JVA  
CHECKED BY: JVA  
PROJECT NO: 2801

SHEET  
OF SHEETS  
DRAWING NO.

10801 WEST CHARLESTON BLVD, 3RD FLOOR  
LAS VEGAS, NEVADA 89135

SUMMERLIN WEST VILLAGE 22

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

REVISION  
BY  
DATE  
REV



**DRAINAGE STUDY FOR  
SUMMERLIN WEST VILLAGE 22  
KETTLE BEND ROAD  
(CLV DS5204)**



|                                                                                                                                               |                                      |                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>CITY OF LAS VEGAS</b>                                                                                                                      |                                      | <b>DATE:</b>                                                                                      |
| <b>INTER-OFFICE MEMORANDUM</b>                                                                                                                |                                      | <b>November 22, 2019</b>                                                                          |
| <b>TO:</b><br>Land Development Services<br>Department of Building & Safety                                                                    |                                      | <b>FROM:</b><br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |
| <b>SUBJECT:</b> Drainage Study for:<br><b>Summerlin West Village 22 - Kettle Bend Road</b><br><b>(Sunset Run Drive to Kestrel Creek Road)</b> |                                      | <b>COPIES TO:</b><br>VTN Nevada                                                                   |
| <b>Cross Streets:</b>                                                                                                                         | Kettle Bend Road & Summerlin Parkway | The Howard Hughes Company, LLC                                                                    |
| <b>File Number:</b>                                                                                                                           | F:\Depot\DSMemos\DS05204A.doc        | Bart Anderson, P.E., DevCo                                                                        |
| <b>Parcel Number:</b>                                                                                                                         | 137-23-101-002                       | CCRFCD                                                                                            |
| <b>Zoning Action:</b>                                                                                                                         | N/A                                  |                                                                                                   |
| <b>FEMA Flood Zone</b>                                                                                                                        | YES NO <b>X</b>                      |                                                                                                   |
| <b>Proposed Storm Drain</b>                                                                                                                   | YES <b>X</b> NO                      |                                                                                                   |

| HISTORY                    | DATE RECEIVED | DATE REVIEWED | COMMENTS           | REVIEW FEES     | FEES PAID<br>Payment Trn # |
|----------------------------|---------------|---------------|--------------------|-----------------|----------------------------|
| 1 <sup>st</sup> Submittal  | 10/15/2019    | 11/20/2019    | See Comments Below | \$400.00        | 3611329: \$400             |
| <b>TOTAL FEES (LDDRS):</b> |               |               |                    | <b>\$400.00</b> | <b>----</b>                |

#### 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:         |
| <b>X</b> | must be resubmitted or supplemented including the following:                                   |
|          | is conditionally approved subject to Clark County Regional Flood Control District concurrence. |
|          | is conditionally approved subject to Clark County Public Works Department concurrence.         |

1. An *Update to the Master Drainage Study for Summerlin West Village 22* recently has been submitted for review. The subject drainage study will not be approved prior to the final approval of the *Update to the Master Drainage Study for Village 22*.
2. The subject drainage study is premised on the developed *Sunset Run Drive (Summerlin Parkway Extension West Bound)* to the south. The subject improvement plans will not be approved prior to the execution of the construction bond of *Summerlin West V21 – Summerlin Parkway Extension* and the associated facilities.
3. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

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

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

4. The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Kettle Bend Road* and a 20'-wide *Interim Berm*. Prior to final plan approval the developer must complete a **Maintenance & Liability Agreement** for the interim drainage improvements and post a minimum maintenance bond of \$50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City of Las Vegas Flood Control* for approval. Once the drainage study is conditionally approved, the engineer should contact the *City's Land Development Section* (229-6371) to begin the agreement process.

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

5. The street and the associated storm drain facilities will eventually be transferred to the *City of Las Vegas*, the engineer/developer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final acceptance of the subject improvement plans.
6. Drop inlets deeper than 10' require special structural design and structural calculations. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *City of Las Vegas Building & Safety Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.
7. All special structures and mainline storm drain connection require details and structural calculations to be reviewed by the *City of Las Vegas Building & Safety Department*. Approval by the *Building Department* must be obtained prior to the final approval of the subject drainage study.
8. **Figure 6 (Existing Condition Map)**: Within offsite basin "OFF3", it appears that an existing channel swale running south to northeast at about 600' west of the basin's east boundary will in fact divert portion of OFF3's flow to the north. In other words, the totality of OFF3's flow will not convey through OFF5 as shown. Address and resolve in the next submittal.
9. **Figure 6 (Existing Condition Map)**: Existing Condition HEC-1 Summary Table does not match the provided HEC-1 run. For example OFF3 lists 64 cfs however, the HEC-1 lists 226 cfs for the OFF3. The  $Q_{100}$  values of other basins in Figure 6 are all mixed up or wrong. Exercise better quality control in the next submittal.
10. Provide additional reference material that shows how the Atkins reference flow is getting to the locations shown in Interim Condition 1 and Interim Condition 2. The provided Atkins exhibit of the reference flow line does not show enough information, provide Atkins grading plans that show how and where that flow is to be channelized.
11. Provide inlet capture/capacity calculations for all proposed inlets.
12. Provide CN calculations for basins HH and NP-4. The CN basins calculation table seems being abruptly cutoff.
13. Provide precipitation map with basins overlaid for all scenarios including *Existing*, *Interim Condition 1*, *Interim Condition 2*, and *Ultimate*.
14. Interim flowmaster cross sections SW5A, SW5B, and SW6 are not analyzed for the correct flows. For example per Figure 7A SW5A should be analyzed for 5 cfs however the flowmaster report input is 6 cfs. Double check all pertinent calculations in Flowmaster accordingly.
15. Verify the slope for interim channel SW8. Flowmaster report input is 22.87% however the summary table in Figure 7B lists 25.14%. Double check all pertinent calculations accordingly.

16. Velocities in *Krestel Creek Street* to Gowan Tributary model are over 25 fps between stations 1645 and 1951. All locations with 100-year flow velocities greater than 25 fps require 1" sacrificial concrete in the bottom storm drain pipe for erosion.

17. **Sheet UT1:** Provide a note and connection detail between the new and existing 8'x8' regional box culvert.

18. **Sheet UT44:** The plan and the profile did not clearly show how a 30"-RCP round pipe connect to a 6'x6' square shape box culvert. It appears that a special junction structure is required. Address in the next submittal.

19. In all interim sump pits, provide barricade for security.

20. 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.

21. 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*).

22. Revise all drop inlets to Type "C-D" Modified Drop Inlet per Standard Drawing 412.1 or Neenah Pre-cast inlets. Revise all pertinent construction notes and callouts accordingly.

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

**END OF REMARKS**  
HDR/AYS

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

T1 KETTLE BEND ROAD  
 T2 KETTLE BEND (42" RCP)  
 T3 KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY  
 SO 1000.00 3276.77 4 .015 3283.626  
 R 1025.23 3277.61 4 .015 0.00 0.00 0  
 R 1029.23 3277.75 4 .015 0.00 -15.00 0  
 R 1033.23 3277.88 4 .015 0.00 -15.00 0  
 R 1060.68 3278.79 4 .015 0.00 -15.00 0  
 JX 1060.68 3278.79 4 1 1.015 2.00 2.00 3278.79 3278.79 75.0-90.0  
 R 1627.57 3297.66 4 .015 0.00 0.00 0  
 JX 1627.57 3297.66 4 2 .015 40.00 3297.66 90.0  
 R 1631.57 3297.75 3 .015 0.00 13.00 0  
 R 1635.57 3297.84 3 .015 0.00 15.00 0  
 R 1639.57 3297.92 3 .015 0.00 15.00 0  
 R 1643.57 3298.01 3 .015 0.00 15.00 0  
 R 1647.57 3298.09 3 .015 0.00 15.00 0  
 R 1679.82 3298.78 3 .015 0.00 15.00 0  
 SH 1679.82 3298.78 3 .015 0.00 0.00 0  
  
 CD 1 4 0 0.00 2.00 0.00 0.00 0.00  
 CD 2 4 0 0.00 2.50 0.00 0.00 0.00  
 CD 3 4 0 0.00 3.00 0.00 0.00 0.00  
 CD 4 4 0 0.00 3.50 0.00 0.00 0.00  
 Q 81.000 .0



KETTLE BEND ROAD  
KETTLE BEND (42" RCP)  
KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY

| Station        | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt/or I.D. | ZL  | No Wth Prs/Pip |
|----------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem         | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1000.000       | 3276.770    | 6.856      | 3283.626   | 125.00  | 12.99     | 2.62     | 3286.25        | .00        | 3.28           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 25.230         | .0333       |            |            |         |           | .0206    | .52            | 6.86       | .00            | 2.34           | .015           | .00             | .00 | PIPE           |
| 1025.230       | 3277.610    | 6.534      | 3284.145   | 125.00  | 12.99     | 2.62     | 3286.77        | .00        | 3.28           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 4.000          | .0350       |            |            |         |           | .0206    | .08            | 6.53       | .00            | 2.30           | .015           | .00             | .00 | PIPE           |
| 1029.230       | 3277.750    | 6.606      | 3284.356   | 125.00  | 12.99     | 2.62     | 3286.98        | .00        | 3.28           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 4.000          | .0325       |            |            |         |           | .0206    | .08            | 6.61       | .00            | 2.36           | .015           | .00             | .00 | PIPE           |
| 1033.230       | 3277.880    | 6.689      | 3284.568   | 125.00  | 12.99     | 2.62     | 3287.19        | .00        | 3.28           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 27.450         | .0332       |            |            |         |           | .0206    | .56            | 6.69       | .00            | 2.34           | .015           | .00             | .00 | PIPE           |
| 1060.680       | 3278.790    | 6.472      | 3285.262   | 125.00  | 12.99     | 2.62     | 3287.88        | .00        | 3.28           | .00            | 3.500          | .000            | .00 | 0 .0           |
| JUNCT STR      | .0000       |            |            |         |           | .0199    | .00            | 6.47       | .00            | .00            | .015           | .00             | .00 | PIPE           |
| 1060.680       | 3278.790    | 6.801      | 3285.591   | 121.00  | 12.58     | 2.46     | 3288.05        | .00        | 3.26           | .00            | 3.500          | .000            | .00 | 0 .0           |
| 155.135        | .0333       |            |            |         |           | .0193    | 2.99           | 6.80       | .00            | 2.28           | .015           | .00             | .00 | PIPE           |
| 1215.815       | 3283.954    | 4.623      | 3288.577   | 121.00  | 12.58     | 2.46     | 3291.03        | .00        | 3.26           | .00            | 3.500          | .000            | .00 | 0 .0           |
| HYDRAULIC JUMP |             |            |            |         |           |          |                |            |                |                |                |                 |     |                |
| 1215.815       | 3283.954    | 2.287      | 3286.241   | 121.00  | 18.17     | 5.12     | 3291.37        | .00        | 3.26           | 3.33           | 3.500          | .000            | .00 | 0 .0           |
| 114.360        | .0333       |            |            |         |           | .0330    | 3.78           | 2.29       | 2.26           | 2.28           | .015           | .00             | .00 | PIPE           |
| 1330.176       | 3287.761    | 2.292      | 3290.053   | 121.00  | 18.11     | 5.09     | 3295.15        | .00        | 3.26           | 3.33           | 3.500          | .000            | .00 | 0 .0           |
| 165.276        | .0333       |            |            |         |           | .0311    | 5.14           | 2.29       | 2.25           | 2.28           | .015           | .00             | .00 | PIPE           |

KETTLE BEND ROAD  
KETTLE BEND (42" RCP)  
KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY

| 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        |
| 1495.452  | 3293.262    | 2.391      | 3295.653   | 121.00  | 17.27     | 4.63     | 3300.28        | .00        | 3.26           | 3.26           | 3.500          | .000            | .00 | 0 .0           |
| 56.124    | .0333       |            |            |         |           | .0277    | 1.55           | 2.39       | 2.08           | 2.28           | .015           | .00             | .00 | PIPE           |
| 1551.576  | 3295.130    | 2.498      | 3297.628   | 121.00  | 16.47     | 4.21     | 3301.84        | .00        | 3.26           | 3.16           | 3.500          | .000            | .00 | 0 .0           |
| 31.357    | .0333       |            |            |         |           | .0247    | .78            | 2.50       | 1.90           | 2.28           | .015           | .00             | .00 | PIPE           |
| 1582.932  | 3296.174    | 2.613      | 3298.787   | 121.00  | 15.70     | 3.83     | 3302.61        | .00        | 3.26           | 3.04           | 3.500          | .000            | .00 | 0 .0           |
| 19.953    | .0333       |            |            |         |           | .0222    | .44            | 2.61       | 1.74           | 2.28           | .015           | .00             | .00 | PIPE           |
| 1602.885  | 3296.838    | 2.740      | 3299.578   | 121.00  | 14.97     | 3.48     | 3303.06        | .00        | 3.26           | 2.89           | 3.500          | .000            | .00 | 0 .0           |
| 13.187    | .0333       |            |            |         |           | .0201    | .26            | 2.74       | 1.58           | 2.28           | .015           | .00             | .00 | PIPE           |
| 1616.072  | 3297.277    | 2.882      | 3300.159   | 121.00  | 14.27     | 3.16     | 3303.32        | .00        | 3.26           | 2.67           | 3.500          | .000            | .00 | 0 .0           |
| 8.190     | .0333       |            |            |         |           | .0183    | .15            | 2.88       | 1.41           | 2.28           | .015           | .00             | .00 | PIPE           |
| 1624.262  | 3297.550    | 3.047      | 3300.597   | 121.00  | 13.61     | 2.88     | 3303.47        | .00        | 3.26           | 2.35           | 3.500          | .000            | .00 | 0 .0           |
| 3.308     | .0333       |            |            |         |           | .0171    | .06            | 3.05       | 1.23           | 2.28           | .015           | .00             | .00 | PIPE           |
| 1627.570  | 3297.660    | 3.256      | 3300.916   | 121.00  | 12.97     | 2.61     | 3303.53        | .00        | 3.26           | 1.78           | 3.500          | .000            | .00 | 0 .0           |
| JUNCT STR | .0000       |            |            |         |           | .0126    | .00            | 3.26       | 1.00           | .00            | .015           | .00             | .00 | PIPE           |
| 1627.570  | 3297.660    | 6.166      | 3303.826   | 81.00   | 11.46     | 2.04     | 3305.87        | .00        | 2.78           | .00            | 3.000          | .000            | .00 | 0 .0           |

|          |          |       |          |       |       |       |         |      |      |      |       |      |     |      |
|----------|----------|-------|----------|-------|-------|-------|---------|------|------|------|-------|------|-----|------|
| 4.000    | .0225    |       |          |       |       | .0196 | .08     | 6.17 | .00  | 2.30 | .015  | .00  | .00 | PIPE |
| 1631.570 | 3297.750 | 6.242 | 3303.992 | 81.00 | 11.46 | 2.04  | 3306.03 | .00  | 2.78 | .00  | 3.000 | .000 | .00 | 0 .0 |
| 4.000    | .0225    |       |          |       |       | .0196 | .08     | 6.24 | .00  | 2.30 | .015  | .00  | .00 | PIPE |

FILE: KBQR.WSW      W S P G W - CIVILDESIGN Version 14.05      PAGE 3  
 Program Package Serial Number: 1513  
 WATER SURFACE PROFILE LISTING      Date: 1-13-2020 Time: 9:39:39

KETTLE BEND ROAD  
 KETTLE BEND (42" RCP)  
 KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY

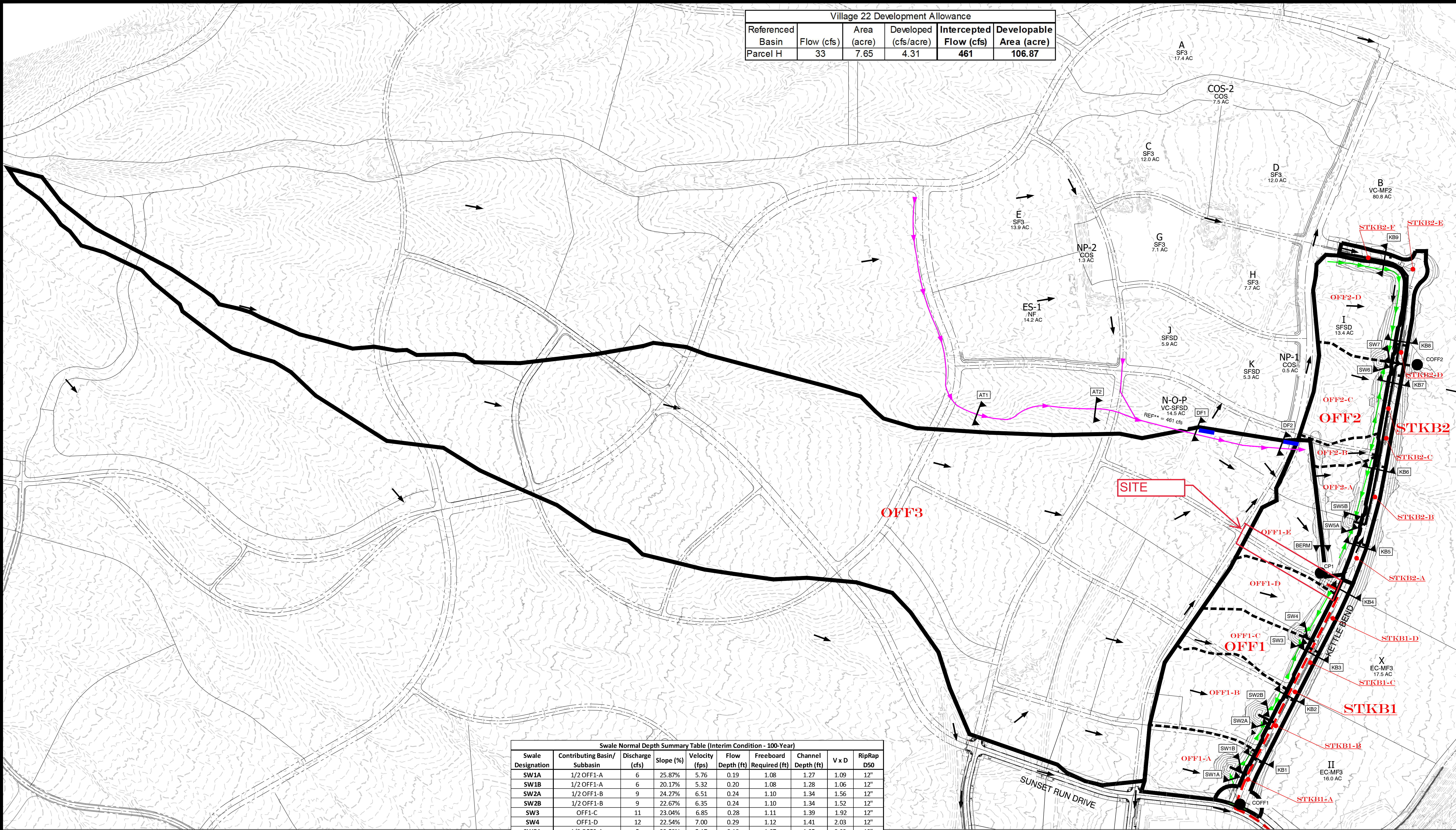
\*\*\*\*\*

| 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  |
|----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|---------|
| L/Elem   | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch |
| 1635.570 | 3297.840    | 6.332      | 3304.172   | 81.00   | 11.46     | 2.04     | 3306.21        | .00        | 2.78           | .00            | 3.000          | .000            | .00 | 0 .0    |
| 4.000    | .0200       |            |            |         |           | .0196    | .08            | 6.33       | .00            | 2.44           | .015           | .00             | .00 | PIPE    |
| 1639.570 | 3297.920    | 6.431      | 3304.351   | 81.00   | 11.46     | 2.04     | 3306.39        | .00        | 2.78           | .00            | 3.000          | .000            | .00 | 0 .0    |
| 4.000    | .0225       |            |            |         |           | .0196    | .08            | 6.43       | .00            | 2.30           | .015           | .00             | .00 | PIPE    |
| 1643.570 | 3298.010    | 6.521      | 3304.531   | 81.00   | 11.46     | 2.04     | 3306.57        | .00        | 2.78           | .00            | 3.000          | .000            | .00 | 0 .0    |
| 4.000    | .0200       |            |            |         |           | .0196    | .08            | 6.52       | .00            | 2.43           | .015           | .00             | .00 | PIPE    |
| 1647.570 | 3298.090    | 6.620      | 3304.710   | 81.00   | 11.46     | 2.04     | 3306.75        | .00        | 2.78           | .00            | 3.000          | .000            | .00 | 0 .0    |
| 32.250   | .0214       |            |            |         |           | .0196    | .63            | 6.62       | .00            | 2.35           | .015           | .00             | .00 | PIPE    |
| 1679.820 | 3298.780    | 6.664      | 3305.444   | 81.00   | 11.46     | 2.04     | 3307.48        | .00        | 2.78           | .00            | 3.000          | .000            | .00 | 0 .0    |

^



| Village 22 Development Allowance |            |             |                      |                        |                         |
|----------------------------------|------------|-------------|----------------------|------------------------|-------------------------|
| Referenced Basin                 | Flow (cfs) | Area (acre) | Developed (cfs/acre) | Intercepted Flow (cfs) | Developable Area (acre) |
| Parcel H                         | 33         | 7.65        | 4.31                 | 461                    | 106.87                  |



| Swale Normal Depth Summary Table (Interim Condition - 100-Year) |                       |                 |           |                |                 |                         |                    |       |            |
|-----------------------------------------------------------------|-----------------------|-----------------|-----------|----------------|-----------------|-------------------------|--------------------|-------|------------|
| Swale Designation                                               | Contributing Subbasin | Discharge (cfs) | Slope (%) | Velocity (fps) | Flow Depth (ft) | Freeboard Required (ft) | Channel Depth (ft) | V x D | RipRap D50 |
| SW1A                                                            | 1/2 OFF1-A            | 6               | 25.87%    | 5.76           | 0.19            | 1.08                    | 1.27               | 1.09  | 12"        |
| SW1B                                                            | 1/2 OFF1-A            | 6               | 20.17%    | 5.32           | 0.20            | 1.08                    | 1.28               | 1.06  | 12"        |
| SW2A                                                            | 1/2 OFF1-B            | 9               | 24.27%    | 6.51           | 0.24            | 1.10                    | 1.34               | 1.56  | 12"        |
| SW2B                                                            | 1/2 OFF1-B            | 9               | 22.67%    | 6.35           | 0.24            | 1.10                    | 1.34               | 1.52  | 12"        |
| SW3                                                             | OFF1-C                | 11              | 23.04%    | 6.85           | 0.28            | 1.11                    | 1.39               | 1.92  | 12"        |
| SW4                                                             | OFF1-D                | 12              | 22.54%    | 7.00           | 0.29            | 1.12                    | 1.41               | 2.03  | 12"        |
| SW5A                                                            | 1/3 OFF2-A            | 5               | 22.59%    | 5.17           | 0.18            | 1.07                    | 1.25               | 0.93  | 12"        |
| SW5B                                                            | 2/3 OFF2-A            | 9               | 1.00%     | 3.07           | 0.46            | 1.00                    | 1.46               | 1.41  | N/A        |
| SW6                                                             | OFF2-C                | 18              | 25.14%    | 8.31           | 0.36            | 1.15                    | 1.51               | 2.99  | 12"        |
| SW7                                                             | OFF2-D                | 23              | 21.85%    | 8.59           | 0.43            | 1.16                    | 1.59               | 3.69  | 12"        |
| BERM                                                            | CP1                   | 707             | 1.00%     | 7.64           | 4.78            | 1.32                    | 6.10               | 36.52 | 8"         |
| DF1                                                             | OFF3+REF**            | 694             | 0.90%     | 7.58           | 2.42            | 1.25                    | 3.67               | 18.34 | 8"         |
| DF2                                                             | OFF3+REF**            | 694             | 2.40%     | 9.63           | 1.90            | 1.30                    | 3.20               | 18.30 | 8"         |
| AT1                                                             | REF**                 | 461             | 9.86%     | 18.28          | 1.78            | Existing                | 1.78               | 32.54 | N/A        |
| AT2                                                             | REF**                 | 461             | 7.58%     | 17.96          | 1.95            | Existing                | 1.95               | 35.02 | N/A        |

NOTE: Velocities under 5-fps are non erosive, no erosion protection required.

| Street Section Normal Depth Summary Table (100-year) |                              |                 |           |                |                 |       |
|------------------------------------------------------|------------------------------|-----------------|-----------|----------------|-----------------|-------|
| Cross Section Designation                            | Contributing Basin/ Subbasin | Discharge (cfs) | Slope (%) | Velocity (fps) | Flow Depth (ft) | V x D |
| KB1                                                  | STKB1-A                      | 4               | 3.00%     | 3.33           | 0.31            | 1.03  |
| KB2                                                  | STKB1-B                      | 3               | 0.70%     | 1.74           | 0.35            | 0.61  |
| KB3                                                  | STKB1-C                      | 2               | 0.70%     | 1.62           | 0.31            | 0.50  |
| KB4                                                  | STKB1-D                      | 3               | 0.70%     | 1.74           | 0.35            | 0.61  |
| KB5                                                  | STKB2-A                      | 2               | 3.60%     | 3.50           | 0.25            | 0.88  |
| KB6                                                  | STKB2-B                      | 3               | 0.70%     | 1.74           | 0.35            | 0.61  |
| KB7                                                  | STKB2-C                      | 4               | 0.70%     | 1.83           | 0.37            | 0.68  |
| KB8                                                  | STKB2-E                      | 5               | 0.70%     | 1.93           | 0.39            | 0.75  |
| KB9                                                  | STKB2-F                      | 2               | 10.20%    | 5.47           | 0.24            | 1.31  |

| INTERIM CONDITION 1 HEC-1 SUMMARY TABLE |           |            |
|-----------------------------------------|-----------|------------|
| BASIN ID                                | AREA (ac) | Q100 (CFS) |
| REF**                                   | -         | 461        |
| OFF1                                    | 33.73     | 66         |
| STKB1                                   | 3.58      | 13         |
| OFF3                                    | 196.33    | 233        |
| CP1 (OFF3 + OFF1E + REF**)              | -         | 707        |
| COFF1 (OFF1A-D + STKB1 + CP1)           | -         | 773        |
| OFF2                                    | 20.63     | 59         |
| STKB2                                   | 5.02      | 18         |
| COFF2                                   | -         | 76         |

\*\*Referenced from Kettle Ridge Drive Technical Drainage Study by Atkins

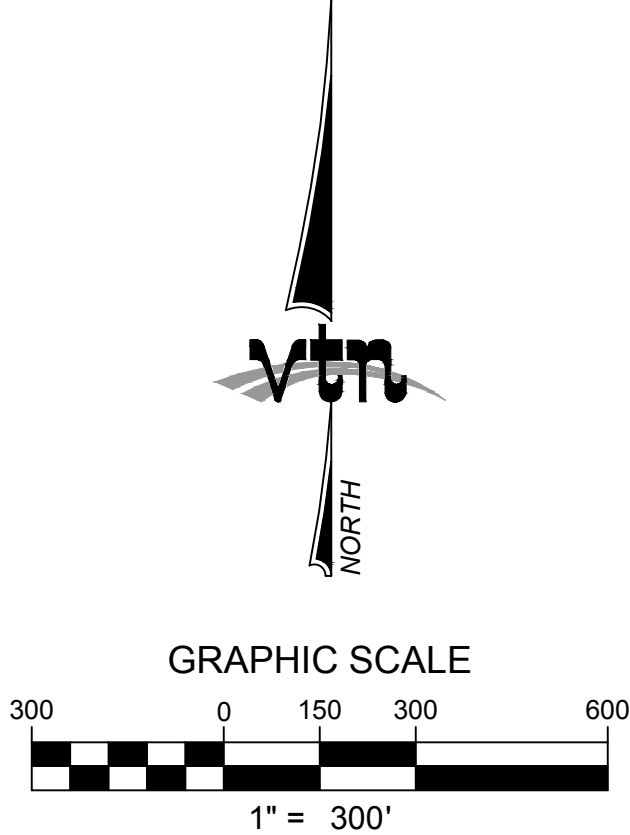
Junction Flow in Kettle Bend Storm Drain:  
773cfs - 707cfs = 66 cfs

| PRORATED ONSITE SUBBASIN SUMMARY INTERIM CONDITION |            |          |      |
|----------------------------------------------------|------------|----------|------|
| BASIN                                              | BASIN AREA | Q100     |      |
| STKB1                                              | 3.58       | 13       |      |
| STKB2                                              | 5.02       | 18       |      |
| SUBBASIN                                           | SUB AREA   | SUB AREA | Q100 |
| STKB1-A                                            | 1.16       | 32.4%    | 4    |
| STKB1-B                                            | 0.84       | 23.5%    | 3    |
| STKB1-C                                            | 0.66       | 18.4%    | 2    |
| STKB1-D                                            | 0.92       | 25.7%    | 3    |
| TOTAL                                              | 3.58       | 100.0%   | 13   |
| STKB2-A                                            | 0.49       | 9.8%     | 2    |
| STKB2-B                                            | 0.95       | 18.9%    | 3    |
| STKB2-C                                            | 1.13       | 22.5%    | 4    |
| STKB2-D                                            | 0.37       | 7.4%     | 1    |
| STKB2-E                                            | 1.48       | 29.5%    | 5    |
| STKB2-F                                            | 0.60       | 12.0%    | 2    |
| TOTAL                                              | 5.02       | 100.0%   | 18   |

| PRORATED OFFSITE SUBBASIN SUMMARY INTERIM CONDITION 1 |            |          |      |  |
|-------------------------------------------------------|------------|----------|------|--|
| BASIN                                                 | BASIN AREA | Q100     |      |  |
| OFF1                                                  | 33.73      | 66       |      |  |
| OFF2                                                  | 20.63      | 59       |      |  |
| SUBBASIN                                              | SUB AREA   | SUB AREA | Q100 |  |
| OFF1-A                                                | 6.21       | 18.4%    | 12   |  |
| OFF1-B                                                | 9.16       | 27.2%    | 18   |  |
| OFF1-C                                                | 5.49       | 16.3%    | 11   |  |
| OFF1-D                                                | 6.05       | 17.9%    | 12   |  |
| OFF1-E                                                | 6.82       | 20.2%    | 13   |  |
| TOTAL                                                 | 33.73      | 100.0%   | 66   |  |
| OFF2-A                                                | 4.74       | 23.0%    | 14   |  |
| OFF2-B                                                | 1.52       | 7.4%     | 4    |  |
| OFF2-C                                                | 6.44       | 31.2%    | 18   |  |
| OFF2-D                                                | 7.93       | 38.4%    | 23   |  |
| TOTAL                                                 | 20.63      | 100.0%   | 59   |  |

## LEGEND

- BASIN BOUNDARY
- BASIN DESIGNATION
- FLOW ARROW
- ATKINS INTERIM FLOWLINE
- LOCAL STORM DRAIN ALIGNMENT
- CCR/CD STORM DRAIN ALIGNMENT
- SUBBASIN BOUNDARY
- FLOW CONCENTRATION POINT
- INTERIM CHANNEL FLOWLINE
- PROPOSED BERM LOCATIONS



INTERIM CONDITION 1 MAP  
FIGURE 7A

SUMMERLIN WEST VILLAGE 22  
KETTLE BEND ROAD

HOWARD HUGHES COMPANY, LLC.  
10845 GRIFFITH PEAK DRIVE, SUITE 160  
LAS VEGAS, NEVADA 89135  
(702) 791-4000

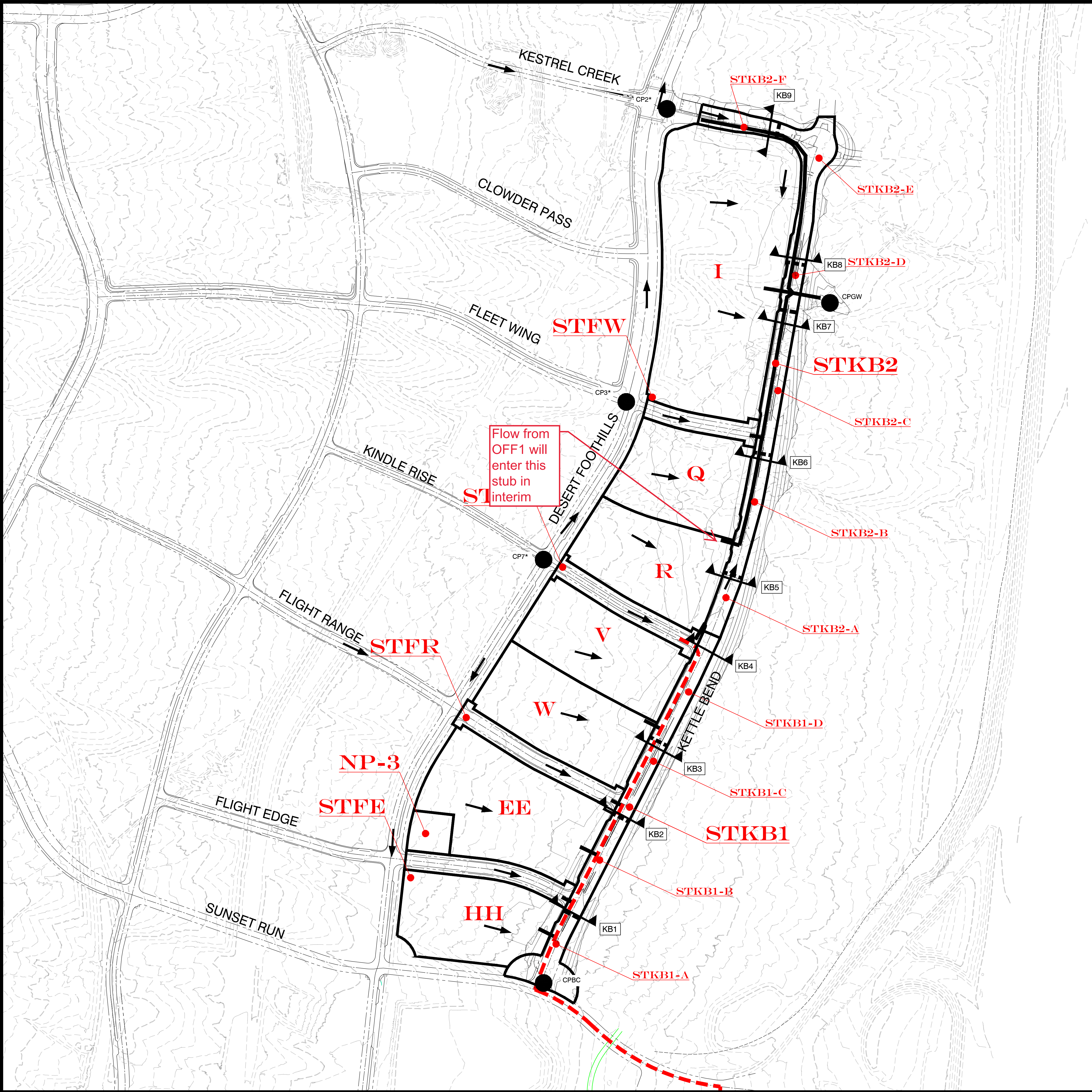
CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5148  
PH: (702) 973-7550 FAX: (702) 382-2887 WEB: WWW.VTNV.COM  
CONSULTING ENGINEERS & PLANNERS LAND SURVEYORS

DRAWN BY: FEBRACY  
DESIGNED BY:  
CHECKED BY:  
PROJECT NO: 7881-S-2  
SCALE: 1" = 300' HORIZ.  
1" = 300' VERT.  
SHEET  
FIG 7A  
2 OF 4 SHEETS  
DRAWING NO.  
2

F:\7881\Kettle Bend Road\Drainage2\_A01\A\_Figures\Figure 7 - Interim Condition 1 Map.dwg, Jan 14, 2020



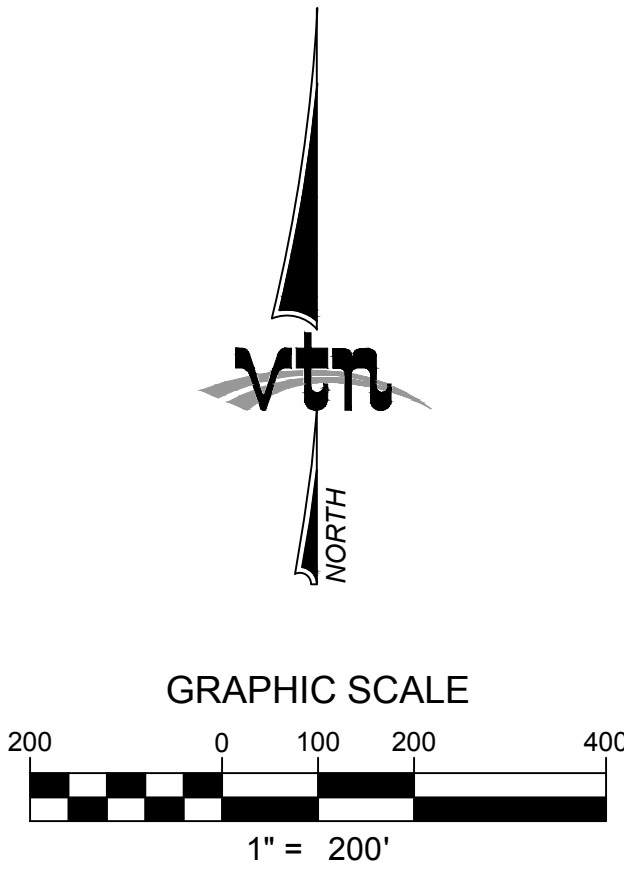


| ULTIMATE CONDITION HEC-1 SUMMARY TABLE |           |            |
|----------------------------------------|-----------|------------|
| BASIN ID                               | AREA (ac) | Q100 (CFS) |
| CP7*                                   | -         | 639        |
| STKR                                   | 1.32      | 6          |
| STKB1                                  | 3.58      | 13         |
| V                                      | 5.01      | 16         |
| W                                      | 5.28      | 16         |
| STFR                                   | 1.50      | 7          |
| EE                                     | 6.8       | 22         |
| NP-3                                   | 0.7       | 2          |
| STFE                                   | 1.36      | 6          |
| CPFE                                   | -         | 8          |
| HH                                     | 4.85      | 19         |
| CPBC                                   | -         | 747        |
| CP2*                                   | -         | 190        |
| CP3*                                   | -         | 77         |
| STKB2                                  | 5.02      | 18         |
| I                                      | 13.44     | 50         |
| STFW                                   | 0.9       | 4          |
| Q                                      | 4.58      | 17         |
| R                                      | 4.97      | 18         |
| CPGW                                   | -         | 374        |

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

| PRORATED ONSITE SUBBASIN SUMMARY<br>ULTIMATE CONDITION |            |          |      |
|--------------------------------------------------------|------------|----------|------|
| BASIN                                                  | BASIN AREA | Q100     |      |
| STKB1                                                  | 3.58       | 13       |      |
| STKB2                                                  | 5.02       | 18       |      |
| SUBBASIN                                               | SUB AREA   | SUB AREA | Q100 |
| STKB1-A                                                | 1.16       | 32.4%    | 4    |
| STKB1-B                                                | 0.84       | 23.5%    | 3    |
| STKB1-C                                                | 0.66       | 18.4%    | 2    |
| STKB1-D                                                | 0.92       | 25.7%    | 3    |
| TOTAL                                                  | 3.58       | 100.0%   | 13   |
| STKB2-A                                                | 0.49       | 9.8%     | 2    |
| STKB2-B                                                | 0.95       | 18.9%    | 3    |
| STKB2-C                                                | 1.13       | 22.5%    | 4    |
| STKB2-D                                                | 0.37       | 7.4%     | 1    |
| STKB2-E                                                | 1.48       | 29.5%    | 5    |
| STKB2-F                                                | 0.60       | 12.0%    | 2    |
| TOTAL                                                  | 5.02       | 100.0%   | 18   |

| Street Section Normal Depth Summary Table (100-year) |                              |                 |           |                |                 |       |
|------------------------------------------------------|------------------------------|-----------------|-----------|----------------|-----------------|-------|
| Cross Section Designation                            | Contributing Basin/ Subbasin | Discharge (cfs) | Slope (%) | Velocity (fps) | Flow Depth (ft) | V x D |
| KB1                                                  | STKB1-A                      | 4               | 3.00%     | 3.33           | 0.31            | 1.03  |
| KB2                                                  | STKB1-B                      | 3               | 0.70%     | 1.74           | 0.35            | 0.61  |
| KB3                                                  | STKB1-C                      | 2               | 0.70%     | 1.62           | 0.31            | 0.50  |
| KB4                                                  | STKB1-D                      | 3               | 0.70%     | 1.74           | 0.35            | 0.61  |
| KB5                                                  | STKB2-A                      | 2               | 3.60%     | 3.50           | 0.25            | 0.88  |
| KB6                                                  | STKB2-B                      | 3               | 0.70%     | 1.74           | 0.35            | 0.61  |
| KB7                                                  | STKB2-C                      | 4               | 0.70%     | 1.83           | 0.37            | 0.68  |
| KB8                                                  | STKB2-E                      | 5               | 0.70%     | 1.93           | 0.39            | 0.75  |
| KB9                                                  | STKB2-F                      | 2               | 10.20%    | 5.47           | 0.24            | 1.31  |



- LEGEND
- BASIN BOUNDARY
  - ST7 BASIN DESIGNATION
  - FLOW ARROW
  - LOCAL STORM DRAIN ALIGNMENT
  - CCRFCD STORM DRAIN ALIGNMENT
  - SUBBASIN BOUNDARY
  - FLOW CONCENTRATION POINT

HOWARD HUGHES COMPANY, LLC.  
10845 GRIFFITH PEAK DRIVE, SUITE 160  
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702.791-4000

2727 SOUTH RAINBOW BOULEVARD  
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WEB: WWW.VTNV.COM  
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

ULTIMATE CONDITION MAP  
FIGURE 8

1/14/20  
DRAWN BY: ACY  
DESIGNED BY:  
CHECKED BY:  
PROJECT NO: 7861-5.2  
SCALE: 1" = 200' HORIZ.  
1" = 200' VERT.

SUMMERLIN WEST VILLAGE 22  
KETTLE BEND ROAD

SHEET  
FIG 8  
4 OF 4 SHEETS  
DRAWING NO. 4



**DRAINAGE STUDY FOR  
SUMMERLIN PARKWAY EXTENSION  
(CLV DS5159)**

|                                                                            |                                                  |                                                                                                   |
|----------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>CITY OF LAS VEGAS</b>                                                   |                                                  | <b>DATE:</b>                                                                                      |
| <b>INTER-OFFICE MEMORANDUM</b>                                             |                                                  | January 2, 2020                                                                                   |
| <b>TO:</b><br>Land Development Services<br>Department of Building & Safety |                                                  | <b>FROM:</b><br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |
| <b>SUBJECT:</b>                                                            | Drainage Study for:                              | <b>COPIES TO:</b>                                                                                 |
|                                                                            | Summerlin West V21 – Summerlin Parkway Extension | VTN Nevada, Inc.                                                                                  |
| <b>Cross Streets:</b>                                                      | Summerlin Parkway & I-215 Western Beltway        | Howard Hughes Company, LLC                                                                        |
| <b>File Number:</b>                                                        | F:\Depot\DSMemos\DS5159C.doc                     | Bart Anderson, P.E., DevCo                                                                        |
| <b>Parcel Number:</b>                                                      | 137-23-410-001                                   | CCRFC                                                                                             |
| <b>Zoning Action:</b>                                                      | N/A                                              | CCPW                                                                                              |
| <b>FEMA Flood Zone</b>                                                     | YES NO X                                         |                                                                                                   |
| <b>Proposed Storm Drain</b>                                                | YES X NO                                         |                                                                                                   |

| HISTORY                    | DATE RECEIVED           | DATE REVIEWED | COMMENTS           | REVIEW FEES       | FEES PAID | #  |
|----------------------------|-------------------------|---------------|--------------------|-------------------|-----------|----|
| 1 <sup>st</sup> Submittal  | 7/18/2019               | 8/12/2019     | Not Approved       | \$400.00          | 349454    | 10 |
| 2 <sup>nd</sup> Submittal  | 10/3/2019               | 11/2/2019     | Not Approved       | \$400.00          | 359744    | 10 |
| 3 <sup>rd</sup> Submittal  | 11/27/2019 & 12/31/2019 | 1/2/2020      | See Comments Below | \$400.00          | 365879    | 10 |
| <b>TOTAL FEES (LDDRS):</b> |                         |               |                    | <b>\$1,200.00</b> |           |    |

**REMARKS:**

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

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

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

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

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

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

<http://gustfront.ccrfc.org/LandDev/LandDev.aspx>

2. The site is also adjacent to the Clark County Western Beltway project. The engineer must coordinate with *Clark County Public Works Department (CCPW)* and incorporate any concerns for boundary conditions along the east border. CCPW concurrence is required prior to final acceptance of the study.
3. An *Update #2* to the approved *Master Drainage Study for Summerlin West Village 22* had been submitted addressing the location change of SD-J. The subject drainage study will not be approved prior to the final approval of the *Update to the Conceptual Master Drainage Study for Summerlin West Village 22*.
4. The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Kettle Ridge Drive* and *Desert Foothills Drive*. Prior to final plan approval the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of \$50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City of Las Vegas Flood Control* for approval. Once the drainage study is conditionally approved, the engineer should contact the *City's Land Development Section* (229-6371) to begin the agreement process.

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

5. For the two proposed *Modified Type A* drop inlets in *Desert Foothills Drive*, make sure that the L bracket used in the modified Type CM inlets is used. Provide structural design and calculations to *City Building Department* for review and approval prior to the final approval of the subject drainage study.
6. All storm drain inlets that are more than 10' deep require a special structure detail and structural calculation and approval from *City Building Department* prior to the final approval of the drainage study.
7. All special structures and mainline storm drain connection require details and structural calculations to be reviewed by the *City of Las Vegas Building & Safety Department*. Approval by the *Building Department* must be obtained prior to the final approval of the subject drainage study.
8. The street and the associated storm drain facilities will eventually be transferred to the *City of Las Vegas*, the engineer/developer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final acceptance of the subject improvement plans.
9. ***Previous Comment #12: Sheet GR5 to Sheet GR7 and Sheet UT5 to Sheet UT7: The regional facility 8'x8' RCB in Sunset Run Drive is too close to the northern curb. In case of needing repair and maintenance in the future, the staging area will break into the curb area which is costly and problematic. Relocate the RCB to the center of the street as far as possible.***

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

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

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

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



Sample Letter to  
certify CD.pdf

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

**END OF REMARKS**  
ays

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





# Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000  
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: [dlc@ClarkCountyNV.gov](mailto:dlc@ClarkCountyNV.gov)



## Drainage Study Concurrence Letter

**Date:** January 14, 2020  
**Firm:** VTN Nevada  
**Engineer:** Aaron Yup  
**Address:** 2727 South Rainbow Boulevard, Las Vegas, NV 89146  
**Phone:** (702) 873-7550  
**Fax:** (702) 362-2597  
**E-mail:** [ayup@vtnnv.com](mailto:ayup@vtnnv.com)

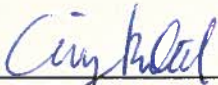
**Subject:** Technical Drainage Study for Summerlin West Village 21  
Summerlin Parkway Extension  
**Location:** Summerlin Parkway and I-215 Western Beltway  
**APN:** 137-23-410-001  
**Sec, Township, Range:** S23, T20S, R59E  
**Flood Zone & Panel:** Zone X, 2150E, Dated September 27, 2002  
**Application Number:** PW20-10110

| Submittals | Date Received | Date Returned | Reviewer | Miscellaneous              |
|------------|---------------|---------------|----------|----------------------------|
| Technical  | 01/03/2019    | 01/14/2020    | CR       |                            |
| Addendum 1 | 01/03/2019    | 01/14/2020    | CR       |                            |
| Addendum 2 | 01/03/2019    | 01/14/2020    | CR       |                            |
| Supplement | 01/03/2019    | 01/14/2020    | CR       | Delivered to front counter |
|            |               |               |          |                            |
|            |               |               |          |                            |

The above-referenced project is located within the **City of Las Vegas** adjacent to Clark County unincorporated areas. The drainage study was submitted to the County for concurrence on January 3, 2020. In addition, the County has received the City of Las Vegas acceptance letter dated January 2, 2020 for the Technical Drainage Study (DS5159C).

The County concurs with the acceptance of this Drainage Study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.



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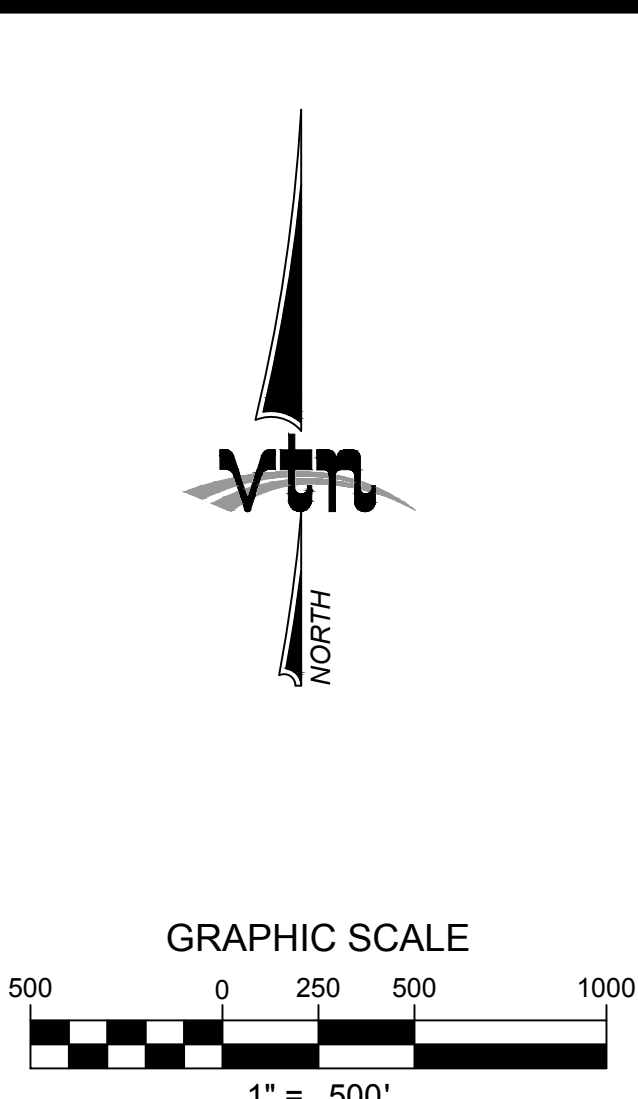
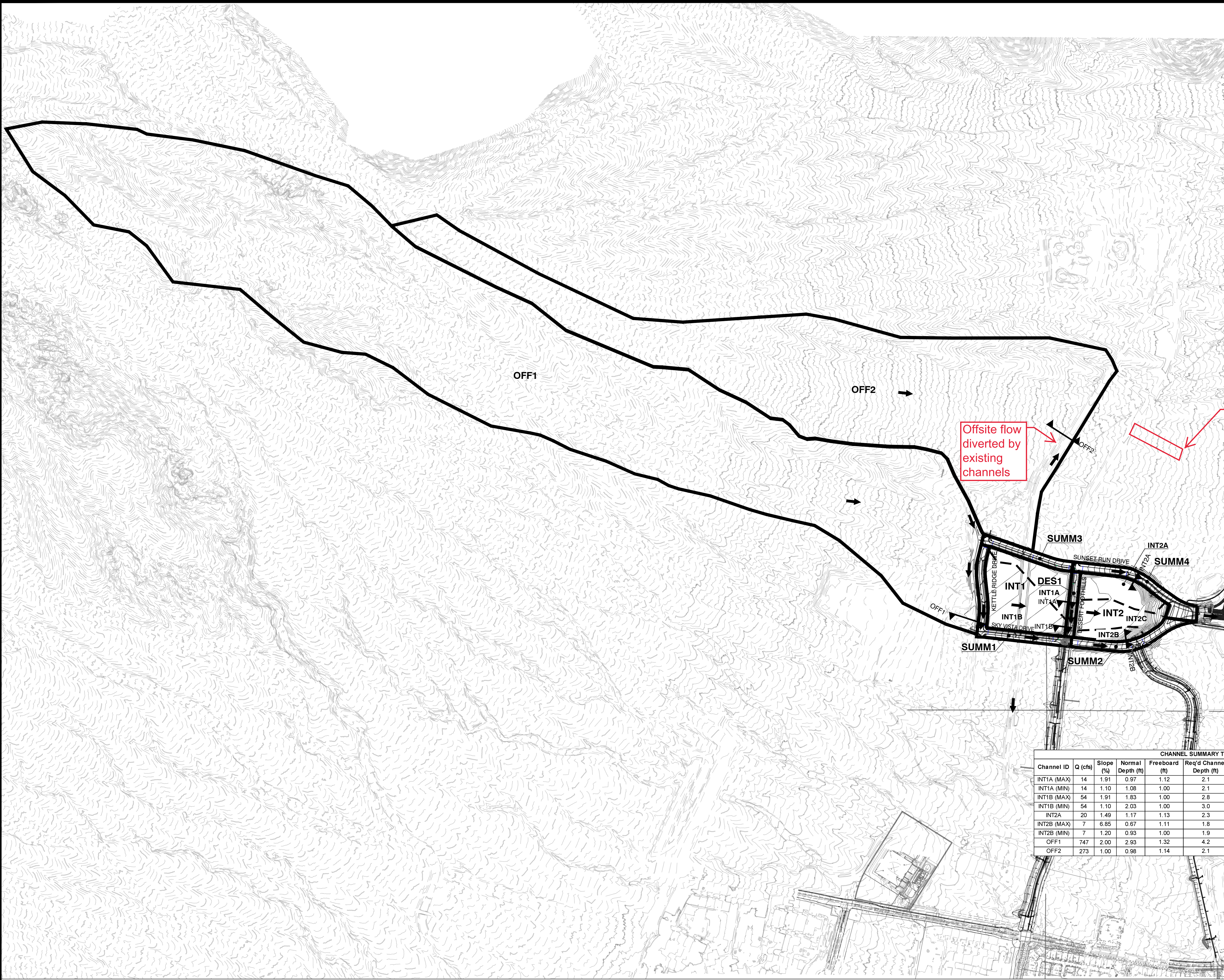
Crissy Riland, P.E.  
Senior Civil Engineer  
Development Review  
crissy@ClarkCountyNV.gov



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W. Layne Weber, P.E., CFM  
Principal Engineer  
Development Review  
wlweber@ClarkCountyNV.gov





| Interim Condition<br>HEC-1 Summary Table |             |            |
|------------------------------------------|-------------|------------|
| Basin ID                                 | Area (a.c.) | Q100 (cfs) |
| OFF1                                     | 376.73      | 747        |
| OFF2                                     | 192.73      | 273        |
| INT1                                     | 18.62       | 54         |
| DES1                                     | 1.80        | 7          |
| SUMM1                                    | 5.05        | 20         |
| SUMM3                                    | 2.85        | 13         |
| INT2                                     | 15.55       | 45         |
| SUMM2                                    | 3.63        | 16         |
| SUMM4                                    | 4.87        | 21         |

| PRORATED SUBBASIN SUMMARY<br>INTERIM CONDITION |            |          |      |
|------------------------------------------------|------------|----------|------|
| BASIN                                          | BASIN AREA |          | Q100 |
| INT1                                           | 18.62      |          | 54   |
| INT2                                           | 15.55      |          | 45   |
| SUBBASIN                                       | SUB AREA   | SUB AREA | Q100 |
| INT1A                                          | 5.81       | 31.2%    | 14   |
| INT1B                                          | 12.81      | 68.8%    | 31   |
| TOTAL                                          | 18.62      | 100.0%   | 45   |
| SUBBASIN                                       | SUB AREA   | SUB AREA | Q100 |
| INT2A                                          | 6.90       | 44.4%    | 20   |
| INT2B                                          | 2.32       | 14.9%    | 7    |
| INT2C                                          | 6.33       | 40.7%    | 18   |
| TOTAL                                          | 15.55      | 100.0%   | 45   |

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

| LEGEND |                      |
|--------|----------------------|
|        | CONCENTRATION POINT  |
|        | BASIN BOUNDARY       |
|        | SUBBASIN BOUNDARY    |
|        | BASIN DESIGNATION    |
|        | SUBBASIN DESIGNATION |
|        | FLOW ARROW           |
|        | CROSS SECTION        |

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

FIGURE 7A  
INTERIM CONDITION 1 BASIN MAP

DRAWN BY:  
DESIGNED BY:  
CHECKED BY:  
PROJECT NO:  
7851-5.8

SHEET  
FIG 7A  
OF SHEETS  
DRAWING NO.

CITY OF LAS VEGAS  
2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5148  
PH: (702) 873-7550 FAX: (702) 382-2587  
WWW.VTNV.COM  
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

FIGURE 7A  
SUMMERLIN WEST VILLAGE 21  
SUMMERLIN PARKWAY EXTENSION

SCALE: 1" = 500'  
HORIZ. VERT. ###







1. ALL CONSTRUCTION AND MATERS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE, THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION, THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA, AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY, THE UTILITY BUILDING CODE, AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (1/2") ABOVE UP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: NOVA GEOTECHNICAL, PROJECT NO. G-18-176, DATED DECEMBER 30, 2019.  
APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC. THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE CITY AND APPROVED PRIOR TO ACCEPTANCE OF FACILITY VIDEO INSPECTION. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT-OF-WAY, AND STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS. THE LOCATION SHALL BE VERIFIED BY COORDINATES WHICH SHALL BE BASED ON THE OFFICIAL HORIZONTAL AND VERTICAL CONTROL NETWORKS OF THE CITY OF LAS VEGAS. FINAL LOCATION MAPS MUST BE SEALED AND CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINITIES OF ± 0.09 METERS (± 0.3 FEET) HORIZONTALLY AND VERTICALLY. A SEPARATE ELECTRONIC CDMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).
22. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION.
23. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.
24. REVISED 06/04/18

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA," LATEST REVISION (USD), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS, ETC., LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.
4. ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN NO. #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 302A WHEN POLE IS INSTALLED BETWEEN SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TRAFFIC ENGINEERING DIVISION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINTS SHALL BE COORDINATED WITH NV ENERGY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICEPOINTS SHALL BE SHOWN ON THE PLANS.
8. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREETLIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED. AT NO EXPENSE TO THE CITY OF LAS VEGAS.
9. THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC. FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON THE PLANS.

REVISED JUNE 28, 2016 (LD VERSION)

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE PUBLIC RIGHTS OF WAY OF THE CITY OF LAS VEGAS AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CITY OF LAS VEGAS AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NV01000000, SECTION II.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE SUBJECT TO PRECIPITATION, WIND, AND/OR SOOT LOCATIONS, AND BMP WEEDS AND WEEDS WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.1 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NV01000000, SECTION II.A.5.
5. ACCUMULATED SEDIMENT IN BMPs SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6631 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.

2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALEY WATER DISTRICTS - APPROVED PRODUCTS LIST ARE ALLOWED TO BE INSTALLED.

3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIALS CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [FC § 506.15 & 507.1]

4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. [FC § 3330, § 3332]

5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTERLINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. [FC § 507.5.7.3]

6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TESTS WITH PRIOR FIRE PREVENTION APPROVAL. [FC § 106.3]

7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [FC § 507.2.1, NFPA 24]

8. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. [FC § 507]

9. PRIVATE HYDRANTS SHALL BE PAINTED RED. [FC § 507.5.7.1]

10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. [FC § 507]

11. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: [FC § C102]

RESIDENTIAL - 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.  
COMMERCIAL - 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.

12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS. [FC § C102.8]

13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.

14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [FC § C102.10]

15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. [FC § C102.4]

16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. [FC § C102.7]

17. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. [FC § C102.6]

18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHEREVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. FOR SYSTEMS REQUIRED TO HAVE TWO (2) SOURCES OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS AND/OR SPRINKLER LEADS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. FOR SYSTEMS PERMITTED TO HAVE ONE SOURCE OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 3 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD-INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. [FC § C104]

19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. [FC § 503.2.3]

20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12% ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. [FC § 503.2.7, § 503.2.8]

21. THE TURNING RADIUS FOR THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FT OUTSIDE AND 28 FT INSIDE TURNING RADIUS. [FC § 503.2.4]

22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 33FT 6 IN. [FC § 503.2.1]

23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF MORE THAN 33 FT WITH PARKING ON BOTH SIDES MEASURED TO FACE OF CURB. NOT LESS THAN 28 FT WIDE WITH PARKING RESTRICTED TO ONE SIDE MEASURED TO FACE OF CURB. NOT LESS THAN 24 FT WIDE WITH NO PARKING ON EITHER SIDE MEASURED TO FACE OF CURB. FIRE LINES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FT. [FC § 503.2.1.1]

24. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. [FC § 503.1.1]

25. APPROVED SECONDARY FIRE APPARATUS ACCESS ROAD SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. CVL REGULATION AND MOUNT

26. ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LINES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. CVL REGULATION

27. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LINES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEAR OR ADJACENT TO EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF CURBS IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. [FC § 503.3]

28. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. [FC § 503.6]

29. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS, OR HAVING FOUR OR MORE TRAVEL LANES AND A TRAFFIC COUNT OF MORE THAN 30,000 VEHICLES PER DAY, ALL HYDRANTS BEING UTILIZED TO DELIVER FIRE FLOW TO THE PROPOSED LOCATION SHALL BE LOCATED ON THE SAME SIDE OF THE STREET AS THE PROPOSED DEVELOPMENT. CVL REGULATION

EFFECTIVE DATE: FEBRUARY 4th, 2019

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.
3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
4. WHEN A DESIGNATED "SUGGESTED ROUTE TO SCHOOL" IS ENCRoACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFY STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.
5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS, UTILITIES TYPE "X" RETROREFLECTIVE SHEETING IN ACCORDANCE WITH CCAUSS 627 AND 716 AND SHALL HAVE AN ANTI-GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5) FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

LWVWD PROJECT # \_\_\_\_\_

(REVISED 01/09/2017)

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LWVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LWVWD COMMUNICATION SUPPORT CENTER (259-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LWVWD INSPECTION. WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.
2. ALL WORK SHALL CONFORM TO LWVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE 2010 EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LWVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LWVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE 2010 EDITION OF THE UDACS.
9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LWVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LWVWD CENTRAL STORES. TELEPHONE 259-3152 OR 259-3802.
11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01, AND APPROVED BY THE LWVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LWVWD PRE-APPROVED MATERIALS AND MANUFACTURERS LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600.
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LWVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LWVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDE THE PLACEMENT OF AN APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.
15. ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNERS ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNERS ASSOCIATION IS IN EXISTENCE, OR THE AGENCY HAVING JURISDICTION. DECORATIVE SURFACE MATERIALS PLACED WITHIN THE STREET FOR THE ELEMENT OF THE PROJECT, IF DISTURBED BY THE LWVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LWVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LWVWD WILL NOT RESTORE, AND WILL NOT BE RESPONSIBLE FOR THE RESTORATION OF, ANY DECORATIVE PAVING SURFACE WITHIN THE STREET. THE LWVWD WILL NOT ATTEMPT TO MATCH COLOR OR FINISH OF ANY ADJACENT MATERIALS.
16. NO LEAD COMPLIANCE NOTE:  
TO COMPLY WITH THE FEDERAL SAFE DRINKING WATER ACT, ALL WATER WORKS BRASS PRODUCTS PROPOSED TO BE RELOCATED, OR INSTALLED AS NEW MUST BE INSTALLED WITH THE LEAD FREE APPROVED PRODUCT. THE OLD LEADED PRODUCT MAY NOT BE REUSED.

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.
2. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.
3. CHISEL "S" OR "C" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.
4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACK FILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES IN PAVED STREETS 80' R/W AND LARGER, SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" S SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.
7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LWVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.
8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.

2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.

3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION, ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.

4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.

5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.

6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

|                           | HORIZONTAL | VERTICAL    | COMPACTION       |
|---------------------------|------------|-------------|------------------|
| A. PAVEMENT AREA SUBGRADE | 0.1+/-     | +0.010-0.1' | SEE SOILS REPORT |
| B. ENGINEERED FILL        | 0.5+/-     | +0.110-0.1' | SEE SOILS REPORT |

REPORT COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE.

7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.

8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL, OR DUST CONTROL, IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.

9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.

10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED 04/15/10

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.

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF  
CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S,R59E,S03

- NONE

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

| DESCRIPTION               | PROPOSED | EXISTING | FUTURE |
|---------------------------|----------|----------|--------|
| CONTOUR (5' INTERVAL)     |          |          |        |
| CONTOUR (1' INTERVAL)     |          |          |        |
| EDGE OF PAVEMENT          |          |          |        |
| SAW CUT                   |          |          |        |
| RETAINING WALL            |          |          |        |
| SCREEN WALL               |          |          |        |
| RIGHT OF WAY              |          |          |        |
| EASEMENT LINE             |          |          |        |
| CENTER LINE               |          |          |        |
| BACK OF CURB              |          |          |        |
| LIP OF GUTTER             |          |          |        |
| FACE OF CURB              |          |          |        |
| SIDEWALK                  |          |          |        |
| UNIT BOUNDARY LINE        |          |          |        |
| UNIT BOUNDARY / ROW       |          |          |        |
| PROPERTY LINE             |          |          |        |
| SLOPE AND FLOW DIRECTION  |          |          |        |
| SCARP AREA                |          |          |        |
| MATCHLINE                 |          |          |        |
| SIDEWALK RAMP             |          |          |        |
| SIGHT VISIBILITY ZONES    |          |          |        |
| PAVED ROAD                |          |          |        |
| WATER UNDER 18"           |          |          |        |
| WATER 18" & OVER          |          |          |        |
| SANITARY SEWER UNDER 18"  |          |          |        |
| SANITARY SEWER 18" & OVER |          |          |        |
| STORM SEWER               |          |          |        |
| FIRE HYDRANT              |          |          |        |
| SANITARY SEWER MAN HOLE   |          |          |        |
| STORM DRAIN MAN HOLE      |          |          |        |

| ESTIMATED WATER QUANTITIES | PUBLIC |
|----------------------------|--------|
| FIRE HYDRANT ASSEMBLY      | 1 EA   |
| 12" GATE VALVE             | 4 EA   |
| 12" CAP AND BLOW OFF       | 2 EA   |
| 24" X 12" TEE              | 1 EA   |
| 12" 5" BEND                | 3 EA   |
| 12" 45° BEND               | 2 EA   |
| 12"x12" CROSS              | 1 EA   |
| 12" C-900 WATER MAIN       | 705 LF |
| 12" DIP WATER MAIN         | 75 LF  |
| 6" C-900 WATER MAIN        | 14 LF  |
| IRRIGATION SLEEVE          | 188 LF |

|                                    |           |
|------------------------------------|-----------|
| 3" ASPHALT CONCRETE PAVING         | 2,760 SY  |
| 4" TYPE II GRAVEL BASE             | 307 CY    |
| LI" TYPE CURB                      | 1,420 LFL |
| RIP-RAP D50 = 8"                   | 1,281 CY  |
| SIDEWALK RAMP WITH TRUNCATED DOMES | 3 EA      |
| EARTHWORKS CUT                     | 13,860 CY |
| EARTHWORKS FILL                    | 16,533 CY |
| EARTHWORKS TOTAL (FILL)            | 1,673 CY  |
| 5' MODIFIED TYPE "C" DROP INLETS   | 1 EA      |
| 24" RCP STORM DRAIN                | 20 LFL    |
| 30" RCP STORM DRAIN                | 13 LFL    |
| 48" STORM DRAIN MANHOLE            | 4 EA      |
| 6X7' RCB STORM DRAIN               | 821 LFL   |
| 8X8' RCB STORM DRAIN               | 130 LFL   |
| SURVEY MONUMENTS                   | 3 EA      |

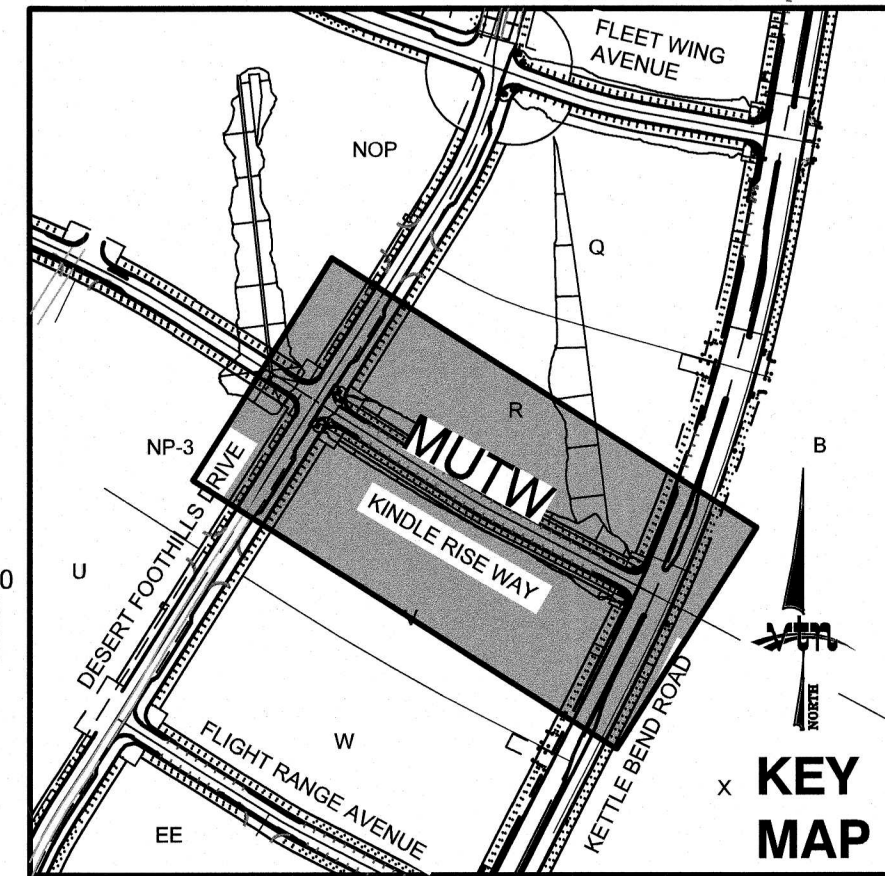
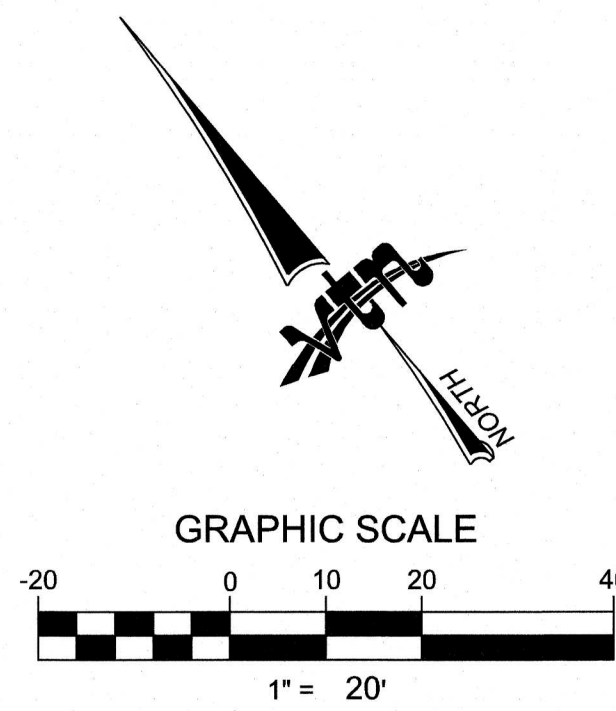
|                                                   |          |
|---------------------------------------------------|----------|
| 1 1/4" CONDUIT                                    | 693 LBS  |
| 3-1/2 PULLBOX                                     | 2 EA     |
| SINGLE LED STREETLIGHT                            | 4 EA     |
| STOP/STREET SIGNS                                 | 12 EA    |
| CROSSWALK BAR                                     | 5 EA     |
| STOP BAR                                          | 2 EA     |
| SOLID WHITE BIKE LANE SYMBOL WITH ARROWS          | 8 EA     |
| 4" SOLID WHITE LINE TYPE II PAVEMENT MARKING      | 100 LBS  |
| 6" SOLID WHITE LINE EDGE TYPE II PAVEMENT MARKING | 1057 LBS |
| TYPE "B" RAISED PAVEMENT MARKER                   | 198 EA   |
| TYPE "C" RAISED PAVEMENT MARKER                   | 86 EA    |
| RED PAINTED CURB                                  | 30 LBS   |
|                                                   |          |

**CITY OF LAS VEGAS**  
10845 GRIFFITH PEAK DRIVE, SUITE 160  
LAS VEGAS, NEVADA 89135  
702-791-4000

**SUMMERLIN WEST VILLAGE 22  
KINDLE RISE WAY-KETTLE BEND  
ROAD TO DESERT FOOTHILL IS DRIV**

CHECKED BY: WJM 02/05/2020  
 PROJECT NO: 7861  
 SCALE: N/A  
 HORIZ. DATE: N/A  
 AM J. ER  
 31/21  
 L  
 745  
 20  
 ER-SITE OF NEVADA  
 SHEETS  
 G NO.





UTILITY PROFILE REFERENCE LABEL  
 UT # = SHEET INDEX  
 SHT # = SHEET NUMBER

WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

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

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

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

BLUE COLORED REFLECTIVE RAISED  
PAVEMENT MARKERS ARE TO BE INSTALLED:

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

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

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

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

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

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

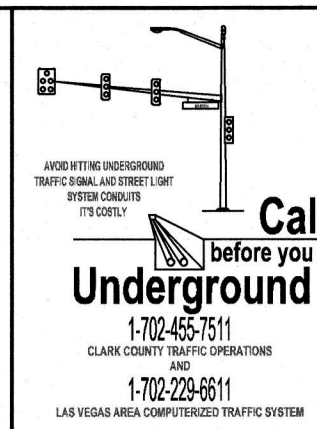
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF  
CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S, R59E, S03

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

LINEAR UNIT: US SURVEY FOOT (FT/US)  
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)  
ZONE: LAS VEGAS HIGH ELEVATION ZONE  
PROJECTION: TRANSVERSE MERCATOR  
STANDARD PARALLEL (AND LATITUDE OF GRID  
ORIGIN): 36°15'00"N  
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W  
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FT/US)  
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000  
FT/US)  
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

**NOTES:**

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.



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

CALL  
**811**

OR  
1-800-227-2600  
AND  
1-702-455-6000

CLARK COUNTY TRAFFIC  
OPERATIONS

## BY: \_\_\_\_\_ DATE: \_\_\_\_\_

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

APPROVED FOR CONSTRUCTION

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

**HOWARD HUGHES COMPANY, LLC**  
**A DELAWARE LIMITED LIABILITY COMPANY**  
 10945 GRIFFITH PEAK DRIVE, SUITE 160  
 LAS VEGAS, NEVADA 89135  
 702.781.4000

**MASTER UTILITY WATER**

|                     |                         |
|---------------------|-------------------------|
| DRAWN BY:<br>GCC    | 10/30/2019              |
| DESIGNED BY:<br>GCC | 10/30/2019              |
| CHECKED BY:<br>MM   | 01/07/2020              |
| PROJECT NO:<br>P861 | SCALE:<br>1"=40'<br>N/A |
| HOT<br>VEH          |                         |

William J. Meyer

PROFESSIONAL ENGINEER - STATE OF NEVADA

WILLIAM J. MEYER

EXP: 12/31/21

CIVIL

No. 15745

25/20

SHEET

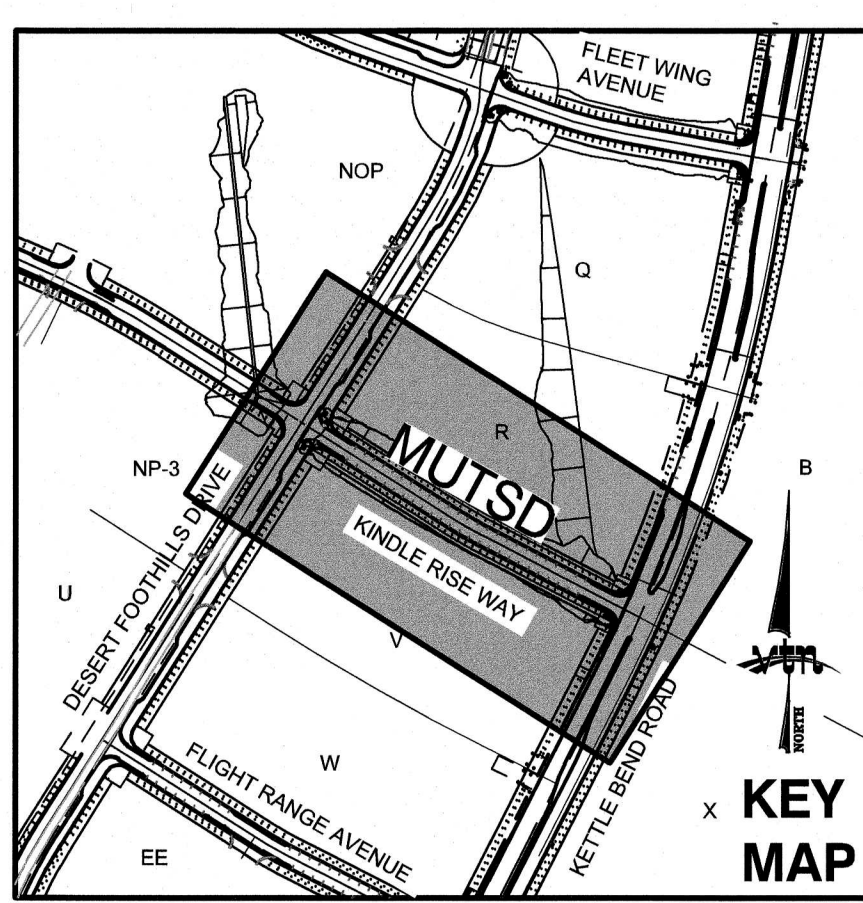
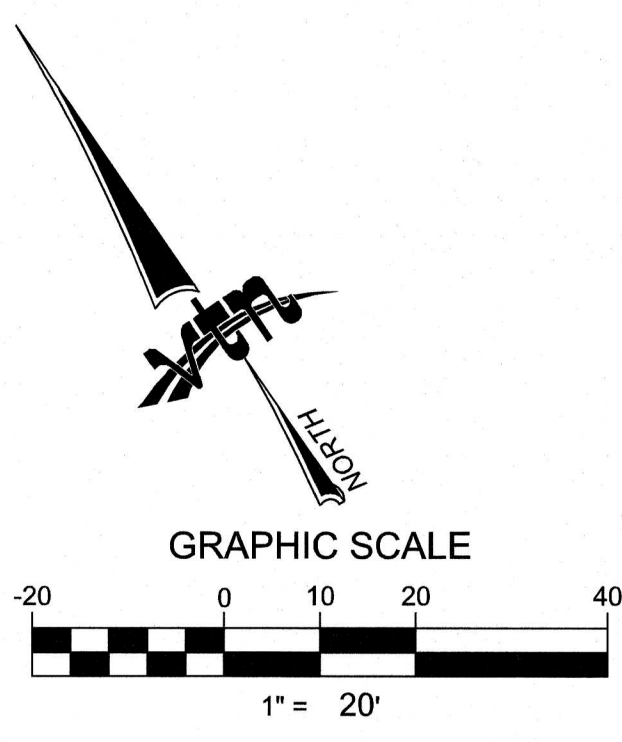
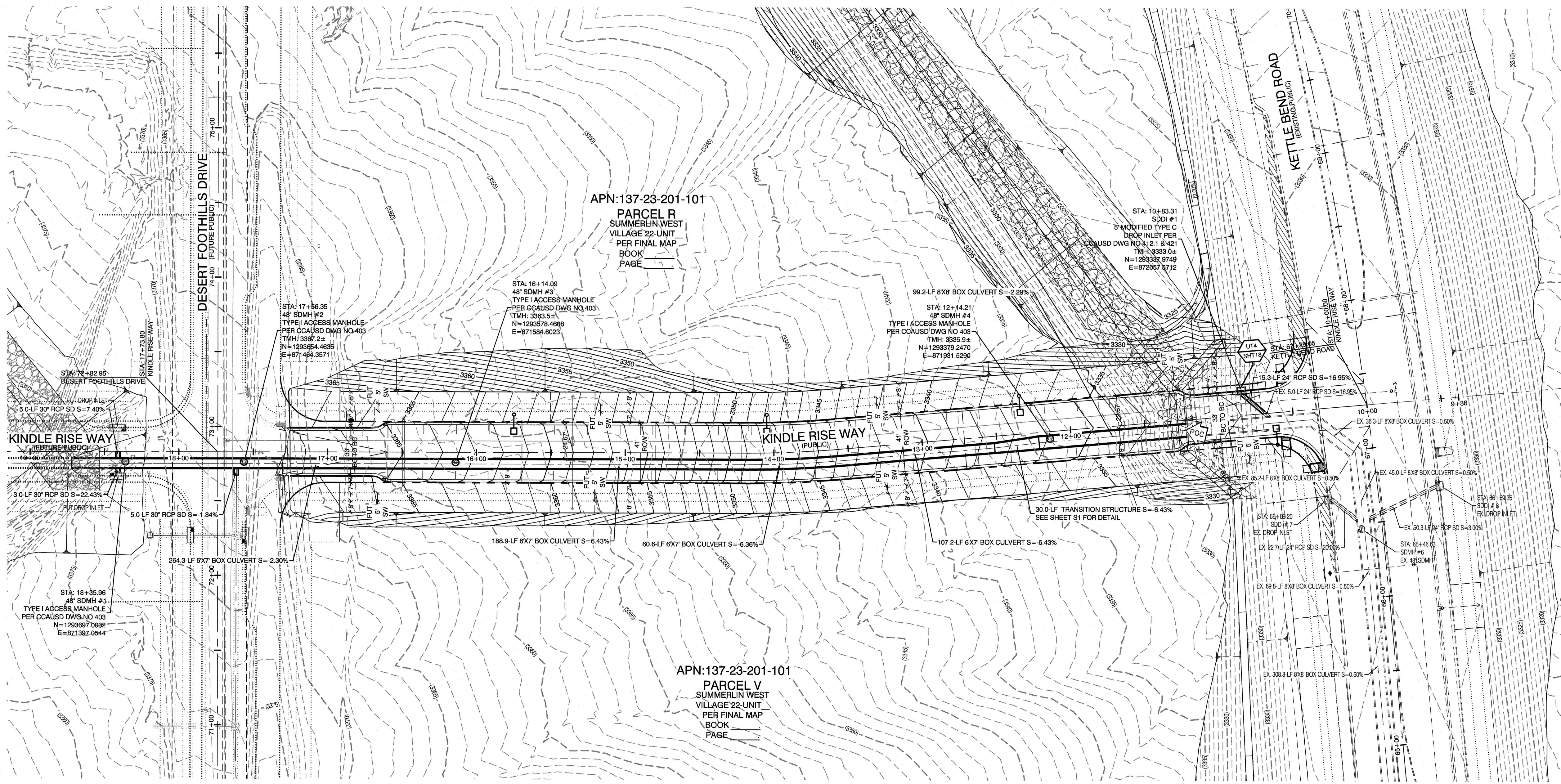
**MUTW**

5 OF 21 SHEETS

DRAWING NO.

H:\7861\Kindle Rise Way - Kettle Bend to Desert Foothills\Sheet Set\7861-MUTW.dwg:2/3/2020 1:23 PM;chrsp





**BASIS OF BEARING**

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

LINEAR UNIT: US SURVEY FOOT (FTUS)

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

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

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

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**BENCHMARK**

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND US&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S,R9E,S03

**GRADING PERMIT NOTE**

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

**GEOTECHNICAL NOTE:**

REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-176, DATED DECEMBER 30, 2019

**SIGHT VISIBILITY ZONES:**

NO STRUCTURE, WALLS, VEGETATION, OR OBJECT OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

**CONSTRUCTION NOTES**

UTILITY PROFILE REFERENCE LABEL  
UT # = SHEET INDEX  
SHT # = SHEET NUMBER

**Call before you Dig**

1-702-227-2929

CLARK COUNTY TRAFFIC OPERATIONS

**Call before you Dig**

1-800-227-2600

AND

1-702-455-6000

CLARK COUNTY TRAFFIC OPERATIONS

**ENGINEER DISCLAIMER NOTE:**

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #XXXXXXX

*William J. Meyer* 2/5/20  
WILLIAM J. MEYER, P.E. No. 19745 DATE

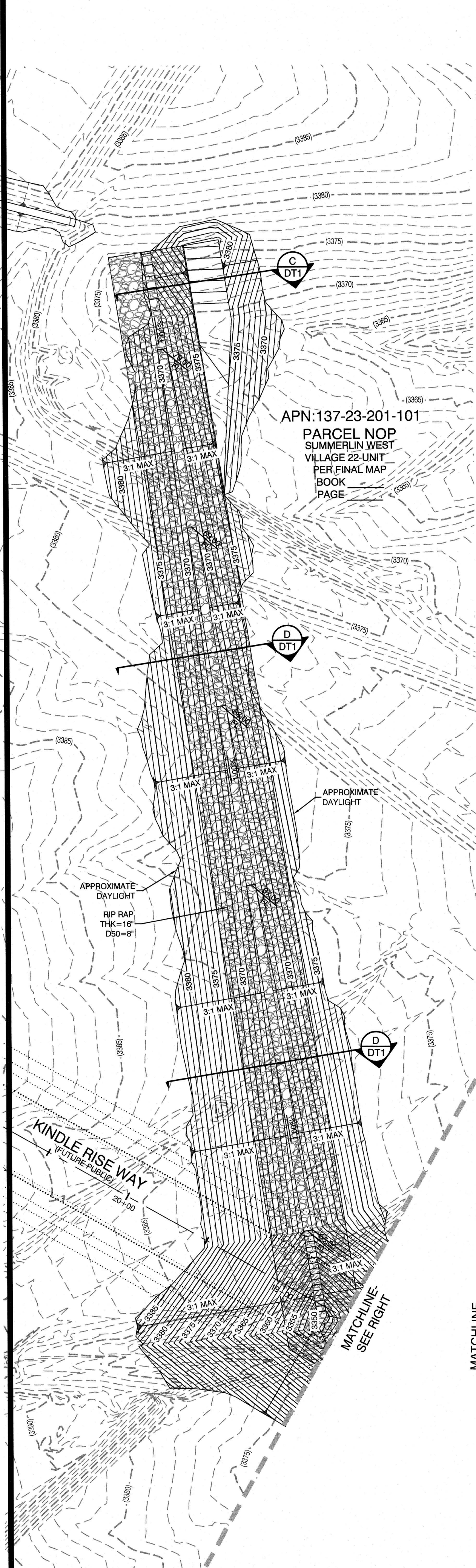
**LAS VEGAS VALLEY WATER DISTRICT APPROVAL**

APPROVED FOR CONSTRUCTION

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

|                                                                                                                      |  |                                                |  |
|----------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------|--|
| HOWARD HUGHES COMPANY, LLC<br>A DELAWARE LIMITED LIABILITY COMPANY                                                   |  | CITY OF LAS VEGAS                              |  |
| 2727 SOUTH RAINBOW BOULEVARD<br>LAS VEGAS, NEVADA 89146-5148<br>PH (702) 873-7550 FAX (702) 368-2887 WEB WWW.HHC.COM |  | CONSULTING ENGINEERS & PLANNERS LAND SURVEYORS |  |
| DRAWN BY: BCC                                                                                                        |  | DESIGNED BY: BCC                               |  |
| CHECKED BY: WAM                                                                                                      |  | PROJECT NO: 7881                               |  |
| DATE: 10/30/2019                                                                                                     |  | SCALE: 1"=40' HORIZ. VERT. N/A                 |  |
| SHEET 6 OF 21 SHEETS                                                                                                 |  | DRAWING NO. _____                              |  |
| MUTSD                                                                                                                |  | 2/5/20                                         |  |
| LAS VEGAS VALLEY WATER DISTRICT                                                                                      |  | APPROVED FOR CONSTRUCTION                      |  |





**Call before you Dig**  
1-702-455-7511  
1-702-228-8511  
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM  
CLARK COUNTY TRAFFIC OPERATIONS

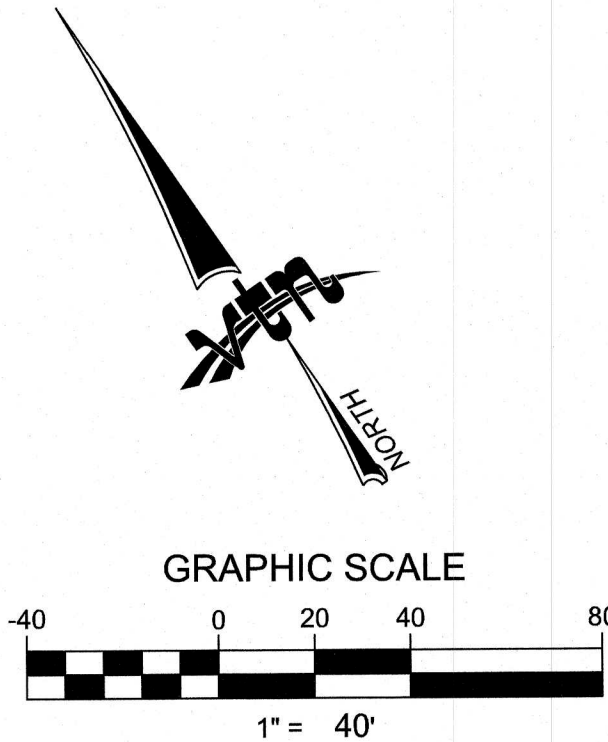
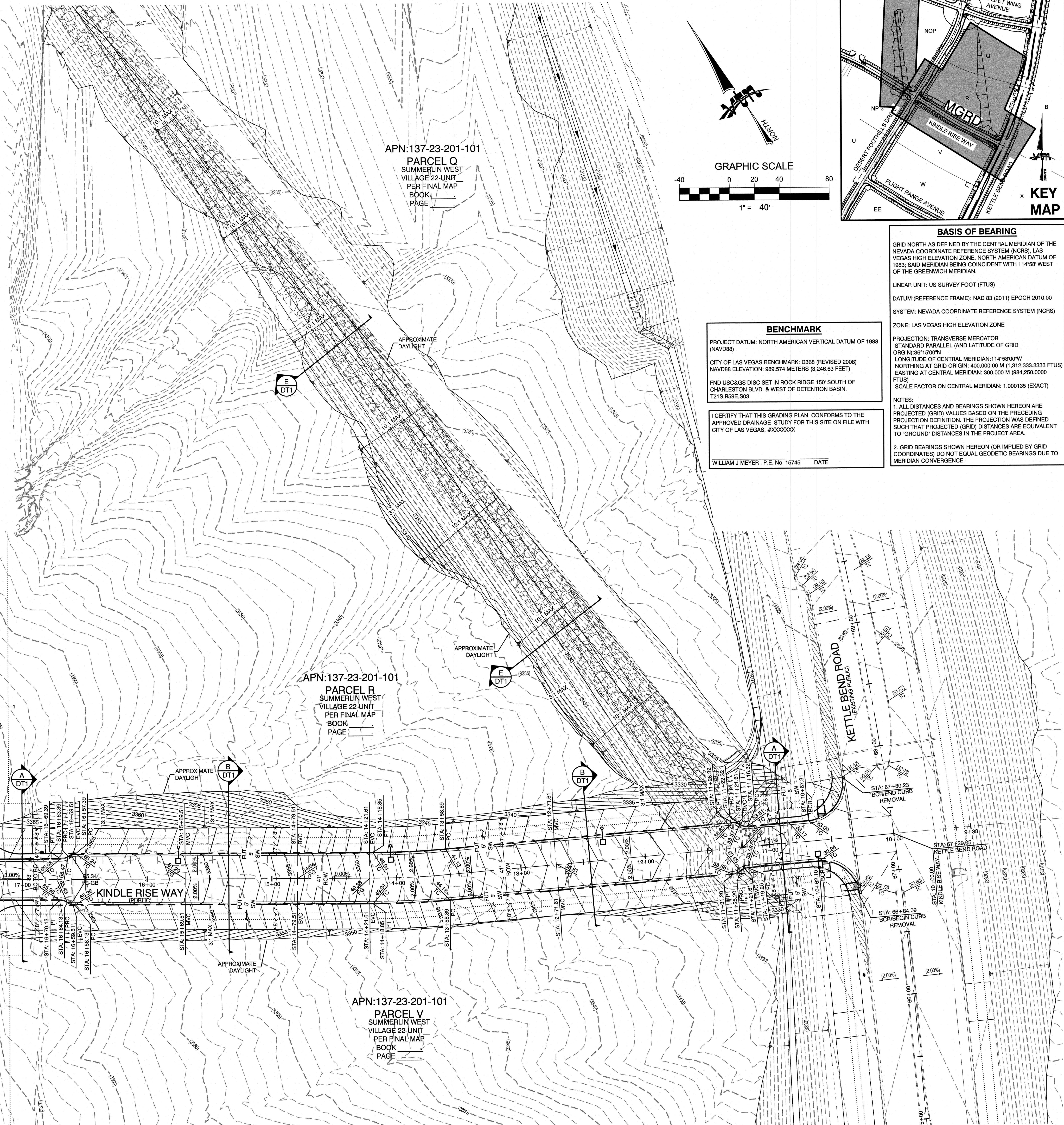
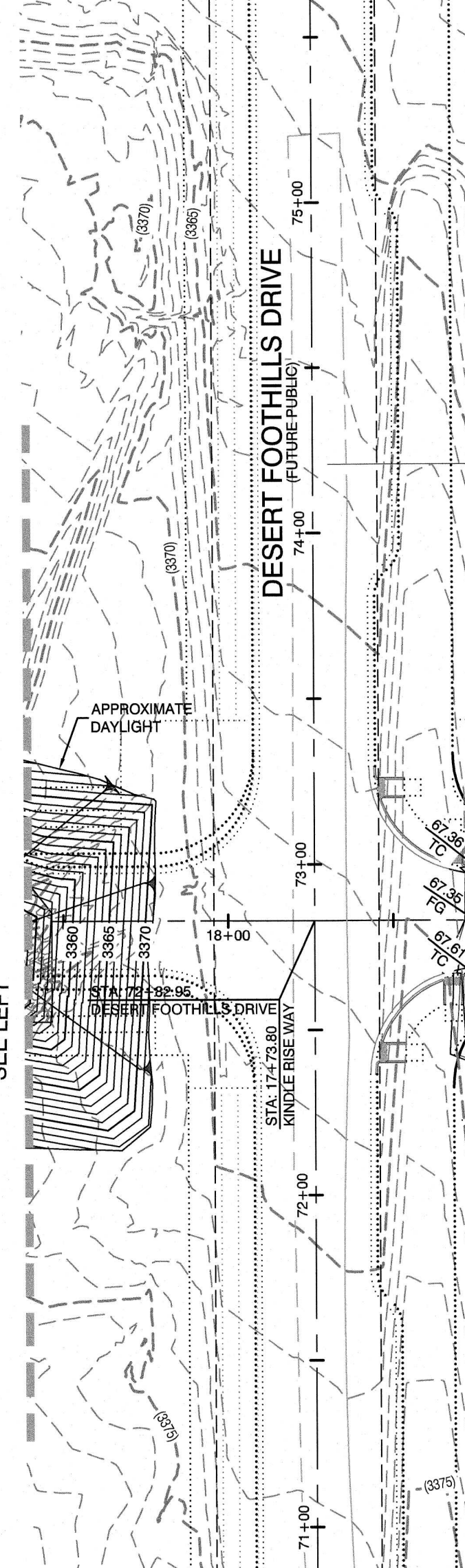
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Avoid cutting underground utility lines. It's costly.  
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1-702-455-6000  
CLARK COUNTY TRAFFIC OPERATIONS

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**GEOTECHNICAL NOTE:**  
REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-176, DATED DECEMBER 30, 2019

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**BENCHMARK**  
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)  
CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)  
FND US&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S, R99E, S03

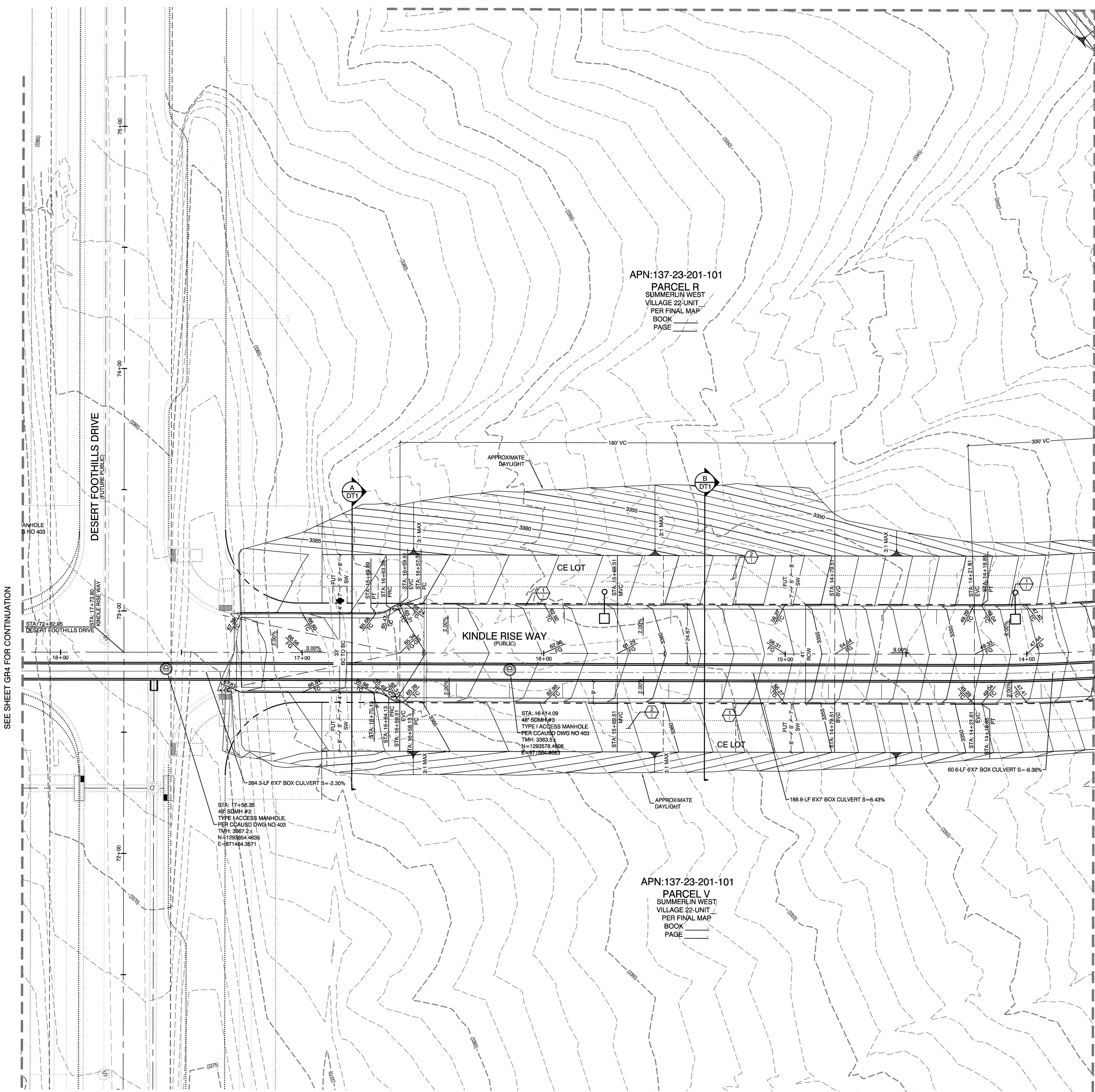
I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #XXXXXX.

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

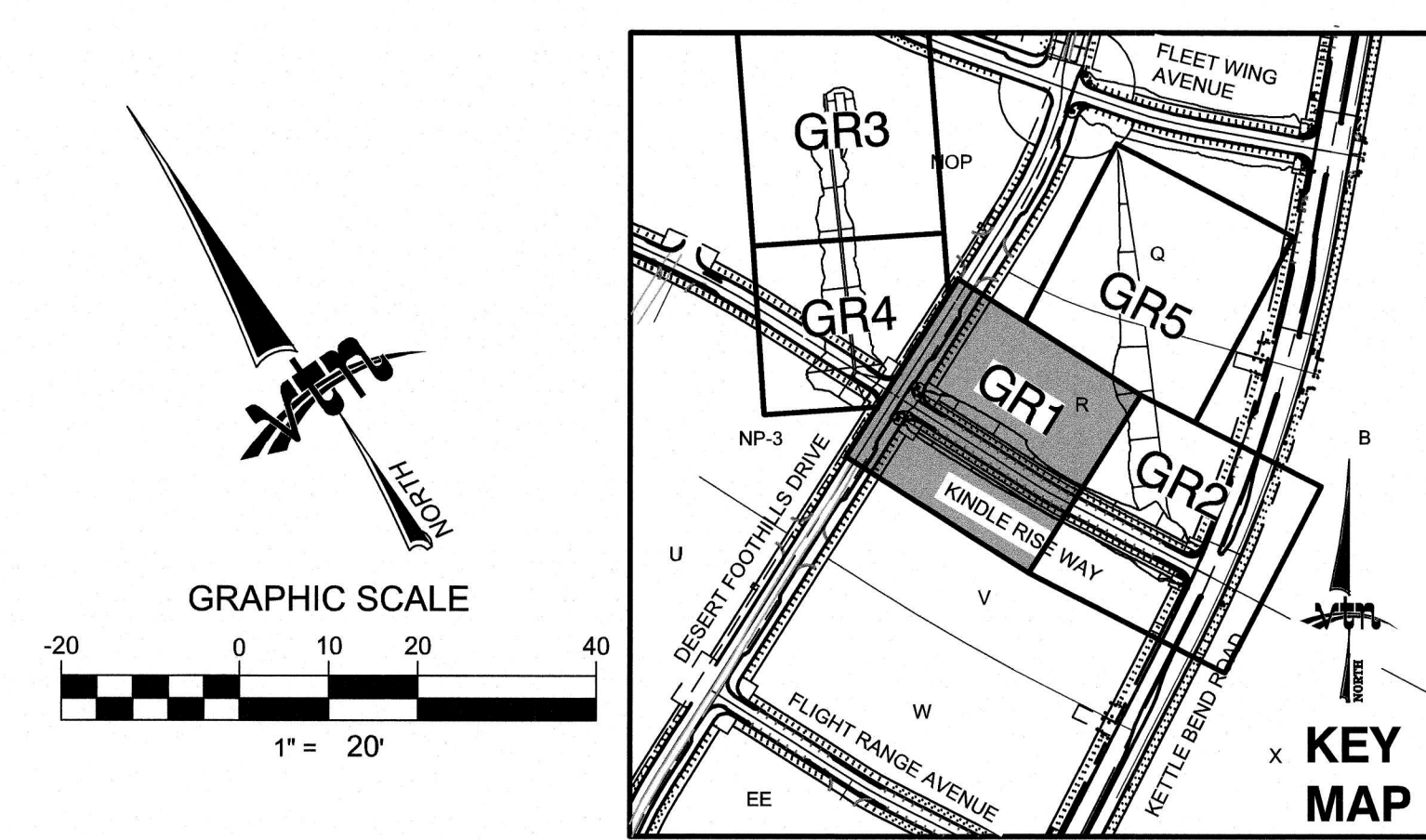
**BASIS OF BEARING**  
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.  
LINEAR UNIT: US SURVEY FOOT (FTUS)  
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)  
ZONE: LAS VEGAS HIGH ELEVATION ZONE  
PROJECTION: TRANSVERSE MERCATOR  
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|                                                                                                                                                              |            |                                                                                                                                                                                                          |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>HOWARD HUGHES COMPANY, LLC</b><br>A DELAWARE LIMITED LIABILITY COMPANY<br>10846 GRIFFITH PEAK DRIVE, SUITE 100<br>LAS VEGAS, NEVADA 89155<br>702.791.4000 |            | <b>CITY OF LAS VEGAS</b><br>2727 SOUTH RAINBOW BOULEVARD<br>LAS VEGAS, NEVADA 89146-5148<br>PH: (702) 873-7550 FAX: (702) 382-2937 WEB: WWW.VTNNV.COM<br>CONSULTING ENGINEERS: PLANNERS & LAND SURVEYORS |                  |
| <b>MASTER GRADING PLAN</b>                                                                                                                                   |            | <b>SUMMERLIN WEST VILLAGE 22</b><br>KINDIE RISE WAY-KETTLE BEND<br>ROAD TO DESERT FOOTHILLS DRIVE                                                                                                        |                  |
| DRAWN BY:<br>BCC                                                                                                                                             | 10/30/2019 | CHECKED BY:<br>WJM                                                                                                                                                                                       | 02/06/2020       |
| DESIGNED BY:<br>BCC                                                                                                                                          | 10/30/2019 | PROJECT NO:<br>7861                                                                                                                                                                                      | SCALE:<br>1"=40' |
| <b>WILLIAM J. MEYER</b><br>PROFESSIONAL ENGINEER-STATE OF NEVADA<br>No. 15745<br>2/3/20                                                                      |            | <b>SHEET</b><br>MGRD<br>7 OF 21 SHEETS<br>DRAWING NO.                                                                                                                                                    |                  |





SEE SHEET GR4 FOR CONTINUATION



**BASIS OF BEARING**  
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983, SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.  
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DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)  
ZONE: LAS VEGAS HIGH ELEVATION ZONE  
PROJECTION: TRANSVERSE MERCATOR  
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**BENCHMARK**  
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)  
CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 999.574 METERS (3,246.63 FEET)  
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S, R09E, S03

- CONSTRUCTION NOTES**
- 1. CONSTRUCT 24" TYPE "1" CURB & GUTTER PER STD. DWG. 216.
  - 2. FUTURE SIDEWALK
  - 3. CONSTRUCT HANDICAP RAMP SEE SHEET DT2 & DT3
  - 4. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
  - 5. FIELD VERIFY AND MATCH EXISTING

**GRADING PERMIT NOTE**  
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**GEOTECHNICAL NOTE:**  
REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-176, DATED DECEMBER 30, 2019

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Call before you Dig

1-702-455-1511

CLARK COUNTY TRAFFIC OPERATIONS

1-702-229-4611

LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

Call before you Dig

Avoid cutting underground utility lines. It's costly.

811

OR

1-800-227-2600

AND

1-702-455-6000

CLARK COUNTY TRAFFIC OPERATIONS

1-702-227-2929

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WILLIAM J MEYER, P.E. No. 15745 DATE 2/5/20

HOWARD HUGHES COMPANY, LLC  
A DELAWARE LIMITED LIABILITY COMPANY  
CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5148  
PH: (702) 873-7550 FAX: (702) 362-2897 WEB: WWW.VTNV.COM  
CONSULTING ENGINEERS & LAND SURVEYORS

GRADING PLAN 1

SUMMERLIN WEST VILLAGE 22  
KINDLE RISE WAY-KETTLE BEND  
ROAD TO DESERT FOOTHILLS DRIVE

DRAWN BY: BCC 10/26/2019

DESIGNED BY: BCC 10/26/2019

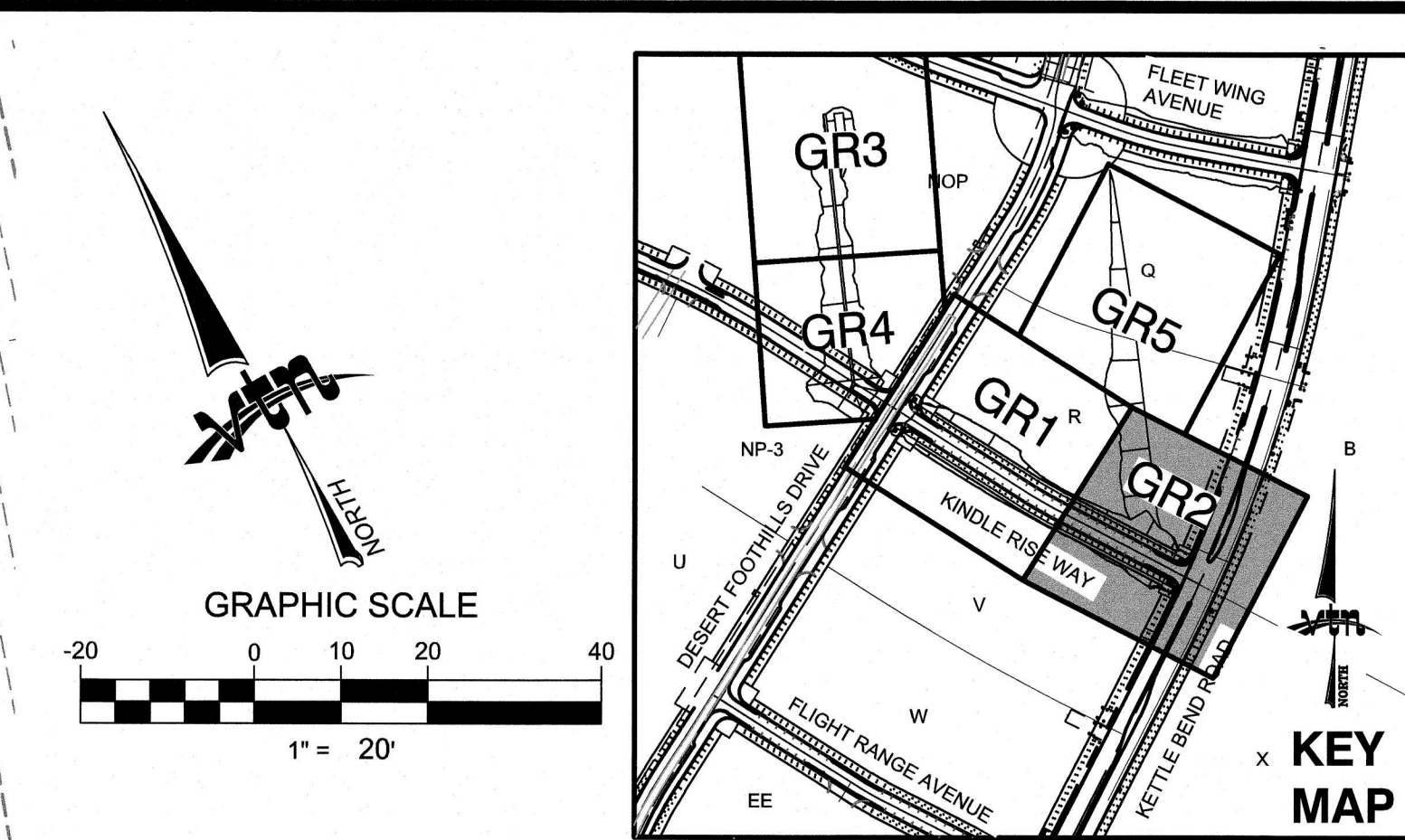
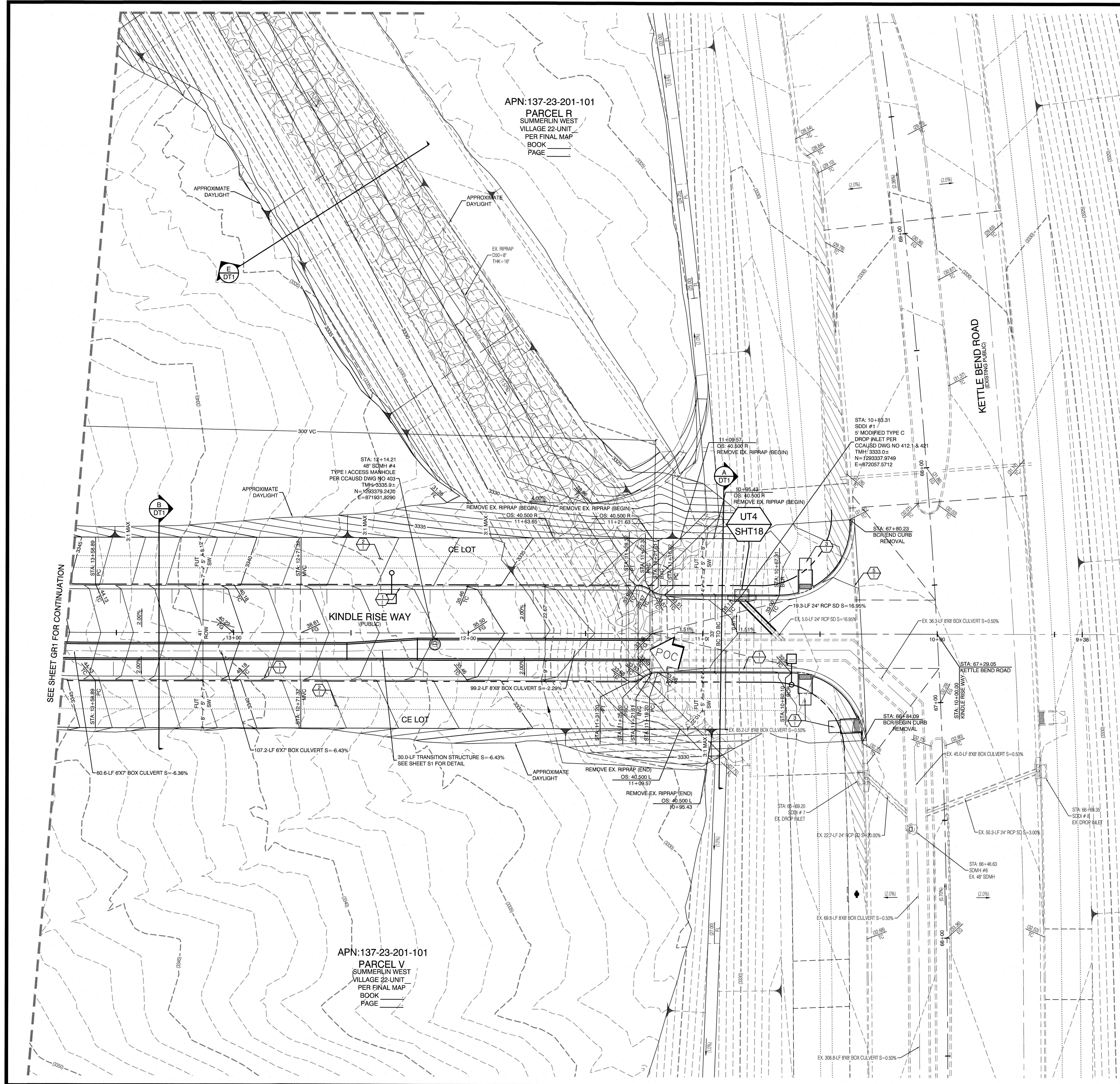
CHECKED BY: WJM 01/07/2020

PROJECT NO: 7861 SCALE: 1"=20' HORIZ. VERT. N/A

PROFESSIONAL ENGINEER STATE OF NEVADA  
WILLIAM J. MEYER  
EXP. 12/31/21  
CIVIL  
No. 15745

7/5/2020  
SHEET  
8 OF 21 SHEETS  
DRAWING NO.





**BASIS OF BEARING**  
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.  
LINEAR UNIT: US SURVEY FOOT (FTUS)  
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
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FIND US&GOS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLTON BLVD. & WEST OF DETENTION BASIN.  
T215, P59E, S03

**CONSTRUCTION NOTES**  
UTILITY PROFILE REFERENCE LABEL  
UT # = SHEET INDEX  
SHT # = SHEET NUMBER

- CONSTRUCTION NOTES**
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  - 3. CONSTRUCT HANDICAP RAMP SEE SHEET DT2 & DT3
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**GEOTECHNICAL NOTE:**  
REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-176, DATED DECEMBER 30, 2019

**SIGHT VISIBILITY ZONES:**  
NO STRUCTURE, WALLS, VEGETATION, OR OBJECT OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

**Call before you Dig**  
Avoid cutting underground utility lines. It's costly.  
1-702-227-2929

**Call before you Dig**  
Avoid cutting overhead power lines. It's costly.  
1-702-227-2929

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

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #XXXXXXX  
WILLIAM J MEYER (P.E. No. 13745) DATE 2/5/20

**HOWARD HUGHES COMPANY, LLC**  
A DELAWARE LIMITED LIABILITY COMPANY  
CITY OF LAS VEGAS  
2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5148  
PH: (702) 873-7559 FAX: (702) 362-2597 WEB: WWW.VTNV.COM  
CONSULTING ENGINEERS & PLANNERS & LAND SURVEYORS

**GRADING PLAN 2**

**SUMMERLIN WEST VILLAGE 22**  
KINDIE RISE WAY-KETTLE BEND ROAD TO DESERT FOOTHILLS DRIVE

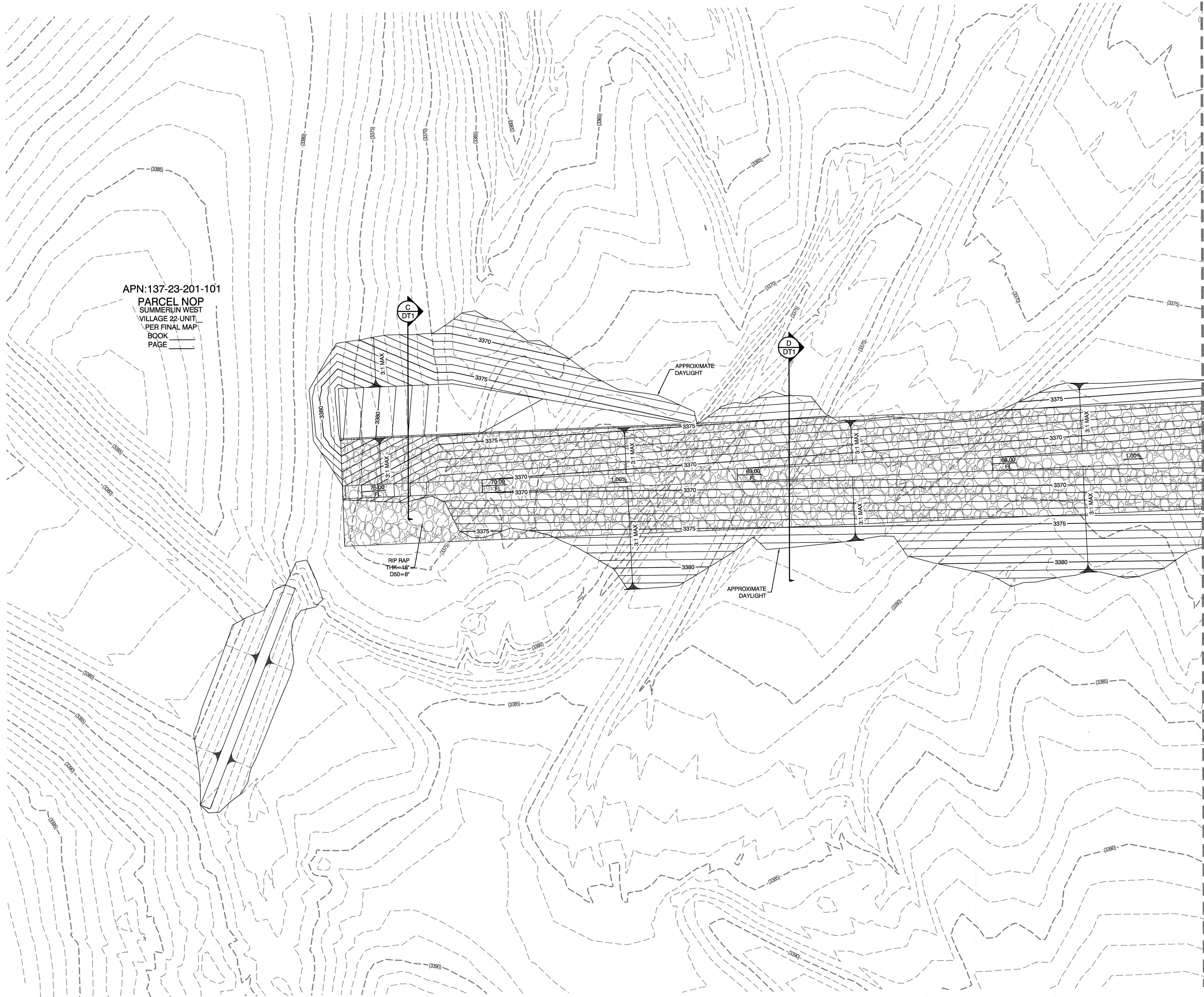
DRAWN BY: BCC  
DESIGNED BY: BCC  
CHECKED BY: WJM  
PROJECT NO: 7981  
SCALE: 1"=20'  
HORIZ. N/A  
VERT. 7981

10/29/2019  
10/29/2019  
01/07/2020

**WILLIAM J. MEYER**  
P.E. No. 13745  
CIVIL  
EXPIRATION DATE: 12/31/21

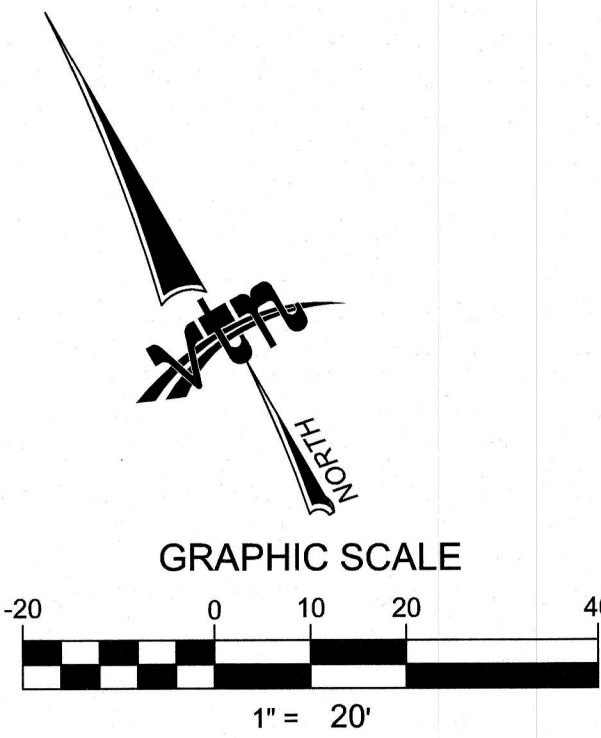
SHEET  
**GR2**  
9 OF 21 SHEETS  
DRAWING NO.





APN:137-23-201-101  
PARCEL NOP  
SUMMERLIN WEST  
VILLAGE 22 UNIT  
PER FINAL MAP  
BOOK \_\_\_\_\_  
PAGE \_\_\_\_\_

SEE SHEET GR4 FOR CONTINUATION



**BASIS OF BEARING**  
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983, SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.  
LINEAR UNIT: US SURVEY FOOT (FTUS)  
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)  
ZONE: LAS VEGAS HIGH ELEVATION ZONE  
PROJECTION: TRANSVERSE MERCATOR  
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°19'00"N  
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W  
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.333 FTUS)  
EASTING AT CENTRAL MERIDIAN: 300,000.00 M (984,250.000 FTUS)  
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

**NOTES:**  
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.  
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

**BENCHMARK**  
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)  
CITY OF LAS VEGAS BENCHMARK: D369 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)  
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S R56E S03

**CONSTRUCTION NOTES**  
UTILITY PROFILE REFERENCE LABEL  
UT # = SHEET INDEX  
SHT# = SHEET NUMBER

- CONSTRUCTION NOTES**
- CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
  - FUTURE SIDEWALK
  - CONSTRUCT HANDICAP RAMP SEE SHEET DT2 & DT3
  - SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CAUSD #500.5 & #503.
  - FIELD VERIFY AND MATCH EXISTING

**GRADING PERMIT NOTE**  
THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHER STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

**GEOTECHNICAL NOTE:**  
REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-176, DATED DECEMBER 30, 2019

**SIGHT VISIBILITY ZONES:**  
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**Call before you Dig**  
1-702-455-5111  
CLARK COUNTY TRAFFIC OPERATIONS  
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

**Call before you Dig**  
Avoid cutting underground utility lines. It's costly.  
1-702-227-2929

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

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

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #XXXXXXX  
WILLIAM J MEYER, P.E. No. 15745 DATE 2/5/20

**HOWARD HUGHES COMPANY, LLC**  
A DELAWARE LIMITED LIABILITY COMPANY  
CITY OF LAS VEGAS  
10846 GRIFFITH PEAK DRIVE, SUITE 150  
LAS VEGAS, NEVADA 89135  
702.739.1000

**GRADING PLAN 3**

**SUMMERLIN WEST VILLAGE 22**  
KIDDLE RISE WAY-KETTLE BEND  
ROAD TO DESERT FOOTHILLS DRIVE

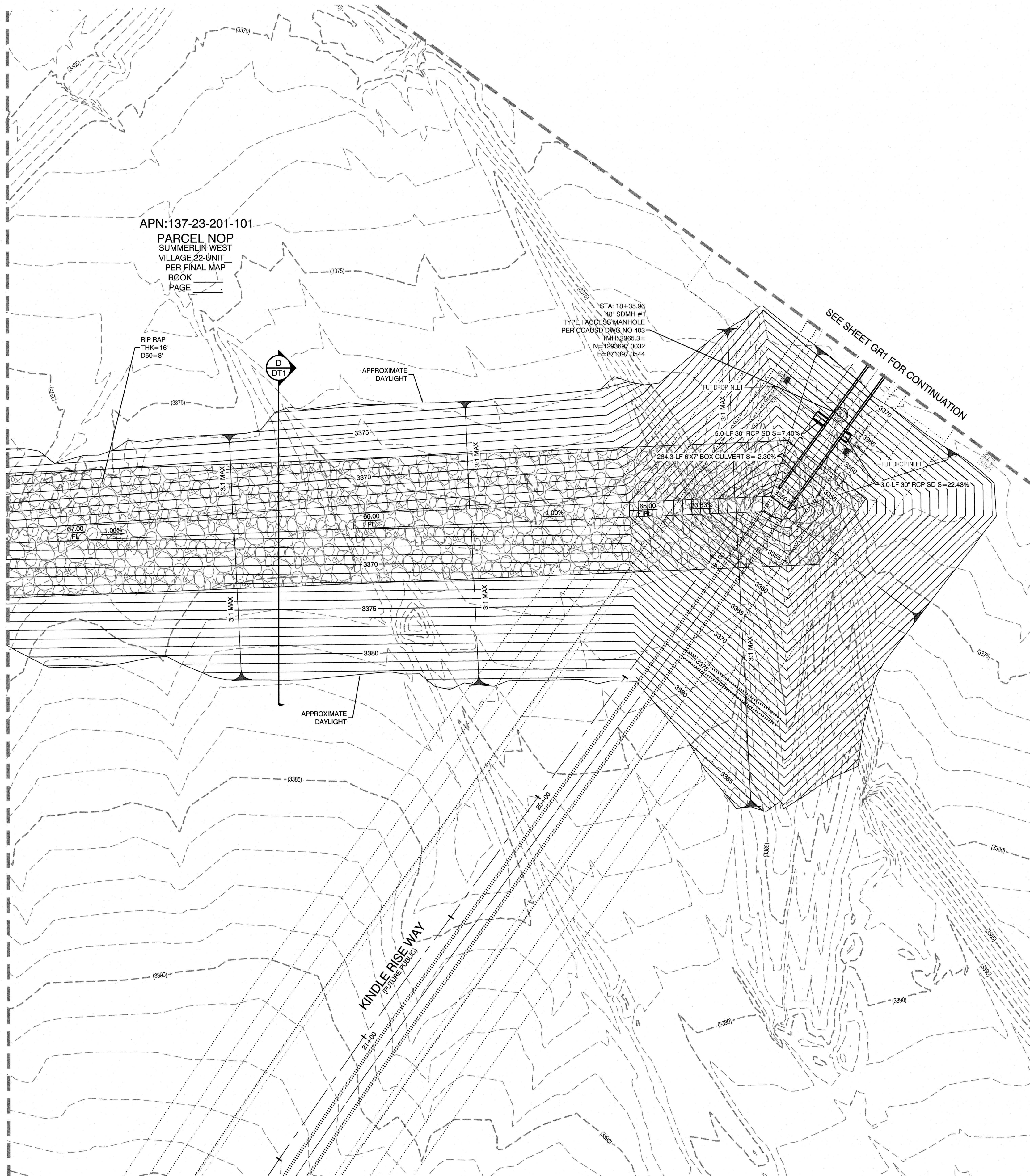
DRAWN BY: BCC 11/05/2019  
DESIGNED BY: BCC 11/05/2019  
CHECKED BY: WJM 02/05/2020  
PROJECT NO: 7861 SCALE: 1"=20' USCF VERT. N/A

**PROFESSIONAL ENGINEER - STATE OF NEVADA**  
WILLIAM J. MEYER  
No. 15745  
2/5/20

**GR3**  
10 OF 21 SHEETS  
DRAWING NO. \_\_\_\_\_



SEE SHEET GR3 FOR CONTINUATION



APN:137-23-201-101  
PARCEL NOP  
SUMMERLIN WEST  
VILLAGE 22 UNIT  
PER FINAL MAP  
BOOK  
PAGE

RIP RAP  
THK=18"  
D50=8"

D  
DTT

APPROXIMATE  
DAYLIGHT

APPROXIMATE  
DAYLIGHT

KINDLE RISE WAY  
(FOR 100' R/W)

STA: 18+35.96  
48" SDMM #1  
TYPE I ACCESS MANHOLE  
PER CCAUSD DWG NO 403  
N=1293697.0032  
E=871397.0544

FUT DROP INLET

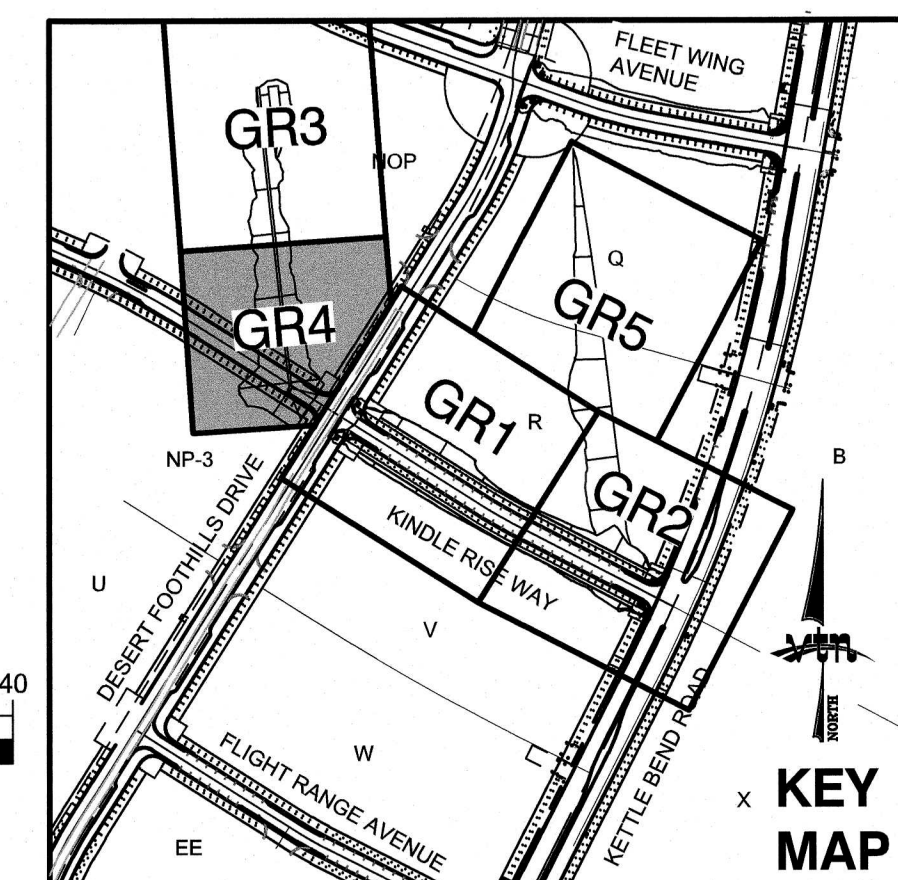
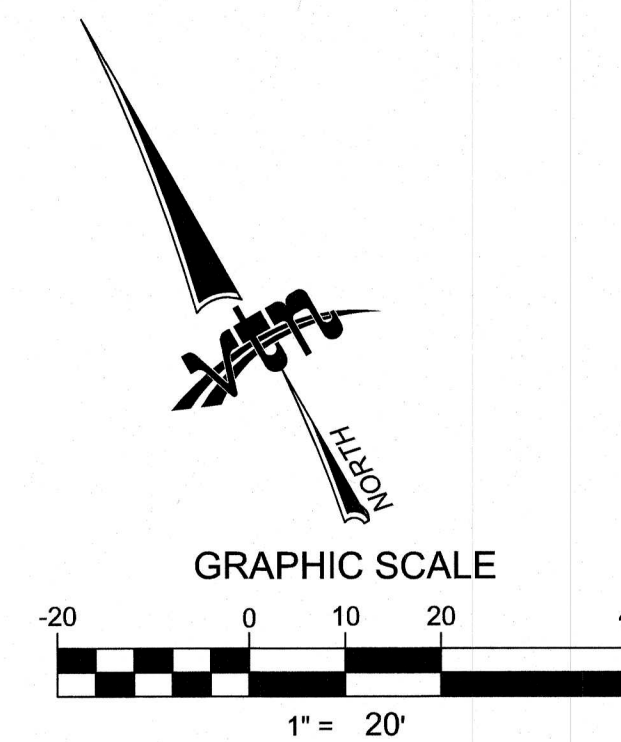
5.0' LF 30" RCP SD S=7.40%

264.3' LF 6X7' BOX CULVERT S=2.30%

FUT DROP INLET

5.0' LF 30" RCP SD S=22.43%

SEE SHEET GR1 FOR CONTINUATION



**BASIS OF BEARING**  
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983, SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.  
LINEAR UNIT: US SURVEY FOOT (FTUS)  
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)  
ZONE: LAS VEGAS HIGH ELEVATION ZONE  
PROJECTION: TRANSVERSE MERCATOR  
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°19'00"N  
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W  
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.333 FTUS)  
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.000 FTUS)  
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)  
NOTES:  
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO 'GROUND' DISTANCES IN THE PROJECT AREA.  
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**BENCHMARK**  
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)  
CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 988.574 METERS (3,246.63 FEET)  
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S R59E S03

**CONSTRUCTION NOTES**  
UTILITY PROFILE REFERENCE LABEL  
UT # = SHEET INDEX  
SHT # = SHEET NUMBER

- CONSTRUCTION NOTES**
- CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
  - FUTURE SIDEWALK
  - CONSTRUCT HANDICAP RAMP SEE SHEET DT2 & DT3
  - SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
  - FIELD VERIFY AND MATCH EXISTING

**GRADING PERMIT NOTE**  
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**GEOTECHNICAL NOTE:**  
REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-176, DATED DECEMBER 30, 2019

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**Call before you Dig**  
Avoid cutting underground utility lines. It's costly.  
CALL 811  
OR  
1-800-227-2600  
AND  
1-702-455-6000  
CLARK COUNTY TRAFFIC OPERATIONS  
1-702-227-2929

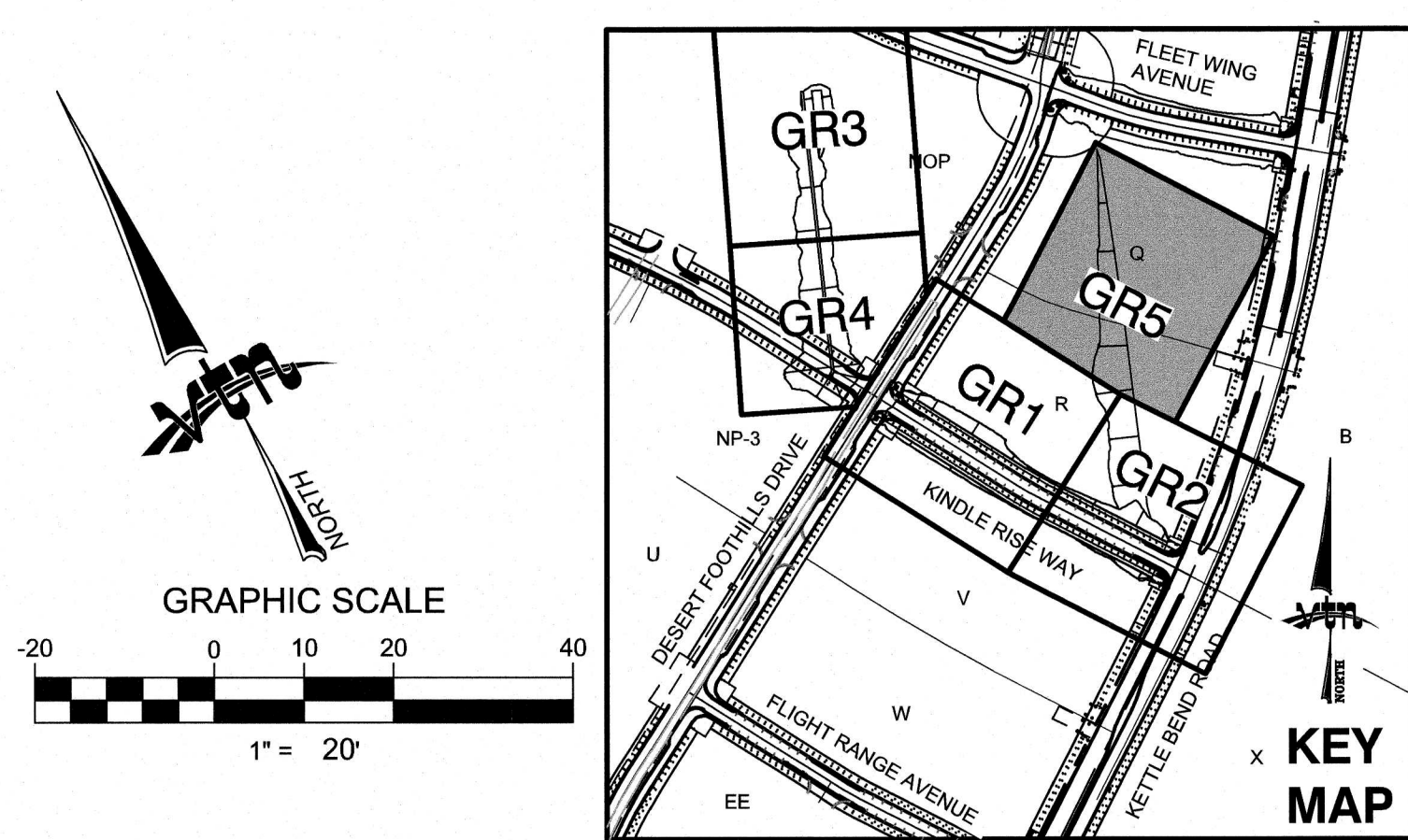
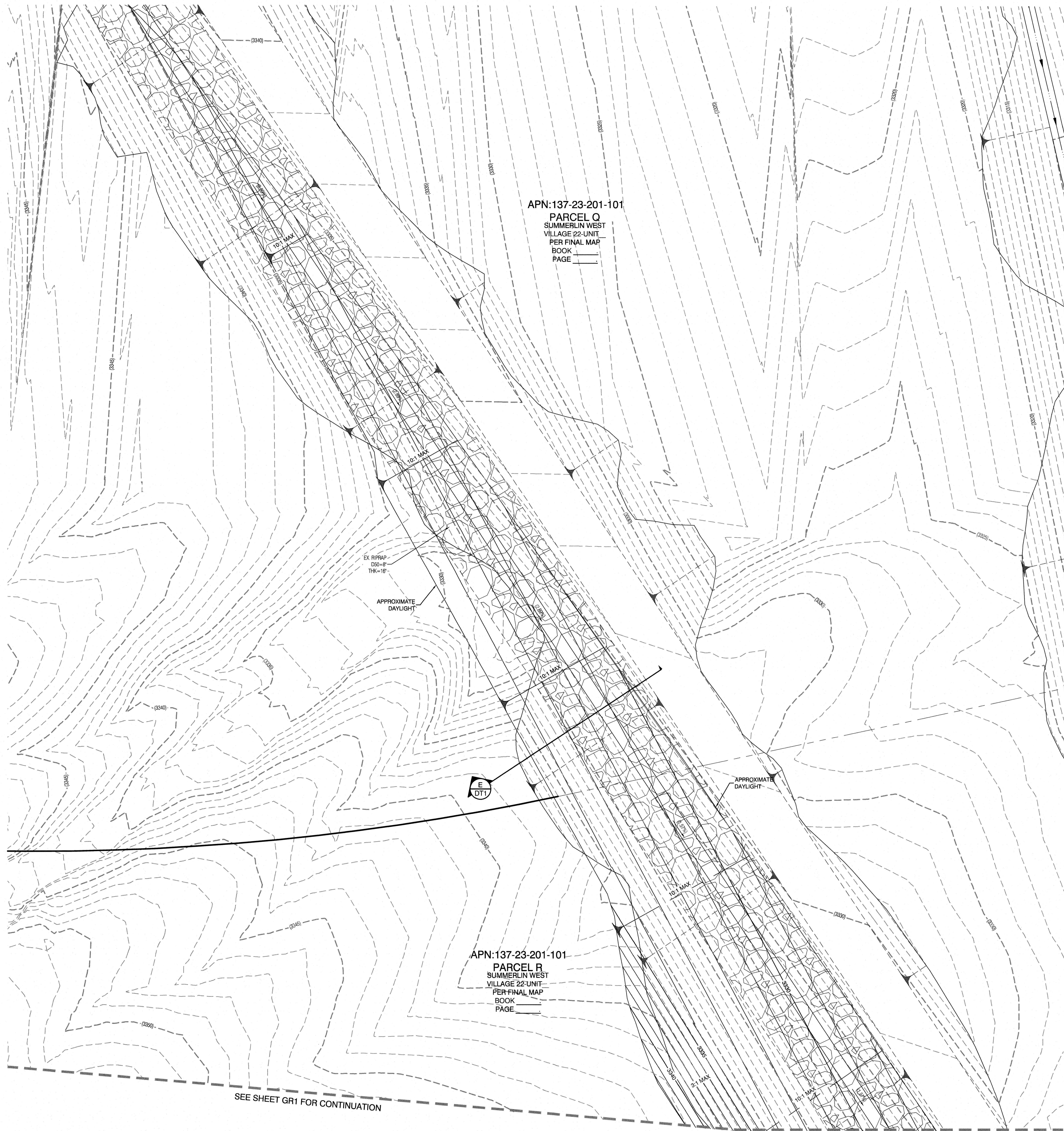
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CALL 811  
OR  
1-800-227-2600  
AND  
1-702-455-6000  
CLARK COUNTY TRAFFIC OPERATIONS  
1-702-227-2929

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #XXXXXXX  
WILLIAM J MEYER, P.E. No. 15745 DATE 2/6/20

|                                                                                                               |                     |                                                                                                                                                                                                |                     |
|---------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| HOWARD HUGHES COMPANY, LLC<br>A DELAWARE LIMITED LIABILITY COMPANY<br>LAS VEGAS, NEVADA 89138<br>702-731-1500 |                     | CITY OF LAS VEGAS<br>2727 SOUTH HANCOCK BOULEVARD<br>LAS VEGAS, NEVADA 89146-5148<br>PH. (702) 872-7550 FAX (702) 382-2597 WEB WWW.VTNV.COM<br>CONSULTING ENGINEERS • PLANNERS • AND SURVEYORS |                     |
| GRADING PLAN 4                                                                                                |                     | SUMMERLIN WEST VILLAGE 22<br>KINDLE RISE WAY-KETTLE BEND<br>ROAD TO DESERT FOOTHILLS DRIVE                                                                                                     |                     |
| DRAWN BY:<br>BCC                                                                                              | DESIGNED BY:<br>BCC | CHECKED BY:<br>WJM                                                                                                                                                                             | PROJECT NO:<br>7981 |
| 11/05/2019                                                                                                    |                     | 11/05/2019                                                                                                                                                                                     |                     |
| 02/05/2020                                                                                                    |                     | 02/05/2020                                                                                                                                                                                     |                     |
| SCALE: 1"=20'                                                                                                 |                     | SCALE: 1"=20'                                                                                                                                                                                  |                     |
| SHEET<br>11 OF 21 SHEETS                                                                                      |                     | SHEET<br>GR4                                                                                                                                                                                   |                     |
| DRAWING NO.                                                                                                   |                     | DRAWING NO.                                                                                                                                                                                    |                     |





**BASIS OF BEARING**

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

LINEAR UNIT: US SURVEY FOOT (FTUS)

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

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR  
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**BENCHMARK**

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S, R89E, S03

**CONSTRUCTION NOTES**

UTILITY PROFILE REFERENCE LABEL  
UT # = SHEET INDEX  
SHT# = SHEET NUMBER

- CONSTRUCTION NOTES**
- 1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
  - 2. FUTURE SIDEWALK
  - 3. CONSTRUCT HANDICAP RAMP SEE SHEET DT2 & DT3
  - 4. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CAUSD #500.5 & #503.
  - 5. FIELD VERIFY AND MATCH EXISTING

**GRADING PERMIT NOTE**

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**GEOTECHNICAL NOTE:**

REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-176, DATED DECEMBER 30, 2019

**SIGHT VISIBILITY ZONES:**

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**Call before you Dig**

Avoid cutting underground utility lines. It's costly.

**811**

OR

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

**1-702-227-2929**

**Call before you Dig**

Avoid cutting underground utility lines. It's costly.

**811**

OR

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

**1-702-227-2929**

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS. #XXXXXXX

WILLIAM J. MEYER, P.E. No. 15745 DATE 2/5/20

**HOWARD HUGHES COMPANY, LLC**  
**A DELAWARE LIMITED LIABILITY COMPANY**  
10846 GRIFFITH PEAK DRIVE, SUITE 100  
LAS VEGAS, NEVADA 89136  
702-331-9333

**CITY OF LAS VEGAS**  
2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5148  
PH. (702) 872-7550 FAX (702) 382-2597 WEB WWW.VTNV.COM  
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

**GRADING PLAN 5**

**SUMMERLIN WEST VILLAGE 22**  
**KINDLE RISE WAY-KETTLE BEND**  
**ROAD TO DESERT FOOTHILLS DRIVE**

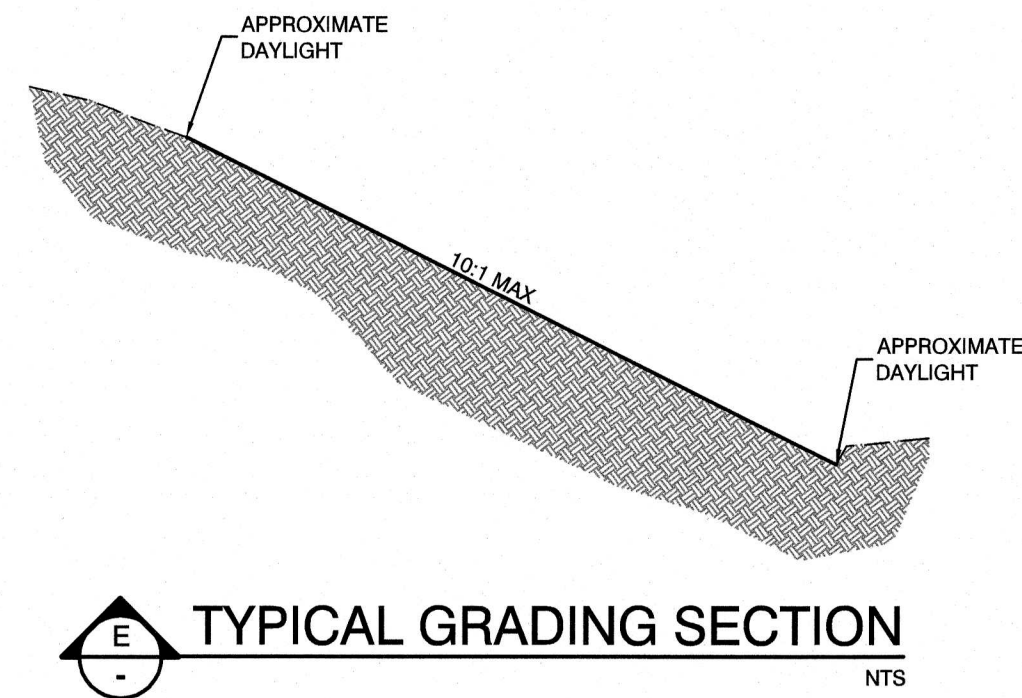
DRAWN BY: BCC  
DESIGNED BY: BCC  
CHECKED BY: NMM  
PROJECT NO: 7981

DATE: 12/12/2019  
DATE: 12/12/2019  
DATE: 01/07/2020  
SCALE: 1"=20'  
HORIZ. VERT.

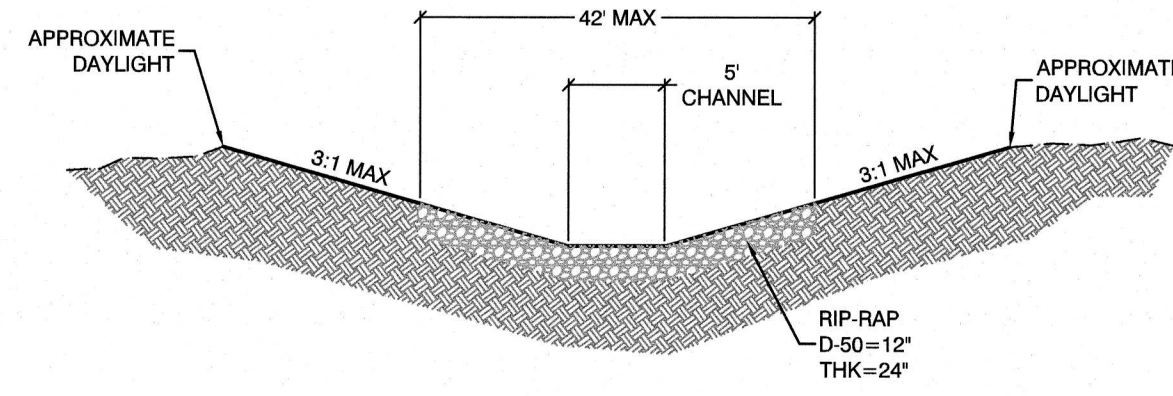
**PROFESSIONAL ENGINEER STATE OF NEVADA**  
**WILLIAM J. MEYER**  
No. 15745  
CIVIL

**GR5**  
12 OF 21 SHEETS  
DRAWING NO.

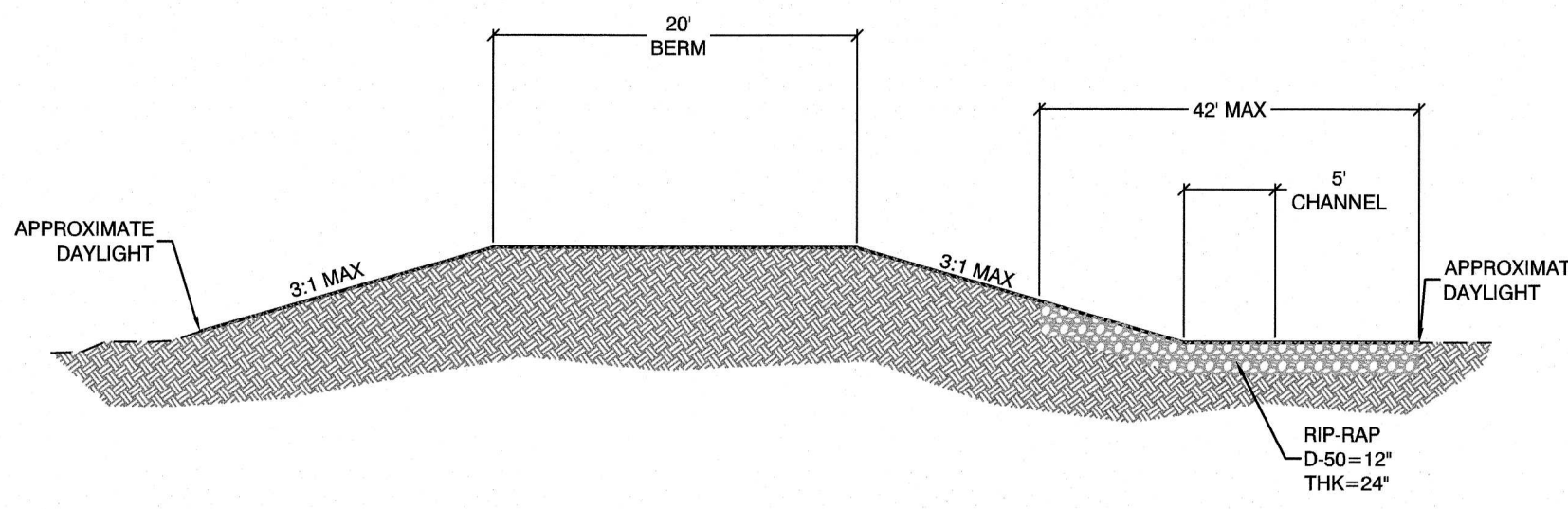




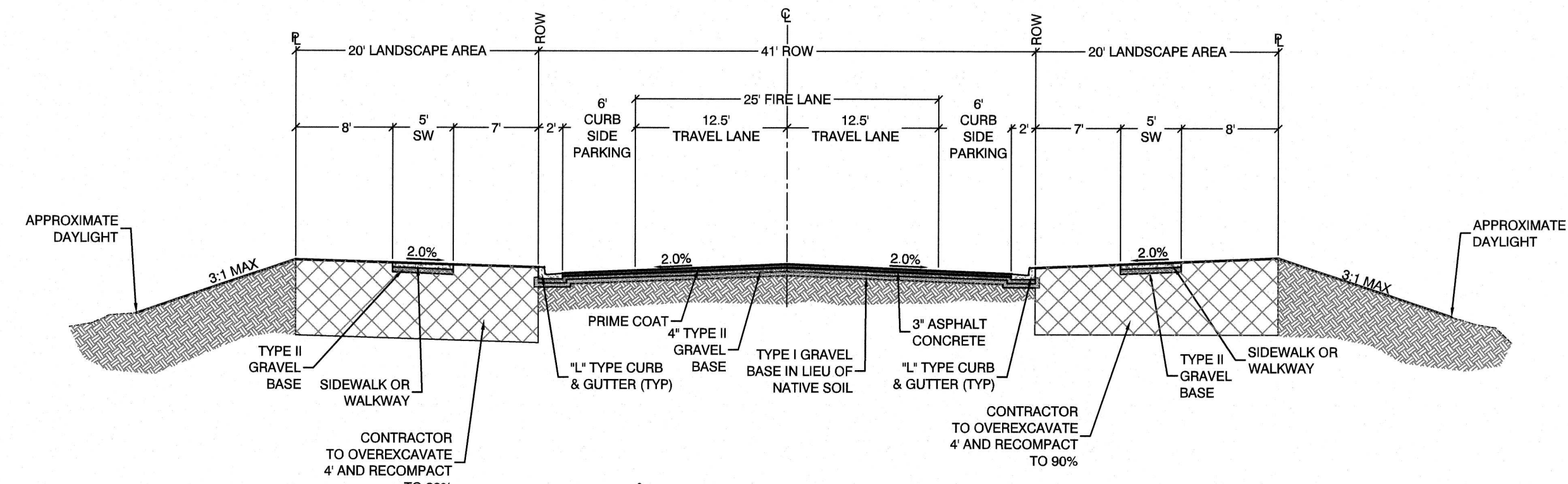
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NTS



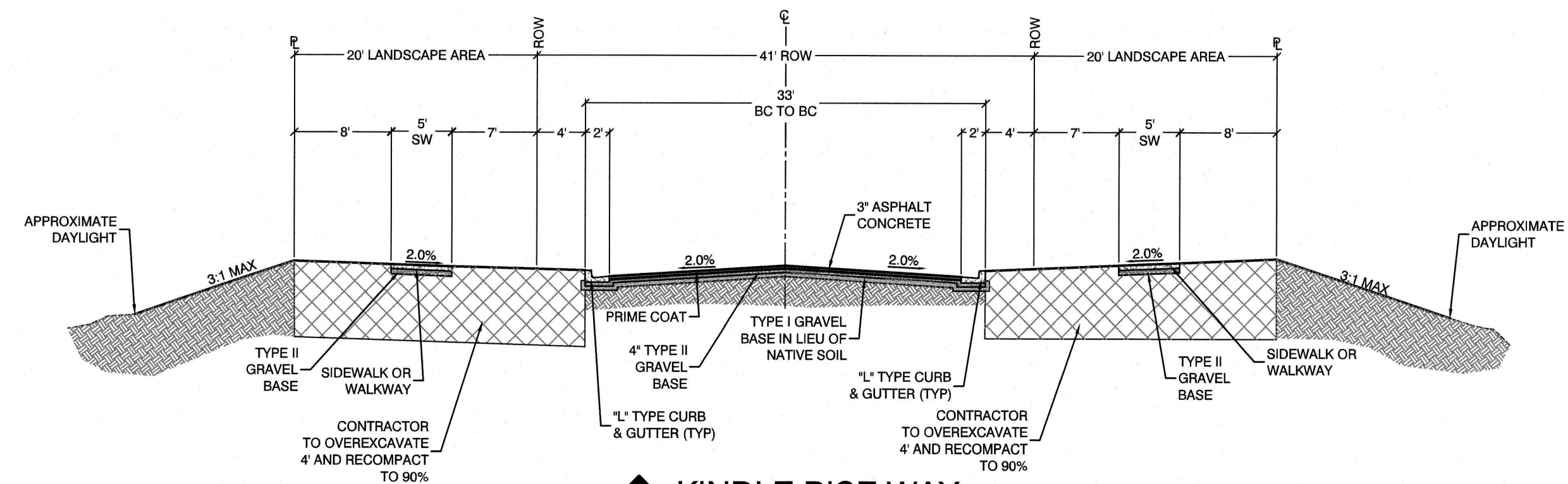
**TYPICAL GRADING SECTION**  
NTS



**TYPICAL GRADING SECTION**  
NTS



**KINDLE RISE WAY**  
NTS



**KINDLE RISE WAY**  
NTS

|                                                                                                                                                       |                     |                                                                                                                                                                                                      |                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| HOWARD HUGHES COMPANY, LLC<br>A DELAWARE LIMITED LIABILITY COMPANY<br>10845 GRIFFITH PEAK DRIVE, SUITE 160<br>LAS VEGAS, NEVADA 89135<br>702.791.4000 |                     | CITY OF LAS VEGAS<br>2727 SOUTH RAINBOW BOULEVARD<br>LAS VEGAS, NEVADA 89146-5148<br>PH: (702) 873-7559 FAX: (702) 362-2397<br>WEB: WWW.VTNV.COM<br>CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS |                      |
| DETAIL SHEET 1                                                                                                                                        |                     | SUMMERLIN WEST VILLAGE 22<br>KINDLE RISE WAY-KETTLE BEND ROAD<br>TO DESERT FOOTHILLS DRIVE                                                                                                           |                      |
| DRAWN BY:<br>BCC                                                                                                                                      | DESIGNED BY:<br>BCC | CHECKED BY:<br>WJM                                                                                                                                                                                   | PROJECT NO.:<br>7861 |
| 10/31/2019                                                                                                                                            | 10/31/2019          | 01/07/2020                                                                                                                                                                                           | SCALE: N/A           |
| PROFESSIONAL ENGINEER STATE OF NEVADA<br>WILLIAM J. MEYER<br>EXP: 12/31/21<br>CIVIL<br>No. 5745                                                       |                     | SHEET<br><b>DT1</b><br>13 OF 21 SHEETS<br>DRAWING NO.                                                                                                                                                |                      |











MATCHLINE - STA 14+30  
SEE SHEET UT1

APN:137-23-201-101  
PARCEL R  
SUMMERLIN WEST  
VILLAGE 22-UNIT  
PER FINAL MAP  
BOOK  
PAGE

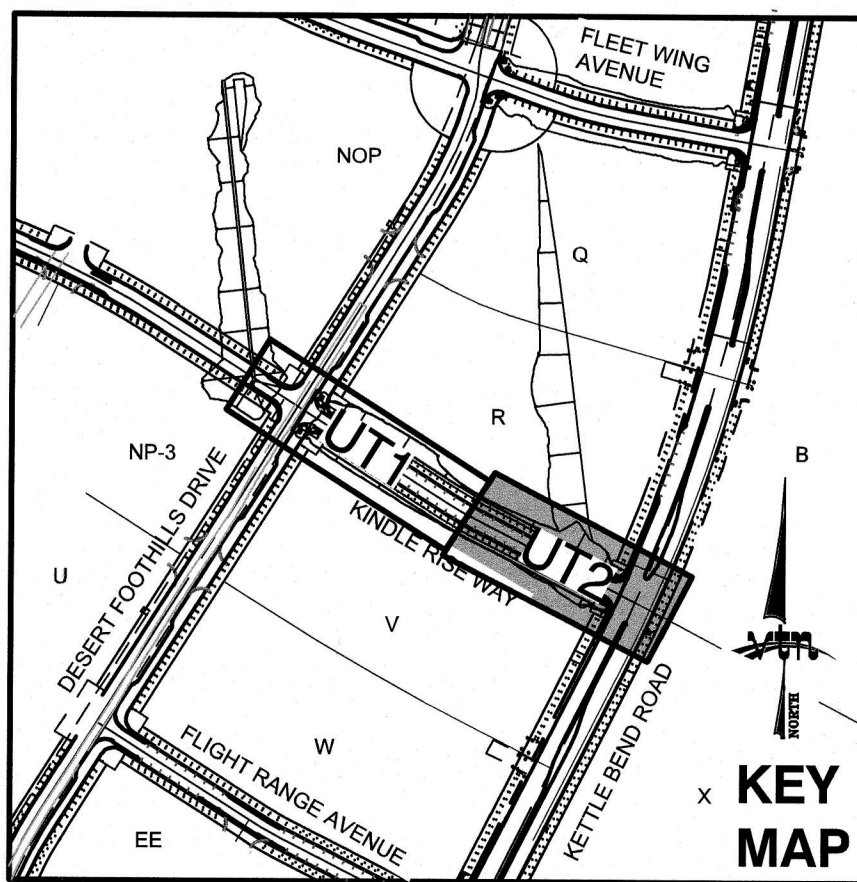
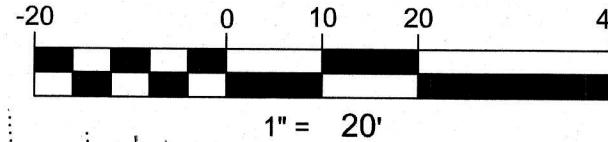
APN:137-23-201-101  
PARCEL V  
SUMMERLIN WEST  
VILLAGE 22-UNIT  
PER FINAL MAP  
BOOK  
PAGE

KINDLE RISE WAY  
(PUBLIC)

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

KETTLE BEND ROAD  
(EXISTING PUBLIC)

GRAPHIC SCALE



#### CONSTRUCTION NOTES

UTILITY PROFILE REFERENCE LABEL  
UT # = SHEET INDEX  
SHT # = SHEET NUMBER

#### WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

#### WATER MAIN COVER NOTE:

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

#### WATERLINE TRENCH NOTE:

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

#### WATER LINE MARKER BALLS NOTE

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

#### FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:  
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.  
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

#### WATER MAIN JOINT DEFLECTION

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

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

#### UTILITY CROSSING NOTE:

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

#### ENGINEER DISCLAIMER NOTE:

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

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

**Call before you Dig**  
1-702-455-7511  
CLARK COUNTY TRAFFIC OPERATIONS  
1-702-227-2600  
AND  
1-702-455-6000  
CLARK COUNTY TRAFFIC OPERATIONS

#### BASIS OF BEARING

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

LINEAR UNIT: US SURVEY FOOT (FTUS)

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

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR  
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N  
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W  
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.333 FTUS)  
EASTING AT CENTRAL MERIDIAN: 300,000.00 M (984,250.000 FTUS)  
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:  
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.  
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

#### BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)  
CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)  
FROM STA: 10+37  
TO STA: 12+52

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S, R69E, S03



1-702-227-2929

#### LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES  
PROJECT:

DATE: LVWVD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

HOWARD HUGHES COMPANY, LLC  
A DELAWARE LIMITED LIABILITY COMPANY  
CITY OF LAS VEGAS  
2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5146  
PH: (702) 879-7500 FAX: (702) 382-2587 WEB: WWW.VTNV.COM  
LAS VEGAS, NEVADA 89155  
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

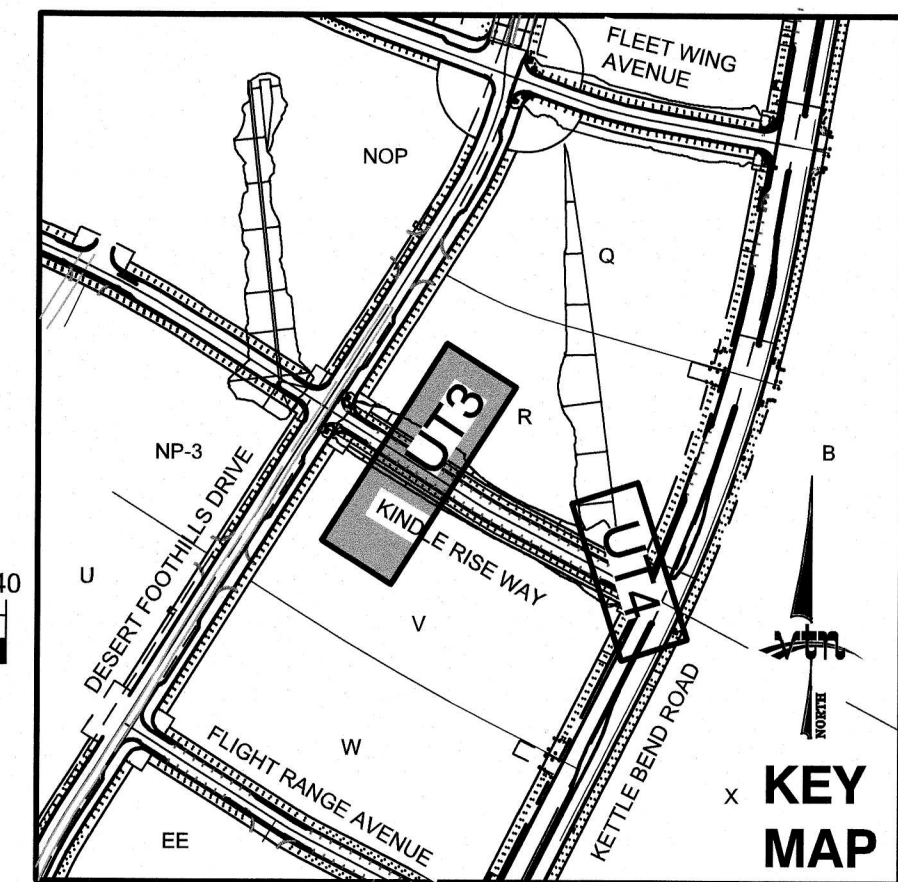
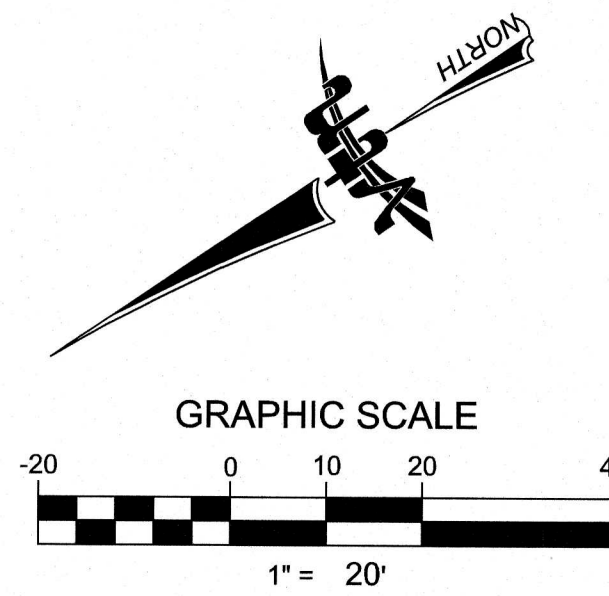
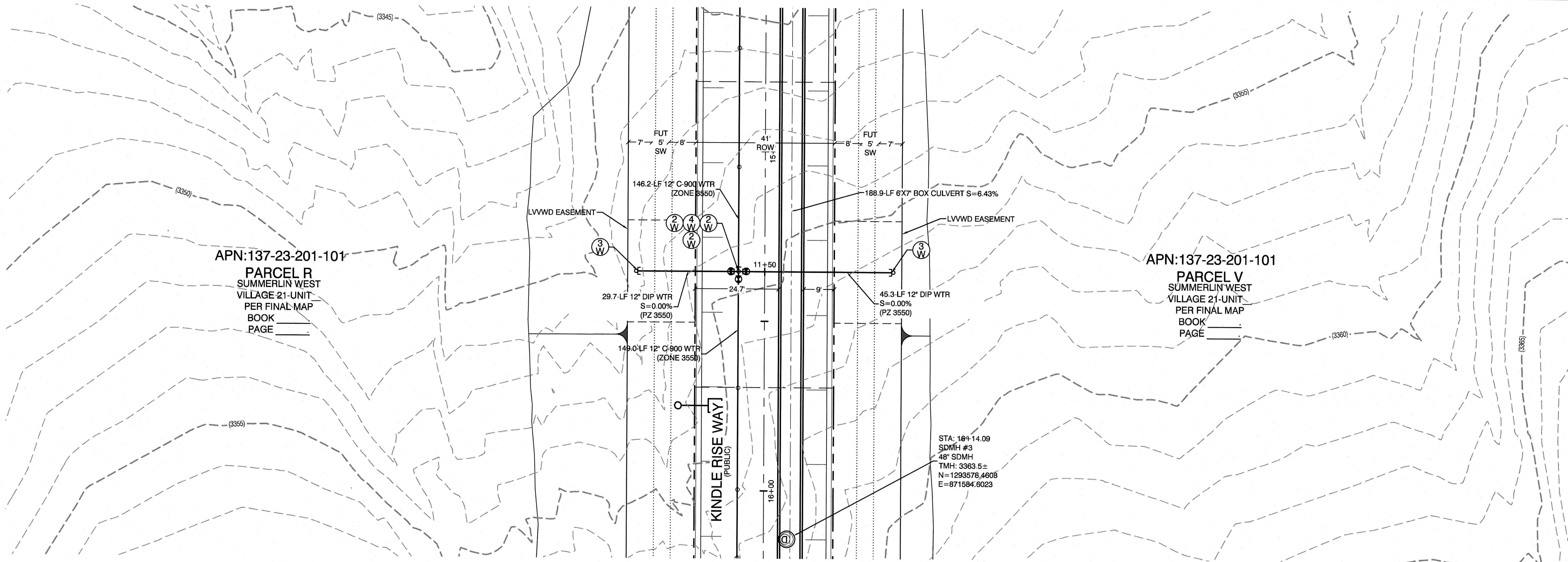
UTILITY PLAN & PROFILE 2  
14+30 TO 9+38  
SUMMERLIN WEST VILLAGE 22  
KINDLE RISE WAY-KETTLE BEND  
ROAD TO DESERT FOOTHILLS DRIVE

DRAWN BY: ECC  
DESIGNED BY: ECC  
CHECKED BY: WJM  
PROJECT NO: 7861  
SCALE: 1"=20' HORIZ.  
1"=4' VERT.

PROFESSIONAL ENGINEER  
WILLIAM J. MEYER  
EXP. 12/31/21  
CIVIL  
2/5/20

16 OF 21 SHEETS  
DRAWING NO.





**WATER PRESSURE ZONE:**  
WATER SERVICE LOCATED IN THE 3550 PRESSURE ZONE.

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

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

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

**FIRE HYDRANT MARKER NOTES**  
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:  
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**WATER MAIN JOINT DEFLECTION**  
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02.  
FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

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

| CONSTRUCTION NOTES                                      |         |  |
|---------------------------------------------------------|---------|--|
| WATER                                                   | PUBLIC  |  |
| 1. FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40) | 1 EA.   |  |
| 2. 12" GATE VALVE (PER UDACS PLATE 39)                  | 4 EA.   |  |
| 3. 12" CAP & BLOW OFF (PER UDACS PLATE 39)              | 2 EA.   |  |
| 4. 12"x12" CROSS (PER UDACS PLATE 31)                   | 1 EA.   |  |
| 5. 24"x12" TEE (PER UDACS PLATE 31)                     | 1 EA.   |  |
| 6. 12" 5" BEND (PER UDACS PLATE 31)                     | 3 EA.   |  |
| 7. 12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17    | 705 LF. |  |
| 8. 12" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17      | 75 LF.  |  |
| 9. 6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17     | 14 LF.  |  |
| 10. WATER POINT OF CONNECTION                           |         |  |

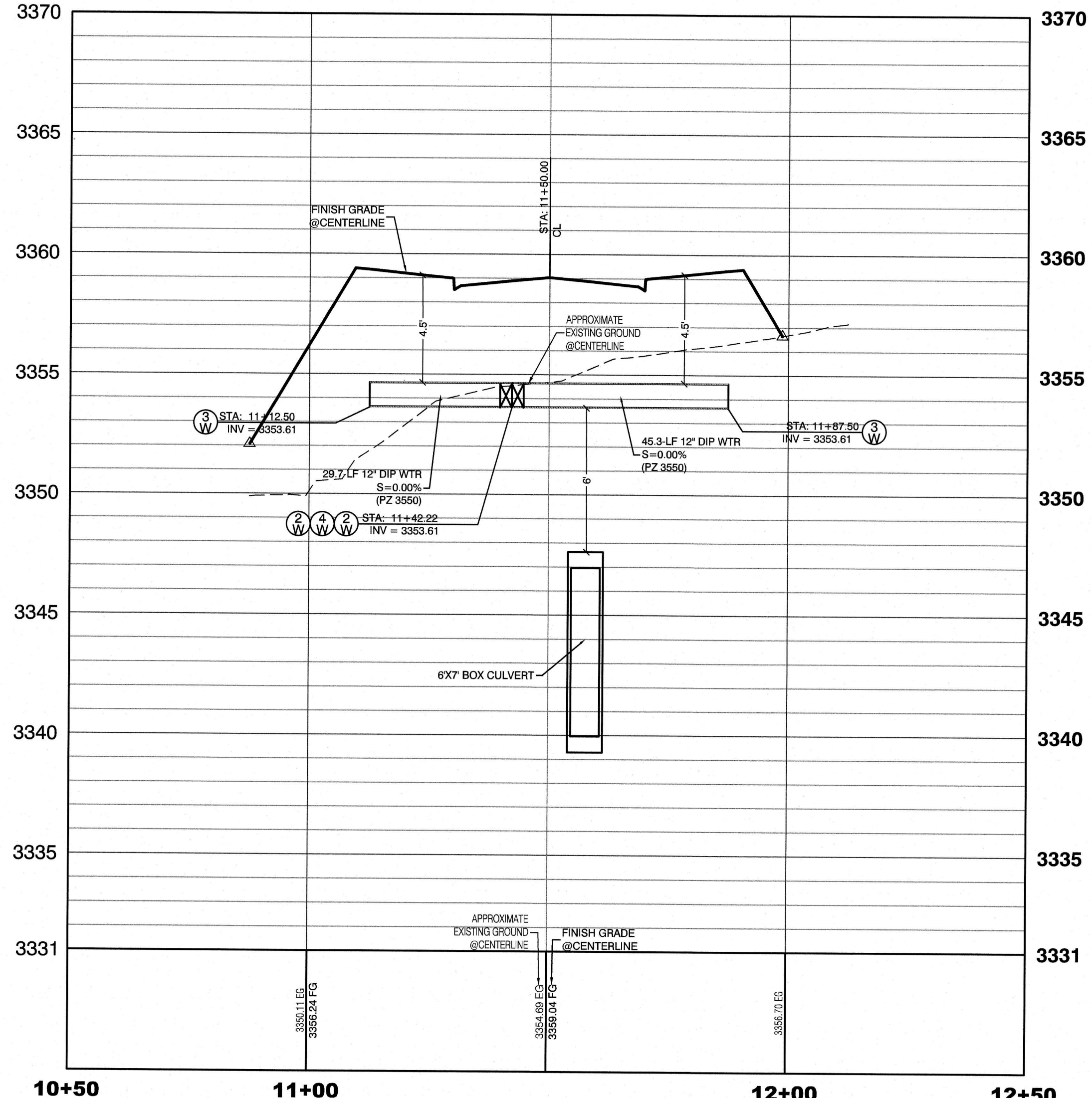
**ENGINEER DISCLAIMER NOTE:**  
UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES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

**BASIS OF BEARING**  
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983, SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.  
LINEAR UNIT: US SURVEY FOOT (FTUS)  
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)  
ZONE: LAS VEGAS HIGH ELEVATION ZONE  
PROJECTION: TRANSVERSE MERCATOR  
STANDARD PARALLEL (AND LATITUDE OF GRID 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: 300,000.00 M (984,250.0000 FTUS)  
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)  
NOTES:  
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.  
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

**BENCHMARK**  
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)  
CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)  
END US&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T215.R596.S03

**LAS VEGAS FIRE & RESCUE APPROVAL**  
BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

**LAS VEGAS VALLEY WATER DISTRICT APPROVAL**  
APPROVED FOR CONSTRUCTION  
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES  
DATE: \_\_\_\_\_ PROJECT: \_\_\_\_\_  
LVWWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



**KINDLE RISE WAY (PUBLIC)**

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

**CALL BEFORE YOU DIG**

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Call before you Dig

1-800-227-2800

1-702-455-7511

1-702-228-8811

**HOWARD HUGHES COMPANY, LLC**  
A DELAWARE LIMITED LIABILITY COMPANY  
2727 SOUTH RAINBOW BOULEVARD  
LAS VEGAS, NEVADA 89146-5146  
PH: (702) 873-7550 FAX: (702) 382-2397 WEB: WWW.VTNN.COM  
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

**UTILITY PLAN & PROFILE 3 WATER LATERAL**

**SUMMERLIN WEST VILLAGE 22**  
**KINDLE RISE WAY-KETTLE BEND**  
**ROAD TO DESERT FOOTHILLS DRIVE**

DRAWN BY: BCC 10/31/2019

DESIGNED BY: BCC 10/31/2019

CHECKED BY: WJM 01/07/2020

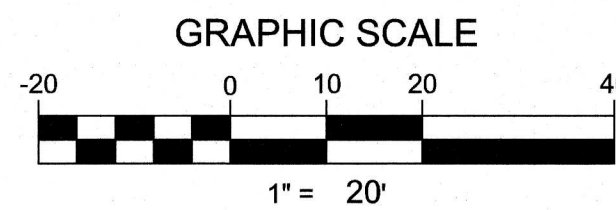
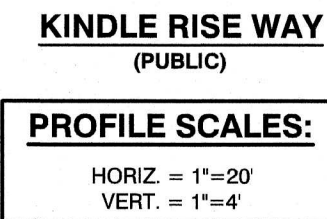
PROJECT NO: 7861

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

**PROFESSIONAL ENGINEER - STATE OF NEVADA**  
WILLIAM J. MEYER  
EXP: 12/31/21  
2/5/20

**UT3**  
17 OF 21 SHEETS  
DRAWING NO. \_\_\_\_\_





|                                                                                                                               |                                                         |        |
|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------|
|                                            | FIRE HYDRANT ASSEMBLY:<br>(PER UDACS PLATE NO. 39 & 40) | 1 EA.  |
|                | 12" GATE VALVE<br>(PER UDACS PLATE 39)                  | 4 EA.  |
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|                | 12"x12" CROSS (PER UDACS PLATE 31)                      | 1 EA.  |
|                  | 24"x12" TEE (PER UDACS PLATE 31)                        | 1 EA.  |
|                   | 12" 5" BEND (PER UDACS PLATE 31)                        | 3 EA.  |
|       | 12" C-800 WATER MAIN<br>PER UDACS 2.06.01 & PLATE 17    | 705 LF |
|         | 12" D16 WATER MAIN<br>PER UDACS 2.06.01 & PLATE 17      | 75 LF  |
|       | 6" C-900 WATER MAIN<br>PER UDACS 2.06.01 & PLATE 17     | 14 LF. |
|                                            | WATER POINT OF CONNECTION                               |        |

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

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LINEAR UNIT: US SURVEY FOOT (FTUS)  
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00  
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)  
ZONE: LAS VEGAS HIGH ELEVATION ZONE

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

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

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)  
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

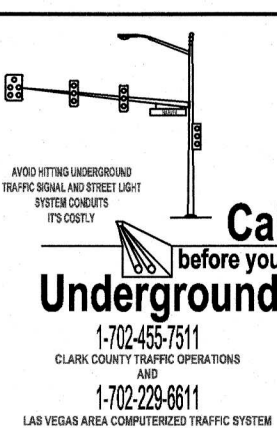
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF  
CHARLESTON BLVD. & WEST OF DETENTION BASIN.  
T21S. R59E. S03

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

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

APPROVED FOR CONSTRUCTION

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



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

CALL  
**811**

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



# UTILITY PLAN & PROFILE 4 STORM DRAIN LATERAL

**SUMMERLIN WEST VILLAGE 22  
KINDLE RISE WAY-KETTLE BEND  
ROAD TO DESERT FOOTHILLS DRIVE**

DRAWN BY:  J. J. McCann  
10/21/2010

DESIGNED BY:

CHECKED BY: \_\_\_\_\_

|             |        |
|-------------|--------|
| PROJECT NO. | SCALE: |
|-------------|--------|

WILLIAM J. MEYER

PROFESSIONAL ENGINEER - STATE OF NEVADA

EXP: 12/31/21

CIVIL

NO. 15745

25/28

SHEET

**UT4**

**18 OF 21 SHEETS**

DRAWING NO.